

Project-based Learning in an UIUC Horticultural Capstone Course

Graduate Project Research Paper

Extramural Graduate Program
Department of Natural Resources and Environmental Science

Anne-Marie Eischen

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Faculty Advisor
Dr. Daniel Warnock

Presentation Panelists
Dr. Donald Briskin
Dr. German Bollero

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Abstract

The Department of Natural Resources and Environmental Sciences and Dr. Daniel Warnock recently developed the capstone class HORT 443 - Horticulture Entrepreneurship to provide ACES undergraduates exposure to business practices and entrepreneurial skills. The need for this class was identified after consulting with Illinois horticulture leaders who identified a skill gap in students entering the workforce. The class relies on project-based learning opportunities to improve student communication, team building, and critical thinking skills. One of the methods incorporated into the coursework to achieve these goals will be the operation of a student-run plant rental service business. The plant rental service (PRS) will utilize an e-commerce website and related business application system to give the students valuable experience in marketing, client communication, operational issues and accounting functions.

The e-commerce website will be used by the University community to order plant material and will be interfaced with the business application system that the students will use to fill and record the orders. The development of this e-commerce website for HORT 443 provided the opportunity for completion of the required project component of the UIUC NRES Extramural Graduate program. Traditionally, graduate projects produce data that is used for analysis and lead to the formation of a conclusion or summary. Instead this project was based on the creation of the e-commerce website which required solutions that would produce a viable software program and would meet the course objectives. This paper describes how the e-commerce website was developed and the anticipated impacts on student learning.

The Changing Expectations of Employers

The genesis of the Horticulture Entrepreneurship (HORT 443) course was the result of informal discussions with Illinois horticultural leaders where they identified that new graduates often lack the necessary skill sets related to business practices. In 2001 the University of Illinois conducted a survey on the economic impact, structure and characteristics of Illinois' green industry of which one of the factors studied was the needs of employers in regards to their workforce (Campbell et al, 2001). A specific need expressed by the participants was their desire to more effectively compete with mass discount merchandisers. To meet these needs the respondents suggested "increasing the emphasis of business and marketing instruction within horticulture curricula'.

These deficiencies are not limited to Illinois horticultural and agricultural employers but are being acknowledged by many industries in regards to its entry level workforce. A survey conducted by the Collegiate Employment Research Institute (2002) on recruiting trends found that "Employers want the "total package" when they hire their next college graduates. Not satisfied with academically well-prepared graduates, employers want individuals who possess and can demonstrate excellent communication and interpersonal skills, teamwork, leadership, and computer/technical proficiency."

In the horticultural and agricultural industries the same results are seen. A recent study predicted that 46% of the job openings for food and agricultural science graduates between 2005 and 2010 would be positions in management, finance and marketing of which only 60% of the graduates would be qualified to fill (Goecker et al., 2005). The expectation would be business majors outside horticultural and agricultural disciplines would be needed to fill the

surplus positions. The difference between the graduate pool and the qualified candidate is the lack of necessary skills to participate and contribute to the operations of their employer.

The specific skills desired by new employers were elucidated in a survey that found a majority (53%) of landscape contracting decision-makers surveyed felt that recent graduates were deficient in business knowledge (Beidler, Iles et al., 2006). This business knowledge included managing employees, client relationships, time management and organizational skills (see Table 1).

Table 1: Responses of the Associated Landscape Contractors of America population when asked to rate the importance of skills used by individuals in the landscape contracting industry.

