

Final Report of a Business Analysis of Xplant: A St. Xavier's College Student-Run Company



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I. Executive Summary

The Marquette University Global Business Brigades (MUGBB) program is designed to give Business and Economics students an opportunity to apply what they have learned in their classes into action by evaluating startup businesses in developing countries, and then making recommendations for improvement. At the invitation of Fr. Vincent Braganza, St. Xavier's College Principal, the MUGBB team was asked to evaluate Xplant. Xplant was established as a student-run biotechnology company to give St. Xavier's undergraduate biotechnology students real world experience running a business. The company produces and sells the Xplant product, which is a plant that is propagated from living plant material, and grown in a sealed test-tube in a gel media without soil or water. Since its inception, the students running Xplant have worked hard to make the company profitable, and while there has been progress, sales have been well below the levels needed to be self-sustaining. After meeting with all of the Xplant departments, the MUGBB team has made various recommendations focusing on four broad areas; Management, Marketing, Production/Quality Control, and Database development. In the area of Management, the team focused on improving time management, enhancing communication between departments, addressing the problem of shirking, inventory control to avoid bottlenecks and finally improving training and transition between classes of students. Numerous Marketing recommendations were made, with a strong focus on enhancing customer satisfaction and thereby increasing the number of repeat customers as a technique to enhance sales and profitability. Many of the Production and Quality Control recommendations are simple refinements of procedures already in place at Xplant, and relatively straightforward reconfigurations of workspaces. Finally, Xplant needs to develop databases to enhance the functioning of all phases of their business operations. Excel-based databases are sufficient at this point.

II. Introduction

Xplant is a student-run biotechnology company that was founded at St. Xavier's College in Ahmedabad. The students who run the company are enrolled as undergraduates in the Biotechnology program at St. Xavier's College, and the curriculum is designed to give the students real world business experience in addition to biotechnology expertise. The company sells the Xplant product, which is a propagated plant that grown in media sealed in a test-tube. The Xplant does not require soil or water for growth. Xplant has made significant strides since its inception, and the program appears to be meeting its curricular goals. The business structure is well conceived and its departmental structure is similar to that seen in mature companies. Yet there remain challenges for the company.

While Xplant has seen modest sales, the sales volume is insufficient to meet the profit targets necessary to make the company self-supporting, which is a goal of St. Xavier's University administration. In an attempt to address some of these challenges, the Marquette University Global Business Brigades (MUGBB) student team was invited to evaluate Xplant. The Marquette team was comprised of six undergraduate students from the College of Business and the College of Arts and Sciences at Marquette. Two Marquette Faculty members accompanied the team and served as project advisors. The MUGBB met with Xplant students and their faculty advisors during the first and second weeks of January 2010 to gather information about the Xplant operation.

As a result of the business analysis, the MUGBB team made recommendations in four broad areas; Management, Marketing, Production/Quality Control, and Database Development. We believe that by following the recommendations outlined in this report, that Xplant can enhance its sales, and become profitable and ultimately self-sustaining.

III. Management Issues

To thrive in any market, a company is dependent on the cohesiveness of its entities. Successful management by any company results in greater revenues, decreased costs and hence enhanced profits. From our understanding of Xplant, the following areas allow room for improvement:

- Time Management
- Communication between Departments
- Shirking
- Inventory Control
- Training/Transition

We elaborate on each of these themes below.

a. Time Management

Management issues are pervasive throughout Xplant company, the first issue involving time management. It is important for Xplant faculty and student leaders to identify times within the academic calendar that are the most time-consuming and stressful for students (ex. Exam time, holidays, etc), to ensure that conflicting priorities are minimized. The goal should be to better manage work being done for Xplant during students' busy times, and to accelerate production and sales during the times when students have more free time. To increase and maximize each student's time efficiency, we recommend the following:

- Use 1st and 2nd year students in some capacity (e.g., sterilization of work area on regular basis): These procedures can be done by lower classmen, as these tasks do not require a high level of technical skill. This will result in having the 3rd year students spend their time on more value-adding activities, such as marketing, production or R&D. Another overall result will be the increase of ownership pride by the 1st and 2nd year student towards Xplant, and hopefully motivate an early interest in the company and its future.

In addition, by familiarizing underclassmen with these activities, you will better prepare them for the transition that takes place at the end of their second year.