Desired Skills	Relative importance (1 to 5 scale)		
Good work ethic	4.84	±	0.03
Proper attitude/personality	4.78	±	0.04
Client relationships	4.63	±	0.05
Time management	4.57	±	0.05
Managing employees	4.48	±	0.06
Plant Identification	4.46	±	0.06
Organizational skills	4.39	±	0.05
Proper planting techniques	4.31	±	0.06
Production management	4.31	±	0.07
Internships or work experience	4.30	±	0.06

*Respondents rated 43 skills

*Rating scale 1 = not important; 2 = below average importance; 3= average importance; 4 = above average importance; 5 = very important (Beidler, Iles, Nusser and VanDerZander. 2006)

In the same survey it was also found that only a small percentage of employers (9.6%) felt that their entry level employees did not possess the horticultural knowledge needed to perform the tasks for which they were hired. They also stated that if a choice had to be made between two candidates, they would choose the one with the stronger horticultural expertise. This supports the UIUC decision that the HORT 443 course should be in addition to, not in place of any horticultural or agricultural class.

Student alumni are also a good source of information related to making the transition between student and employee. The University of Arkansas recently felt that their Crop, Soil and Environmental Sciences curricula was not meeting the needs of perspective students due to the declining student enrollment (Madewell, Savin and Brye 2003). The survey covered many areas including what employers and alumni perceive to be important skills a prospective employee may already possess prior to graduation. The employers and the alumni were asked to rank several employee proficiencies on a scale of 1 to 5, where 5 represents a "strongly agree" response to a skill that the participant found to be highly relevant. Both the employers and alumni ranked the same hiring criteria as their three most important skills set (see Table 2). These employee characteristic are oral and written communication abilities, interpersonal skills and research/hands-on experience.

Table 2: Ratings and rankings of employers and alumni of the University of Arkansas Crop, Soil and Environmental Science programs concerning the importance of specific hiring Criteria.

Hiring criteria mean	Employer			Alumni		
	Mean	SD	Ranking	Mean	SD	Ranking
Oral and written communication skills	4.5	0.7	1	4.6	0.7	1
Interpersonal skills	4.4	0.7	2	4.5	0.7	2
Research/hands-on work experience	4.1	1.0	3	4.1	0.7	3
Technical aptitude	4.1	0.5	4	4.2	0.8	4
Course relevance	4.0	0.8	4	4.2	0.7	4
Leadership/management skills	3.8	0.9	4	3.8	0.7	4
Grade point average	3.3	0.7	8	3.4	0.7	8
Business skills	3.0	0.9	7	3.1	1.0	7
Extra-curricular involvement	2.9	0.9	8	3.4	1.0	8
Foreign language	1.9	0.8	10	2.4	1.0	10

* Respondents were asked to rate their agreement with statements on a scale from 1 to 5, with 5 being “strongly agree” and 1 being “strongly disagree”.

*Values ≥ 3 were considered positive

* Employer (n=30) and alumni (n=96-98)

(Madewell, Savin and Brye, 2003)

Linking educational experience with working life

Most of the deficiencies found in entry level employees are specific components of the more general concepts of problem solving, communication and critical thinking. Dealing with clients, collaborative interaction with other employees, managing staff, resolving workplace conflicts all involve these three basic concepts. Successful graduates are able to integrate the abstract theories and formal knowledge into real world experience. Bromme and Tillema

(1995) state that “Becoming a professional is not a process of substituting experience for theory, but a process of fusing theory and experience”. Most agree the most effective way to link the academic environment with working life is through project-based learning.

Project-based learning gives students the opportunity to work through real world issues with sufficient teacher scaffolding and often industry leader support. The purpose of project-based learning is to simulate authentic situations in working life where unknown end results can be explored (Boud and Feletti 1991). Project-based learning can take many forms. In programs such as engineering degrees, the project-based course would attempt to consolidate all the engineering courses in the creation/design of a client requested project. Business schools frequently develop new business ventures complete with a customer base, marketing plan and projected revenues and expenses. Law schools will hold mock trials with students taking the lead roles as the plaintiff, defendant, prosecutor, defense attorney and judge. Frequently these classes are called capstone or senior seminar courses. In many programs they are required for graduation.