- Modify the transition period: Our understanding is that the new 3rd year students take over Xplant during the summer months, and this is also the time when sales are the highest (i.e., students have more free time to sell, as they do not have lectures). We recommend that this transition period occur earlier, perhaps in December or January, after the semester exams and the break. The 2nd year students would then have several months to become comfortable with the company by shadowing current 3rd year students, while slowly transitioning the business to the younger students. With this structure, the soon-to-be 3rd year students could put all their efforts into selling during the summer, without having to worry about also learning about the company. The current 3rd year students could also focus more on their post-graduation preparations, as the 2nd year students would slowly begin taking over Xplant during this period.
- Standardize and document the training process: It is important that the training framework remain consistent from year to year; while at the same time incorporating lessons learned from previous classes into the transitional materials. The students learn essential business knowledge through Xplants' operations. It is important to document and share this knowledge with future classes, so that repeat mistakes which waste time and impose costs on the company can be avoided. Thus, we strongly recommend that the training materials be prepared and then a process of updating and revising the materials annually be established.

b. Communication between Departments

The next issue identified is inadequate communication between and in some cases among departments. There are monthly reports that are required to be sent to the CEO, in order to evaluate the operations of each department. From our understanding, these reports are not always sent on time, and some are not sent at all. These reports need to be mandatory, as this

information is critical for Xplant's success. If reports are not received, this should be reported to the academic advisor and appropriate sanctions should be made (e.g., repeated violations of this practice could lead to a reduction in the department head's final grade, or some other appropriate consequence).

The monthly reports should also be turned in several days prior to department head meetings. This will ensure that the CEO, COO, MD and other relevant Xplant personnel can view this information before the meeting. In addition to enhancing information flow, this can streamline meetings (again saving student time) and also allow the meetings to be more focused on finding solutions to potential problems or issues, and not simply sharing each department's reports.

c. The Problem of Shirking

A third issue regarding management is the problem of shirking, which is avoiding or neglecting a duty or responsibility. Participation in the Xplant company is required by all 3rd year student. Thus, if some team members do not adequately contribute their time and efforts to Xplant, this imposes additional time obligations on fellow students. We believe that this is a moral and equity issue (i.e., it is not fair to those students who must shoulder the extra burden) as well as a logistical problem for the company and all students need to be made aware of the problem generated by shirking one's responsibilities. This problem is especially pronounced if there is a large customer order to be completed in a short amount of time, or if an order needs to be filled during times of the year where students have exam pressures. Students who contribute the most time and effort on these orders naturally feel the most stress during these periods and so the problem of shirking needs to be reduced. The following recommendations can be used to improve student participation and effort towards Xplant's operations:

- Regular performance evaluations: Performance evaluations are used to measure one student's participation and effort against a standard or average participation. Since students involved in Xplant are peers and friends, a depersonalized approach is desirable. This means that a students' participation should not be compared to other individuals, but instead to a class average, or to an appropriate benchmark set by the academic advisors. In addition, all students should receive periodic reviews, not just those who are believed

to be performing at an inadequate level. The criteria used in such an evaluation should be objective so accountability can be emphasized. The measures should require little or no judgment on the part of supervisors (e.g., attendance, contamination rates, etc. could be monitored and included in the review). Performance evaluations can be performed quarterly or monthly, although the latter may be excessive. The evaluations should be reviewed individually with the academic advisor, to ensure that each student is aware of his or her performance relative to the relevant benchmarks of comparison.

- Consequences for shirking responsibilities/duties: Our recommendation is that there be consequences for those students who shirk their Xplant responsibilities. Since operating Xplant is a team effort, every member's contributions are essential to the survival and success of Xplant. Examples of specific consequences might include withholding the certificate of completion of the course, or even failing that portion of the grade assigned by St. Xavier's College. The latter is certainly a very severe consequence. We feel like the consequence should be enough to motivate each student to participate and complete their required duties, even if some weeks are more demanding than others.

Along these same lines, we feel like it is necessary to publically reward those individuals who perform above everyone else in the class. Examples of specific rewards might be a special prize for the top seller of each month, or for the person who puts in the most hours at Xplant in any given time period. These rewards will hopefully motivate other students to perform at their best levels, thus increasing overall morale and attitudes towards Xplant.

d. Inventory Control

As we understand the inventory issue at Xplant, there are not always adequate materials available for production, which in turn hinders the product's lead-time. A product's lead-time is the period of time between the initial customer order to the delivery of the product to the customer. We recognize that the lead-time for any given product at Xplant is around twenty-one

days; however, sometimes a bottleneck appears when a certain component of the product is not present. Examples of insufficient inventory include the chemicals to make the media or the stands that the customer requested. We understand that chemicals are perishable, which suggests one solution would be to improve the method by which you order the inventory. Currently, you are not ordering in bulk because of deficient demand. To combat deficient demand, some research should be conducted to analyze which products are being bought. Three questions that research will answer include: How much should I order? How often should I order? Should I carry certain stands or not? In regards to the last question, if your research indicates a slow demand for a particular strand, the opportunity cost (cost of foregoing alternatives) of holding the inventory might be too great. In other words, a stand that does not sell, results in giving up revenue that could have been generated if another more popular strand were purchased. Additionally, part of the non-selling stand cost is a sunk cost (a cost that cannot be recovered once it has been incurred). Therefore, if Xplant considers reducing the number of models, it might result in decreased cost. In addition, if fewer models were kept, the chances to buy in bulk would increase. Lastly, buying in bulk would reduce the cost of the final product if volume discounts are available, which could further increase the profit margin.

Another solution to inventory control includes labeling each component with the correct customer order number. The process of establishing an order number is discussed further in the database section. A customer order number should be created once a customer makes the purchase. For example, if a customer purchases caladium in a desktop calendar stand on July 1, 2010, the customer order could be 10-0107-001. In this instance, the 10 would indicate the year, the 0107 would indicate the month and date, and the 001 would indicate which student placed the order. After creating the number, each stage in the process of the particular order would be clearly indicated, which results in easy recognition and less lost inventory. One option for labeling could make use of a temporary PostIt Flag attached to the stand or test tube with the customer order number written on it.

In summary, by analyzing Xplant's sales history, a forecast of purchasing certain components can be created. Meaning, when sales are slow, your inventory must in turn be low. When carrying a balanced amount of inventory, the costs of storing unnecessary components are

reduced, which results in a greater net income. Another component of inventory control contains the issue of recognition. With the creation of the customer order number, the flow of the product through the stages of creation to delivery will become much smoother. Furthermore, the customer number would result in a reduction in the number of lost inventory, which reduces the cost of replacing the product.

e. Training and Transition

According to our knowledge of Xplant's training, the students gain business sense mainly from the experience of running Xplant. Indeed, the curriculum in place allows the students to more fully comprehend biotechnology, and ultimately its application in the marketplace. Even though the standards for each year are imbedded in the curriculum, the goals and expectations for the company each year seem a little unclear. To overcome confusion of expectations, they should be clearly laid out for all students. For first year students, the importance of goal setting should be evident. A suggestion of creating a company goal is strongly encouraged in order to increase organizational commitment. Once a company goal is established, one of the tasks of the leadership team would be to make sure that each of the individual and departmental goals are aligned with the company goals. By setting both an individual as well as a group goal for their final year, the first year students would become motivated to work toward achieving that goal. The importance of creating SMART goals should be emphasized. SMART stands for Specific, Measurable, Attainable, Realistic, and Timely. Another emphasis incorporates the relevance of modifying the goal. By scrutinizing their goals, the level of commitment to them increases exponentially. For 2nd year students, another solution might prove more beneficial: shadowing.

Since most of the learning comes about through experience, we would advocate shadowing to allow the students to learn about business earlier in the program. For instance, opening up monthly meetings to second year students would allow the second year students to observe how the company runs. This would also allow for more interaction and provide a more realistic picture of the company for the second year students.

Another recommendation involves the marketing team. The suggestion entails an invitation for younger students to shadow a marketing salesperson's visit to a potential customer.

The attendance would allow the younger students to develop a relationship with current customers. Establishing the relationship builds trust, and the trust leads to repeat sales, which can be used to drive sales once they start to run Xplant. Also, the relationship is crucial because trying to convince a new customer to buy Xplant is much harder than selling to a repeat customer.

Third year students are also crucial in the shadowing process. In addition to the expectation of acting as role models, other specific expectations should be set. For instance, the third year students, especially those in a leadership position, should actively seek to identify less known high potential first and second year students. The leaders should also actively provide support for those interested in future leadership positions. Support mainly stems from providing helpful information and inspiring them to work towards their goals. One solution to providing support would be to set up an informal meeting where those in leadership positions would meet with first and second year students who aspire to obtain a post. The goal of the meeting would be for the younger students to get a realistic feel for the work done by each of the leaders. Overall, the shadowing process will aid in a smoother transitional process and will empower younger students to take on a greater role once they take over the business.

Another way to smooth out the transitional period is to obtain anonymous feedback from third year students. An example of the process would include an anonymous survey distributed to all third year students at the end of the year. The survey would include such questions as: What would you like to see improved about the company? What were the biggest struggles? Although we understand that those in leadership positions pass on their insight, it would be beneficial to also extend that to everyone in the company.

By sharpening management practices, many benefits arise including group cohesiveness and reduced costs. Indeed, effective management relies heavily upon creating a team culture in which an open and honest exchange of information is expected. Key management recommendations should take into account that motivation is an ongoing process and is different for each student. The best way to find out what motivates people is to ask them and then listen and observe.

IV. Marketing Issues

Through our discussions with the various departments, it became clear that the effective marketing of the Xplant has been a significant challenge. The struggle in marketing has not resulted from a lack of effort; in fact, the most recent year has seen significant growth in sales. However, there appears to be little repeat business, which makes annual sales growth challenging. In essence, you are developing your customer base from scratch each year. Thus, an important goal should be to increase the number of repeat customers which should result in higher sales volumes and higher profits. Specifically, we have identified a number of issues in the marketing of the Xplant that need to be addressed to permit more robust growth.