The development of capstone courses should serve three purposes in undergraduate education (Cuseo 1990). To integrate the curriculum, thereby allowing students to make connections between course content, skills learned, and applied context. A second purpose is to provide students with an opportunity to reflect upon their college experience. Finally, a third purpose is to prepare students for graduate work and the professional world. The importance of capstone courses is that they allow the students to have a ‘senior experience’ similar to their ‘freshman experience’ (Gardner and Van der Veer 1998). Like the transition

from high school to college, the move from the academic world to working life requires as much preparation.

To facilitate the transition from the academic environment to the workplace it is necessary to recognize that the type of learning a student does in school is different than the type of learning they do when they are in the work place. Resnick (1987) believes that there are four major differences between how a student acquires information and proves their competencies and how an employee obtains knowledge and experience. The student environment is controlled and formal with predicative outcomes. On the job training/learning is often casual in structure but is frequently initiated with the assistance of a supervisor and other employees.

The first learning difference is that school activities are usually individual-based. Homework, test scores and research papers are exclusive to the student. In the workplace, the goals are broader including corporate success and departmental projects. Very little work product is produced by a single employee but rather through collaboration and interaction.

Another difference is the use of tools to perform tasks. In the classroom, even with the growing trend toward the integration of technology, the traditional assessment of success involves testing without the use of books or notes. In the workplace, using any tool that leads to efficiency and efficacy is encouraged. Little memorization is required.

Resnick (1987) points to symbol manipulation as the third school learning characteristic. Students use word problems, case studies and homework to illustrate concepts. In the work place, employees do not use symbols but instead are connected to physical things. It is often

difficult for the student to realize that theories have real world applications. For most people this realization occurs after being in a work environment for several years.

The fourth difference is that school learning is general and work place learning is situation specific. It is the goal of formal education to provide the framework from which an employee can then transfer concepts to actual events. Very few real life experiences are clear cut in either their interpretation or their solutions. If an adequate foundation is acquired in higher education, it can help identify the proper steps necessary to resolve a problem. In the business community there are frequently disagreements as to the meaning of results or the understanding of situations. Employers expect employees to defend their positions with theoretical concepts and accepted principles applied to the current circumstance. The relevance of the theory applied is ultimately how the decision to proceed is determined.

The recently approved Horticulture Entrepreneurship (HORT 443) will be a capstone class designed to expose students to work place learning. To highlight the first characteristic of work place learning, individual tasks will be replaced by teamwork. To gain experience in the use of tools the students will utilize a Filemaker database. Manipulation of symbols such as homework and case studies will be replaced with the resolution of issues related to customers, delivery constraints and inventory quality. Finally, during class lectures and case studies the students will learn about theory of marketing, business strategy and personnel management. In the operation of the Plant Rental Service the students will have to implement these concepts and judge their results thereby applying concepts to specific situations.

Capstone courses strive to present a realistic and meaningful experience based on real world data and experiences to students. For example, the University of Wisconsin-Madison's Department of Civil Engineering requires a minimum of one three credit course in a capstone design experience (Hanna and Sullivan, 2005). In 1998, the University of Wisconsin-Madison faculty chose the development of four pedestrian bridges for the Kickapoo Reserve as the class project. To be an appropriate project, certain constraints were required. The project had to be completed in one semester and have owner support. Four student groups with equal expertise were expected to deliver topographical maps, feasibility and environmental studies, meeting notes, interim reports and final presentations to the reserve client.

As with most project-based learning, the students were not the only participants who obtained a benefit from the experience. The students gained real world skills in an open-ended design project, learned to manage and budget time, were exposed to cultural aspects of their profession, gained proficiency in written and oral communication and conflict resolution skills. The reserve managers received a completed design for a much needed community project that would not have been feasible with its current funding. The University also learned where the undergraduate curriculum was inadequate due to student assessment at the conclusion of the class.

Like most capstone curriculum, the UW-M course goal was to provide the students with a project that allowed them to demonstrate the knowledge gained from their undergraduate engineering classes. The HORT 443 course will concentrate on developing basic business skills through the operation and management of a Plant Rental Service (PRS). Therefore, HORT 443 will not be a culmination of the topics in horticultural or agricultural classes, but

rather will be additive. The students will gain familiarity in concepts not previously studied. To assist the learning process the course will be a mix a traditional lecture and web assisted learning.