- a. Low Customer Satisfaction: Customers do not have a good understanding of your product. In fact, they are often disappointed and rarely purchase it more than once. We believe this is because they view the Xplant as a substitute for a common houseplant, and they believe they are buying a product with some degree of permanence. Indeed, your stands convey this sense of permanence and certainly a calendar stand would suggest that the plant should be alive for at least a year. Your customers become dissatisfied when the Xplant uses all of the media, and ultimately dies. Overall, the problem exists because the nature of the product has not been effectively communicated in the marketing process. There are several potential solutions to this problem. One solution is to modify the message and to highlight the merit of the product to the potential consumers. We recommend having a written statement about the product's special and unique characteristics with the actual product, instead of relying on the actual spoken words of the plants characteristics during the selling process. You will not always be there to explain why the Xplant is valuable, but affiliating the product and the message in one would greatly carry on the message you are hoping to convey to people. This can be accomplished by the following ways. On the product, along with the directions on the tag, it would be beneficial to have a brief statement about the plant itself. For example, "This plant is one of X number of plants created from a single leaf." This would establish the real value of the product in the customers mind, rather than just being seen as a

common houseplant or decoration. Also, it may be advantageous to include a statement about how the technology associated with Xplant is being used to help address poverty issues in Gujarat and to point out that Xplant is a student run company. A second solution is to price the product to include replacement plants for a period of time (e.g., one year for a calendar or a metal stand). Beyond that period, you can offer replacement Xplants at a lower cost.

- b. Soliciting Customer Feedback: Another important aspect of improving customer satisfaction is initiating and utilizing customer feedback. Although there has been some attempts to obtain feedback, we feel that the importance of getting your customer's opinions has not been adequately emphasized. Marketing is not strictly about selling and advertising the product; rather, it is also about establishing a relationship with your customers. This requires that Xplant obtain customer feedback. The feedback will help you improve sales, find new target markets, and solve any problems that people may have with the purchase they made. Good relationships with the customer are important because repeat, loyal customers are necessary to generate sustainable profits. It is much more expensive to find new customers than continue sales to existing customers, and it is nearly impossible to consistently grow your sales without a base of repeat customers. An effective way to gain feedback lies in the incentives you give people to respond. A discount on their next purchase or a free sample will encourage response and at the same time encourage people to continue buying Xplant products. Another suggestion that may help contribute to marketing is the use of focus groups. A focus group is a small group of people, usually prospective consumers, who are brought in to discuss a specific product or service. These small group discussions are used to produce qualitative information about the product as well as individual responses and reactions to the specific products. The importance of a focus group lies in the information that you will receive about customer preference. It will help you cater to the customer more, rather than guessing what the customer may like. They will inform you of many things, including what they like and dislike about the product, whether they understand why it is worth paying the price that you charge, what an appropriate price might be, what improvements they may

like to see, etc. In short, focus groups are a common way to gather a wealth of information about your product, and they can certainly inform your product development team.

- c. Increasing Sales: Clearly a big problem lies in the lack of sufficient sales. As any company knows, increased sales generally leads to increased profits as long as pricing is done correctly. Once again, we must stress the importance of repeat customers, which helps stabilize the company's cash flow much more than just relying on finding new customers. Our group has recommended that you set realistic monthly goals for new sales as well as retention of existing customers. Repeat customers are happy customers who extol the benefits of the product whereas unhappy customers will likely undermine your ability to grow your sales through word of mouth. Your analysis of sales should be based on monthly data so that you can compare the sales from month to month as well as with the same month in the previous year. While it is not bad thing to set lofty goals, these goals need to be attainable in the foreseeable future. By achieving these goals, you improve morale and employee satisfaction.
- d. Telling the Story of Xplant: One area for improvement includes the promotional material. One cannot underestimate the value of brochures but those can be expensive. Again, the solution to promotion can lie in the integration of the story with the product. Whether loose cards are placed at the base of the product, or the message is conveyed on the tag or in a brochure that comes with the product, the Xplant's true value needs to be relayed. We highly recommend increasing the amount of promotional materials being circulated. One activity that can be done more effectively is to focus your marketing efforts in local fairs and science related events. As scientists, you see the value and innovation of your product, and we believe that other science students and their teachers are in a good position to understand and appreciate the value of your product. You mentioned that Science City purchased many of your plants. Pursuing ventures of that nature could greatly benefit your sales. We also believe that within your promotional materials, testimonials would be important. Customer testimonials can be derived from

the customer feedback process. To obtain positive testimonials, one must have adequate customer satisfaction as well as responses to market surveys.

- e. Create an Xplant Mission Statement: A mission statement of the company would also add value to your promotional materials. Statements such as this, which describe the importance of the company and the unique features of its product line, can be a concise way to convince people to buy your product.
- f. Develop an Effective Company Website: Another valuable tool in promoting your product is a website. We understand that unlike developed countries, online purchasing is not as prevalent in India in general and Ahmedabad in particular. We are not recommending that you sell online immediately; however, we believe this may be a valuable tool in the future. Nevertheless, we believe that it is important to have an Internet presence that is independent of the St. Xavier's Research Foundation, but contains links to the Foundation. The new website should be geared more towards the marketing and the customization of the product with less emphasis on the product background and the Foundation.
- g. Pricing Issues: Incorrect pricing of your product has led to selling products at breakeven. An important aspect of making a profit is the correct pricing of the product. Oftentimes, it is hard to find a balance between offering a fair price and making a sufficient profit. To effectively price your products, you need to know your costs of production at each stage. One critical thing to remember is that student time inputs are a very important cost. Time needs to be considered in at each stage of production to ensure that you generate profits. For example, the multi-colored media are much more time consuming to produce, and should be priced accordingly. An example of incorrect pricing was a recent bulk order in which a mistake in pricing led to Xplant recouping its costs, but not generating any profits. This needs to be avoided in the future. We suggest that you create a standardization of price. If there is a very costly stand, it may not be worth its perceived market value. The main focus of your product lies in the plant, not the holder. The holder is an important part of the product, but it is not the main concern. The holder is a compliment and can be interchangeable. If cutting costs is a priority, the solution may lie