The use of web assisted learning has proven to be a valuable tool in higher education coursework. The purpose of integrating technology in a traditional lecture setting is to move the students from a passive to an active form of learning. Recent research shows that technology-based material that is offered in an interactive manner, which is perceived by the students to be easily understood and navigable, demonstrates a significant student learning experience (Evans et al. 2004). Other research has found that developing curriculum that is a "hybrid" of traditional lectures and on-line assignments produces student competencies that were equivalent or better than the conventional method and promoted a deeper active learning process (Riffell and Sibley, 2005).

The project-based capstone HORT 443 course will use the hybrid approach of conventional course material and web based learning. Coupling the theory of capstone courses with the web-based learning will be unique in that it will present opportunities to connect active learning and real world experience. The manipulation of the web-based e-commerce and business application by the students will give the students an active learning experience. It will also give them real world knowledge as they will fulfill all business management roles including receiving, production, shipping, marketing and finance. The HORT 443 e-commerce site is designed to provide this linkage for student learning by using a basic business model, an off the shelf software package, and structured interactions between students, clients, and instructors.

The e-commerce site is divided into a series of business application pages designed to expose the students to some general business terms and concepts. In a retail business model, the ordering process, shipping of goods and billing customers are universal. Within this simple cycle, situations are likely to arise that require PRS staff (students) to resolve challenges. In class, students will be assigned tasks, such as checking and processing client orders, managing inventory, delivering products, and reporting sales information. The interdependence of these tasks will complete the cycle. Students will see the correlation between successful customer relations with the growth of a business. Although the rental service is a small, simple operation, its business principles and work flow will be similar to those the students will see in their professional life. As part of the student run company, an e-commerce site will be the foundation for business operations. Thus, the development of a robust e-commerce website is a critical component of the HORT 443 class.

The development of the e-commerce website for HORT 443 provided the opportunity for completion of the required project component of the UIUC NRES Extramural Graduate program. The traditional graduate project produces data that must be collected, analyzed and reported. For this project, it was the programming of the software that created challenges that had to be resolved. Because the e-commerce site is currently unused in the classroom, the impacts of this site on student learning are yet to be determined. Therefore, this paper will focus on website conceptualization and development.

Methods used to Develop the e-commerce Website and Business Application pages

The software platform chosen to host the Plant Rental Service website and related business application is Filemaker Pro 7.0. The choice was primarily due to the ability to host the public e-commerce pages within the same program as the business applications as well as the author's working knowledge of the program. A general description of Filemaker Pro 7.0 terminology and logistical flow is given to familiarize the reader with the software package. Filemaker 7.0 is a relational database which enables the user to store, retrieve and access data saved in its records. Relational databases are based on tables which hold the records of the database. Tables are information-specific and contain fields that are characteristics of that information. All of the fields related to one instance is called a record. For example, one of the tables in the PRS relational database is the Contact table which contains all the information regarding those customers who have registered as authorized users. Some of the fields in this table are Contact ID, Contact name, Login Name, Department name and e-mail address. When a user completes these fields, a record is created in the Contact table.

The PRS database has seven relational tables. Relational tables allow the information to be stored only once and to be used many times. In the e-commerce website database, a customer enters their information only once and each time they place an order the contact record is retrieved and utilized by the order. This store-once use-often characteristic of relational databases minimizes the amount of data stored in the database.

The method for linking tables and creating a relationship between them is the table's primary key. Each table has an identifier that is serial in nature, unique to a record and non-modifiable

by the user. This identifier is called a primary key. Each time a record is created, a new primary key is assigned.

To link the tables, a table's primary key must also become a field in the other table. Having the key in both tables forms a bridge between the two tables allowing the information to be accessed by either table. In Table 3 the lines that connect the tables indicate which primary keys are used to link the tables.

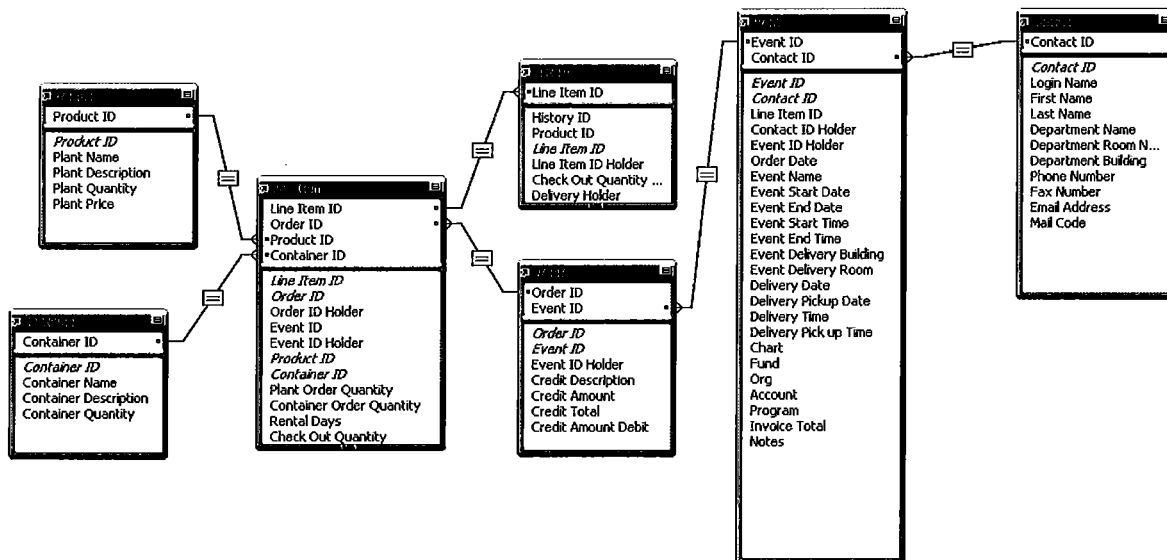


Table 3: Plant Rental Service database table map

The relationship between the two tables allows records of one table to be accessed and retrieved in layouts of other tables. If a primary key of one table is repeated in another table, that ID field is now called a foreign key. A foreign key does not assign a new serial values but is used as the connection between two tables.

Which primary keys are placed in other tables is not random or all inclusive. First a table must be determined to be the parent or the child of the other table. The most important set-up

criterion of a Filemaker database is the determination of which tables are the parents and which are the children. The theory supporting this decision is called the One-to-Many concept. If a table will have one record related to many records of another table, that first table (one) is the parent and the other (many) is the child.

In the PRS database the Contact table is the parent and the Event table (events needing plant material) is the many. One customer may have the opportunity to order plant material for many events. To signify the parent-child relationship, the parent's primary key is created in child's table. In the example noted above, the Contact ID becomes a foreign key in the Event table.

The main reason for linking tables is so that data from one table can be displayed in another table's layout. A layout is a screen that either is used to input data, display information or perform a calculation. Layouts are assigned to tables allowing data from that table's fields to be input or displayed. If a foreign key is a field in the layout's table, then it will also allow data to be input or displayed from that linked table. In the PRS database since the Contact and Event tables have a relational connection, then the contact records can be displayed or input in an Event layout.

The assigning of layouts to tables creates issues when navigating between layouts. Frequently navigating to a new layout creates a new record in a table. In the PRS database, navigating from the "Login" layout to the "Order Form" layout results in switching from the Contact table to the Event table thereby creating a new record in the Event table. The problem then is

getting the information input on the proceeding layout to follow the navigation to a new layout.