in cheaper stands, or the phasing out of less popular and cost inefficient products. An easier way to standardize the price of your products could be by reducing the number of variations offered. For example, only 3-4 types of media color, 3-4 of the most popular stands, and four different kinds of plants. This allows for more efficient allocation of resources and time. If there happens to be special requests, price adjustments and premium rates can be charged if necessary, resulting in even greater profits.

- h. Consistency in Marketing: It appears that your various sales staff each have a different market strategy. Since no two strategies are exactly alike, monitoring their success becomes difficult. Creating a consistent strategy does not mean all potential buyers need to be treated as identical. You will market to a pharmaceutical company that is using Xplant for gifts differently from a school that is using Xplant for science fair purposes. However, there should be some consistency of materials going to each type of potential customer. Short-term recommendations are to add the story and special characteristics to the tag or stand of the product in order to inform the customer without having increased effort on the part of your sales staff. When there is no representative to describe the product, a cheap and effective way to market the product is as simple as a closer examination of the plant by the prospective consumer. Upon reading the story and characteristics of the plant, the prospective customer may gain interest and pursue purchasing the product. With an accessible phone number and website, the sale is made that much easier.
- i. Marketing Incentives: A long-term recommendation to increase marketing participation is the implementation of selling incentives. The most basic of the strategies would be sales commissions. While this usually entails monetary compensation, we understand that profits from the sale ideally go towards more research. This is why the commissions need not be money, but still something of value to the student such as an award, prize, etc. We also recommend sales competitions between the students. While this is intended to be friendly competition, some incentive to sell more than the other person will influence people to give the extra effort involved in closing a sale.

- j. Consider other Products and Services: Given the inability to send the Xplant through the mail, your market area is limited by the ability to hand-deliver the product. The Xplant product occupies a niche market, and one that we believe can be successful. We understand that hardening of the product to become a permanent plant is an extension of the Xplant product, and we believe that effort to refine that process can be valuable. However, we also believe that you should consider additional products derived from the core capabilities that your students learn in their biotechnology training that may have a market that is less limited than the Xplant product. By expanding the scope of products, and perhaps identifying some products that are more portable, and less vulnerable to contamination, you may find it easier to achieve the goal of self-sustainability.

We recognize the extensiveness of this lengthy list of recommendations, and we understand that it is not possible to implement all suggestions in one year. However, we do suggest that the Xplant management consider creating a prioritized list of marketing improvements based on these and other insights that they believe to be important and that a process of systematic implementation can be established. Additional sales translate into additional profits, which Xplant needs to become a self-sustaining entity.

V. Production and Quality Control Issues

Production and quality control are two critical components to the success of any business. By regulating these aspects of a business, an increased level of quality may be obtained which will result in a more loyal customer base. Furthermore, by carefully monitoring production and quality control, it is possible to minimize costs, both in material costs as well as time and labor costs. Through a streamlined management of these groups, Xplant may be able to run as a self-sustaining business.

- a. Reducing Contamination: As a result of our meetings with the Xplant student team, it is clear that the Production Department (PD), the Quality Control Department (QCD) and the Product Design Department (PDD), have made efforts to minimize contamination rates of media and products. By extending the quality control period from

14 days to 21 days, the likelihood of contamination after delivery to customers has been reduced. This is a positive improvement, as it will increase the trust that customers have in the business, and may encourage repeat customers. Furthermore, by taking extra precautions through the compulsory wearing of protective gloves and facemasks, it is possible to reduce the level of unnecessary human contamination. However, contamination rates continue to remain high, and the cost of such contamination may be detrimental to the success and sustainability of Xplant. Furthermore, it is important to consider the cost of labor time when contamination occurs. This is only amplified when some contamination occurs in labor-intensive products, such as those Xplants that have multi-colored medias. And finally, in streamlining the PD and QCD of Xplant, it will be important to maintain consistency of production and quality control. This will ensure that all members are performing at a consistent and high-quality level. In doing so, contamination can be reduced and costs may also be minimized. Therefore, in order to improve the success of Xplant as a whole, these issues concerning the PD and QCD need to be addressed.