To retain the information input on a previous layout (different table) the primary and foreign keys must be stored in a global storage field and then redisplayed on the new layout. In the PRS database navigating from the Contact table layout "Login" to the Event table layout "Order Form" requires that the Contact ID be stored in the Contact ID Holder temporarily and then when the user arrives at the "Order Form" layout, the Contact ID Holder is pasted in the Contact ID field on the "Order Form" layout. The pasting of Contact ID allows the record related to that customer be displayed on the new layout. See Table 4 for an example of the "Order Form" layout.

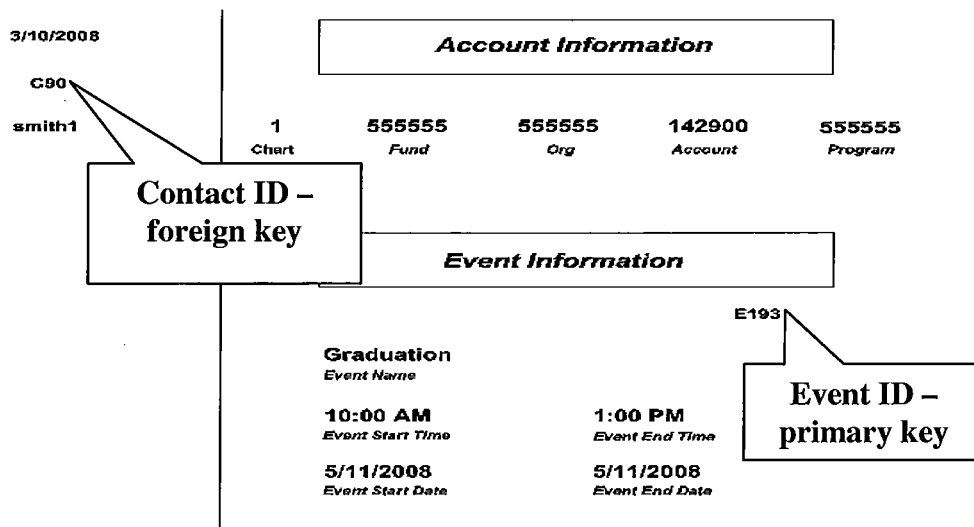


Table 4: Order Form layout displaying Event table information and related Contact table fields.

For details on all the tables, fields and layout definitions see Appendix A, Developer's Manual. To create a functional e-commerce website for use in classroom instruction, the website clients needed to be identified. The Plant Rental Service website has three clients; the University

community, course faculty members and student PRS staff. Each group had different needs but had to be addressed concurrently during the development of the programming. Unlike developing a commercial website and integrated business application pages, the focus of this project had to be not only the customers who will use the site and make it as user-friendly as possible, but also the faculty member(s) who will be maintaining the website and the pedagogical outcomes for the students.

For the e-commerce site to be useful, clients need to feel comfortable quickly with the site. For the user, the website must be familiar and look like other e-commerce sites. The user will navigate through seven layouts beginning at the "Home Page" layout and ending in the ability to print a confirmation of their order. The user will create a login name using their NetID, a common UIUC identifier. After logging in, all the contact information related to that NetID is displayed allowing information to be changed by the user. Though this does pose some risk to the stability of the data, it is possible for personnel to change departments, buildings, or room numbers and the modification of existing data allows the login name to follow the user and not be tied to a department. Due to limited staff resources, a password was not incorporated into the system. Users frequently forget their passwords and having a password as a required parameter would mean there would be a need to have staff available to reset the password. To receive a complete review of the navigation of the website, see Appendix B, User's Manual.

For the faculty member, the continued maintenance and utilization of the database is a serious concern. The program must be robust enough to have a long shelf life and be simple enough to allow future modifications. Without knowing the technical expertise available to make

changes, the programming had to be logical so that a faculty member could read the Developer's Manual (Appendix A) and follow the reasoning. This was the most difficult aspect of the programming as to what is frequently clear cut to one programmer is not as rational to another. Good programming is like good literature, it is readable to everyone. Whether this goal has been achieved is still not known.