To mitigate persistent contamination problems, we suggest that you attempt to improve professionalism. That is, it is important for all members to be attentive to protocols that are in place, and take extra precautions during more vulnerable time periods, such as monsoon season. Extra precautions during such times are critical, as it has been noted that during monsoon season, the failure rate is 90%. It is not practical or cost efficient to continue business during a period of 90% failure. In order to make monsoon season an appropriate time to conduct business, this failure rate must be reduced, by preventing the potential sources of pollution and contamination that are controllable. For example, the wearing of lab coats, gloves and facemasks are compulsory. However, if this is not consistently followed, then contamination rates will remain high. Full participation in such protocols is necessary for them to be effective. This is a business, and members should follow protocols in a manner that is appropriate for a business. Furthermore, by limiting conversation during production times, the likelihood of contamination is reduced, as airborne contaminants won't be spread as

much. By strictly enforcing only one person in the room during production and inoculation, such activity can be reduced and a reduction in contamination rates may also occur.

- b. Identifying Problems in Production: There are several ways that may be effective, to better enforce existing or new protocols. One way is to perform regular, depersonalized evaluations of all members of departments that are involved in the production of products. As individual evaluations may be difficult to administer from a managerial position, as members are also peers, and possibly friends, depersonalizing such evaluations will eliminate potential tensions. For example, standard reviewing performed on *each* member will prevent the singling out of individuals and instead provide feedback to all members. You could perform such evaluations in a manner that averages the success rates of production of all the members and compares an individual's performance level to this average performance level. This will further encourage workers that are performing well, as well as encourage those that are performing below average to work at a level that is equal or higher to that of his/her peers. Another way to ensure the proper consideration for protocols is to create daily task checklists that provide a detailed description of proper behavior and performance of daily tasks. For example, if it is critical that all members wear a lab coat, a checklist will list this as a daily task, and must be signed by a supervisor.

Other issues that have been reported as contributors to contamination include individual sanitation measures, existing or potential equipment and room configuration. Regarding the efforts of individuals to sanitize the workspace and their utensils, this may be added to a daily task list. By monitoring and individual's compliance to such measures will ensure that each individual is following these protocols. With consistent compliance, it will be possible to eliminate certain types of contamination, reduce contamination rates and address other sources of contamination. This is a critical first step, and if individual sanitation measures are not considered, and other efforts to combat contamination will be significantly less effective.

- c. Equipment and Room Configuration: Regarding equipment, it has been noted that there are several pieces of existing equipment that are either out of date, or ineffective. One of these pieces of existing equipment is the UV lamp. Because the UV lamp is out of date, it is seemingly ineffective. Perhaps addressing the importance of replacing outdated equipment and acting accordingly to replace it may result in a decreased failure rate. Furthermore, potential equipment that can be added to the workspace, it has been suggested that an air purifier would aid in the reduction of contamination. Though this may be a long term goal, working to reduce the amount of air flow into workspaces during times in the production process that are susceptible to contamination is a free and practical first step. Such implementation of new equipment should only happen, when the students are performing in a way that has eliminated any possibility of controllable contamination.

Concerning the configuration of the workspace, it seems that certain reconfigurations may also contribute to a decline in failure rates. For example, the current configuration of the workbenches makes the inoculation workspaces susceptible to contaminants carried by airflows, when the door connecting the inoculation workroom and the outside room is opened. Though limiting the amount that the connecting door is opened may reduce the amount of airborne contaminants, keeping the door closed for the entire work process may not always be possible. Instead, considering the redirection of the first workbench so that the workbenches are facing inward (and the rear of the first work bench is facing the door) may reduce the exposure to air draft that results from the opening of the connecting door. Simple steps regarding this configuration may reduce contamination rates and is free. Also, adding an additional entrance into the cooling room, that is not accessible through the lab room, will prevent a draft of air that is potentially containing contaminants. Furthermore, added barriers into this room, like a second doorway, after the first doorway (creating a small inter-room entranceway), would reduce the amount of airflow as well. Reconfigurations like additional doorways may be more long-term goals, as they may be costly, while other free reconfigurations are worth considering, as they can be implemented immediately.

Though such extensive measures to reduce contamination may seem trivial, it is critical to realize the costs that are associated with such faults. There are several types of costs that are realized when addressing contamination. These include but are not limited to the cost of a potential sale, the cost of materials, the cost of labor and time, and the cost of a consistent customer base and support. Regarding the cost associated with a potential sale, it is important to recognize that every product that is created and then lost could have been a potential sale. If, for example, a test tube was produced and available for sale, a student could sell this product and receive a profit between Rs. 10 and Rs. 65. However, if the product was made but then lost due to contamination, then there is no possibility for a sale on this product and Xplant has potentially lost up to Rs. 65. Also, though Rs. 15 per 10ml of nutrient media may seem like a small cost, if there are 50 contaminated test tubes in one month there is a total loss of Rs.750 *in one month*. The continued loss of resources due to contamination or faulty production is extremely costly to Xplant and will prevent Xplant from streamlining production and becoming self-sufficient.

- d. Recognizing the Importance of Time: The cost of labor and time is not being considered to the extent that it should be. Because the laborers of Xplant are students, they are not being paid, and the cost of their time may not be as obvious because there is not a numerical value attributed to their time contribution. But their time is valuable nonetheless, and it needs to be considered. This is important for production, but it is also important as students organize their schedules. By reducing contamination rates, time commitments will be reduced, as there will not be as much need for troubleshooting. For example, if you were preparing for an order of 25 test tubes, and before the order was complete, three of the plants failed, it would require more time for production and this time may not be available, according to students' academic workload. Furthermore, pricing products according to the time commitments that are required for production, will add value to students' time, as well as add a higher profit margin upon sales. For

example, products that are produced with tri-layer media should be sold at a higher price since the time costs are much higher.