For students, the website must provide learning opportunities in a managed environment. Because of the interdependence of the tasks which are required to complete a plant rental order, the students will engage in collaborative learning process. Van Merriënboer and Paas (2003) have noted that "working together while accomplishing a task is seen as a characteristic of a powerful learning environment, aiming at active construction of knowledge. Within an interactive, collaborative environment students will be encouraged to "exchange ideas, share perspectives and use previous knowledge or experience in order to decide on the best solution for the problem" (Dewiyanti et al., 2007). It will become the students' responsibility to actively pursue decision-making among all the participants to complete the order cycle. Though the collaborative process does shift the onus of some of the learning to the students, the HORT 443 will not leave the students without instructor support. The instructor will also be part of the group participating in the collaborative process. The instructor's role will be guiding and mediating the interactions, thereby increasing both the individual and the group's performance (Webb and Palincsar, 1996).

The PRS website will provide the tool to the collaborative learning process. This tool must be perceived by the students to be logical, simple to use and be compatible to their motivation for taking the course. Students must feel comfortable with the website but at the same time need

to be challenged to develop stronger critical thinking, management, and problem solving skills. The next few paragraphs will provide the reader with several examples of how student learning will be enhanced through the utilization of this learning tool.

For the student staff, the development of new knowledge by becoming familiar with terms and concepts commonly used in e-commerce, retail operations and business and accounting professions was desirable. For instance, after an order has been placed the student staff must first determine if the plant material is available and if the delivery dates are feasible. If either of these situations is not possible, it is the responsibility of the student staff to contact the user and make changes to the order. This may be of some disappointment to the client and it will create a situation that will require the student to negotiate a resolution that satisfies both the constraints of the inventory and the needs of the client. The methodology required by the student to determine the stock available for an order is not a system displayed field but instead requires the student to view two values and determines the amount of stock available. The stock available to reserve for an order is not just the stock available on the day of delivery but also the stock available during the entire rental period. The need to check stock on hand on the day of delivery is self-evident. Will the plant be in the greenhouse on the day of delivery? The rationale for also checking if the stock is available throughout the rental period is more theoretically complex.

Unlike retail operations where you sell what you have and when the sale is completed the stock is gone, rental services sell the same thing over and over again and usually at a future date. If a previous order has been processed that occurs between the delivery dates and the pick-up dates of the current order, the amount of requested stock may not be available for the

entire rental period, even though the In Stock Quantity on the delivery date is sufficient. It will require the student staff to view all the inventory levels *between* the delivery date and delivery pick-up date. The lowest in stock quantity between those two dates is the greatest amount that can be rented for the current order. This kind of analytical thinking will require the student staff to be aware of the theory and why it is important.

For the student staff to be able to view the delivery date and pick-up dates in chronological date order, the delivery date and delivery pick-up date had to be merged to a single date field. If the delivery and pick-up dates were left in their own fields, you could sort on either the delivery date or the delivery pick-up date but not on both at the same time. During the check out and check in process, the Delivery date and the Delivery Pick-up date is copied to a single field called the Activity Date. Now all rental activity can be viewed by date irrespective if it is a delivery or pick-up date. On the layouts Activity Date is called the Check In/(Check Out) Date to prevent confusion to the PRS staff.

Table 5 displays the Product Info layout for the plant Table top palm. The lower portal displays the availability status of the Table top palm which allows the student to determine the Check Out Quantity. For example, when checking stock for an event between 5/09/08 and 5/11/08 the amount of available rental material is 2. It is the lowest value in the In Stock Quantity field between those two dates.

Plant Name

Plant Description

Plant Price

Plant Quantity

Availability Status



Check In/(Check Out) Date	Check In/(Check Out) ID	Check In/(Check Out) Quantity	In Stock Quantity
4/2/2008	H113	3	6
5/10/2008	H106	-2	4
5/10/2008	H119	-2	2
5/12/2008	H107	2	4
5/12/2008	H120	2	6

Table 5: The “Product” layout for the Table top Palm record.

The quantity rented also needed to be merged to one field for the same reason. Again, two separate fields can not be sorted but the Activity Quantity field (displayed as the Check In/(Check Out) Qty) is either a negative (check out quantity) or a positive quantity (check in quantity). The Activity Quantity is a running total of all the subtractions and additions by date. Within the “Product” layout there is a portal that lists all the rental activity for that record. It is here where the student staff will determine the Check Out Quantity.

Operational issues such as delivery and pick-up logistics, proper paperwork processing and recordkeeping are potential problem resolution situations. Unlike most capstone courses where the tasks are representations of real world conditions, the plant rental operation is the real world within the University community. The first time plant material is not delivered on time, the students will learn about client communication. Forwarding completed chargeback forms to the Departmental accounting staff in a timely manner will illustrate issues related to revenue recognition. Creating a calendar of delivery and pick-up dates and times will reinforce the concept of time management.

Due to time constraints, the current version of the e-commerce website does not link the delivery schedule to a Filemaker calendar template. This calendar would have been populated with the delivery times and dates and allowed the students and faculty to have a snapshot of this information in one place. To compensate for this, layouts were designed in the business application section that would allow the staff to sort on dates. Thus, the only requested functionality that could not be delivered is real-time inventory availability to the user at the time the order is placed. Originally it was thought when the user clicked on "Add to Cart" it would search the business application portion of the database for the In Stock Quantity field and return a message back to the user as to the quantity of stock available. Due to the fact that inventory calculation programming is more complicated than originally thought, the real-time inventory function was not built into the system.

In working with plant rental service website the students will see the connection between the most common business concepts such as revenue and expense recognition and become familiar with terms such as accounts receivable, invoice, vendor and accounts payable. The order is the first step in the revenue recognition process. By processing the order, sales will be recorded (revenue) and sending an invoice will create a charge that the customer is obligated to pay (accounts receivable). For the expense side, placing a plant in the greenhouse means ordering from a vendor and establishing a responsibility to pay them for the goods (accounts payable) and creating a cost of goods sold (expense) to the PRS.

Understanding that inventory must be maintained and accounted for through delivery and pick-up and properly caring for the plant material will insure future sales is an important

concept. Monitoring which plant material is frequently ordered and is often of insufficient quantity to fulfill orders will demonstrate the concept of supply and demand. None of these concepts are easily taught through theoretical studies. Only by performing and observing the related cycles will give the students exposure they will ultimately be able to use in their new professional life.

The e-commerce website is fully functional from a client and student perspective. University clients can place plant orders for events on campus. Students can easily fill these orders and track product through the system. Basic business practices will be illustrated and carried out in a meaningful and memorable manner. Instructors can use the website for classroom instruction, situational role playing, case development, and active learning. The author believes that the objective of developing the interface that links students with clients and provides student learning opportunities is fulfilled by the development of the e-commerce website described above.

Conclusion

Most beginning professionals do not understand how to recognize errors or how to remedy them. Course work often discusses the correct way to do things, but they do not teach students what steps are necessary when it is not a textbook situation. New employees rely on formal terminology but professionals frequently use cultural jargon. It is the purpose of a project-based capstone course to advance the students' measure of success from that of an academic competency to an employee's achievement. HORT 443 will move the students from school learning to workplace learning through a collaborative interaction between and among fellow students and their instructor. Through the use of the PRS website, the students will be

able to experience terms and concepts that they will be able to more readily transfer to their first professional job.

The concept of a student run business using an e-commerce website can be described as a “virtual internship”. Students in the HORT 443 class are expected to manage a fully functioning campus based business while in the course. Having this “virtual internship” while in a course provides freedom to the students that may not exist in a traditional internship experience. Students remain in close contact with peers, are provided an environment where failures do not jeopardize employment, and given the tools for success. This exposure will ultimately be useful in their new professional life. The development of the e-commerce website described above is expected to play a critical role in student learning in HORT 443.

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