- e. Quality and Customer Satisfaction: Finally, addressing the correlation between contamination rates or failed production, and a consistent customer base is critical for growth within the company. It seems that customer satisfaction is an issue and the rate of returning customers is low. It is important to recognize that trust is lost with each failed product that is delivered. By reducing or eliminating the threats to contamination, you eliminate the likelihood that your customer will receive a faulty product and further discourage their repeat purchases. If the customer receives a healthy, long-living product, they will be more willing to trust your business and recommend Xplant to their fellow business partners. This will be critical to Xplant, as it is impractical to seek out new customers constantly, while simultaneously losing existing customers. A strong customer base will be a reliable way to expand the future of Xplant.

Though it is obvious that Xplant is making significant efforts to streamline the production and quality control of the products, it seems that through these simple techniques, production will run smoother and result in a reduction of costly mistakes. Furthermore, this will aid in the building of a strong customer base, which will in turn, help Xplant become a self-sustaining business.

VI. Database Development

Collecting data, and the effective dissemination of information, is essential in identifying, addressing, and successfully solving problems for any enterprise. In order to create a reliable environment of data sharing it is important to continually update and monitor a primary data source, which allows an individual party to access the necessary data in a timely manner. Thus, it is also essential that this data is updated on a regular schedule (preferably daily). This free-flowing information provides a resource for easy and efficient communication throughout the enterprise. It is important that each stakeholder in an enterprise has access to any data that is

necessary to carrying out their role. By creating a comprehensive, enterprise-wide database for Xplant, this student-run company will be able to communicate more effectively, evaluate internal as well as external issues, and make quick, decisive decisions which will help lead the company to profitability.

Currently information within the Xplant is decentralized and lacks organization. Each group or department holds large amounts of data (or potential data¹) that is largely kept within its own small group on a daily basis. The only venues for information sharing are monthly reports, which tend to vary in thoroughness and consistency, and group discussions, which are inefficient venues for sharing all such information. This also means that by the end of a reporting period department heads and officers are making decisions based on information that is possibly old, or completely missing. This can lead to uninformed decisions by management. Ultimately, this problem extends to each department in the company and affects performance within each department individually and collectively. This inefficiency inhibits Xplant from addressing important issues and taking advantage of possible opportunities and synergies within the organization that such data could provide. Once a database is implemented, Xplant will be able to monitor and evaluate each of its processes and make appropriate, informed, and up-to-date decisions on a daily basis. We outline below the importance of database development for each of the various departments.

- a. Production Department: One of the most significant factors that would enhance the overall performance of Xplant is tied to the definitive, accessible data generated within the Production Department. A large amount of the data entered into the company's comprehensive database would be generated by the Production Department (PD) and would serve to greatly improve the strong progress that has been made by the department over the past few years. The PD is the generator of all the products, and thus would be the originator of all the data held in the database. It is the PD that would initiate the information record of each individual Xplant. In the creation of each Xplant, each plant would be given an **Identification Number**. This number would serve as the key for all

¹ There are large amounts of data, which is not being recorded or shared due to lack of infrastructure within the company. As a result of a comprehensive, enterprise-wide database this data will be realized and available to the necessary parties, who can make the appropriate decisions based on the information generated.

other information held in the database. Other essential information such as **Plant Type, Date Inoculated, Producer [Innoculator] Name(s), Workstation Origin, and Original Plant Origin Number** will create a record of basic product information that will necessarily provide essential data for the origins of the production. This basic information will eventually allow the PD to continuously improve its production and processes. Additionally, this will provide a background for all other departments to enter, track, and evaluate their own information.

- b. Quality Control Department: The Quality Control Department (QCD) could easily be the biggest benefactor of a comprehensive database. As a result of standardized data entry, the QCD will be able to evaluate and analyze individual issues as well as enterprise-wide trends. In fact, a comprehensive database will probably prove to be the most useful tool that the Department will have in improving how Xplant conducts business on a daily basis and it will also allow it to accurately measure success. While some issues might seem immediately apparent, they might not necessarily have the greatest impact on important issues such as cost, demand, and profits. In addition, the potential for unrealized opportunities and/or unresolved issues could be more easily identified through a centralized comprehensive database and ultimately help to create business strategies that are responsive and timely. Oftentimes simple problems that could be easily solved are not immediately recognized or too easily ignored when a company lacks a common communication system and the tools to help recognize, measure and alert appropriate parties or departments. The benefit of a shared comprehensive database for the QCD lies in the Department's ability to evaluate information that is entered into the system; however there are a few categories that specifically apply to the QCD. Data including the **Supervisor, Stand Supplier, Container Supplier, Lid Supplier, and Date Media Ingredients Purchased** could be used to study trends that contribute to production success/failure. A comprehensive database will create an accessible venue to enhance the dialogue between the QCD and PD. The database will nonetheless create opportunities for the QCD to also communicate with other departments (i.e. Research & Development)

and work with them to create a more successful enterprise. Improving quality throughout the company will decrease cost of production and the amount of time expended (also a cost). Increasing the effectiveness of the QCD will help launch Xplant on the road to self-sustainability.

- c. Product Design Department: The Product Design Department (PDD) has an important mixture of production and creative roles, which makes it an integral part of Xplant's success. This dual role means that the PDD must not only closely monitor the desires and whims of the broad consumer market to determine demand, but also pay attention to practical production trends, which will affect the company's ability to meet those demands. The Product Design Department is in charge of establishing Xplant in the media and preparing the final product for the final customer. This is an essential part of the process, and is a critical part of the final product's success/failure. The PDD, in its production capacity, would be adding data such as **Media Number** (which will serve an equally important role in the R&D Department), **Media Color/Type**, **Name of Media Preparer(s)**, **Plant Container Number**, **Container Lid Number**, and **Stand Number**, which would focus on the production aspect of the Department's role. Additionally, as the company creates a greater dialogue between itself and the consumers, it will be important to track the progress of the plants and customer's likes/dislikes about individual products. While the PDD group will most likely not be responsible for gathering this data, it will be the greatest beneficiary of such information. As Xplant becomes more adept at customer communication it will be more important to determine what sort of information it gathers from its consumers and adapt accordingly. Possible information such as **Life of Plant** and **Reason for Loss of Plant** will prove invaluable in the Department's everyday functions. As the group generates more feedback it will be able to recognize other data it would like to gather from its customers. By creating a database, which connects the PDD more closely to its customers, and providing a clearer idea of what it is creating, it will be able to direct its efforts in the best possible way in the future to meet consumer demands and preferences. Obviously, ignoring important

data and feedback will create more problems in the long term. A more informed PDD would mean a more nimble and successful Xplant.

- d. Research & Development Department: The Research & Development Department (RDD) focuses its efforts on the future of the company. The success of the RDD today will mean the sustainability of Xplant for tomorrow. Due to previous transitions, the RDD has become proficient at understanding the importance of keeping a permanent source for the data. As with any research group, a record of past trials and the results of such trials are important in deciding how to proceed in the future. Although mentioned previously, it is important to emphasize that the **Media Number** will be an important record reference for the RDD. Additionally, a more detailed record, describing the exact contents of the media will be important. This does not mean that the other data (i.e. all data recorded by other departments such as Production) are superfluous. On the contrary, it will be important for all information to be recorded for each plant no matter the origin. It would be best to create individual columns in the database for each **Ingredient** that is used. Using a scientific measurement of volume for each would be advisable. This will create a clear record for the current year, as well as for subsequent years. Also transferring the current hard copy records onto a computer database format will allow the RDD to study trends and recognize breakthroughs more easily. While creating products for the future it is imperative that the department study its past.
- e. Human Resources Department: While the Human Resources Department (HRD) will not be imputing data into the database, it will be able to use the system as a resource in evaluating the people it manages. Obviously, face-to-face management is imperative and will need to continue and improve, but the ability to tie performance to measureable outcomes within the database will enable leaders to quickly analyze information and addresses performance issues. The HRD will find that being able to use data to back up its assertions will encourage dialogue to discuss both problems and accomplishments with colleagues. Rather than running the risk of having performance issues taken

personally, the database will create a professional, impersonal, and unbiased resource for the department to address important issues that will make Xplant more successful.

- f. Marketing Department: The Marketing Department (MD) is the face of Xplant. It is often their interaction with the consumer, and especially the feedback from current customers that they obtain, which guides marketing strategies and ultimately impacts the direction of the company. While individuals may be making the correct decisions, there is no reliable way to disseminate this to the rest of the department. Inconsistencies and the inability to track sales patterns, as well as customer comments/concerns, ensure that the MD will not have the appropriate data to make informed decisions. By tracking how products are performing and how customers are reacting to each product, the Department will be able to react quicker and with more accuracy in meeting market demands. Implementing areas such as **Customer Feedback** (for comments/concerns of the customer), **Type of Customer**, **Name of Seller**, **Number of Orders Purchased**, and **Number of Units Purchased** will give the MD the upper hand in meeting customer needs. As Xplant develops a full understanding the details of what its customers are saying it can begin to work with them to make each relationship more successful.
- g. Finance and Administration Department: The Finance and Administration Department (FAD) will strongly benefit from the data generated for this database system. Understanding the bottom-line for the organization create a context for all decisions made and help to identify objective measureable goals throughout the company allowing all managers and executives to share objective information on which they can base their decisions. Elements such as **Cost** need to be broken down into specific categories (i.e. **Cost of Stand**, **Cost of Tube**, and **Cost of Each Ingredient Used in the Process** will allow the costs to be tracked properly). Also tracking time spent developing the product would be a positive benefit for the company, as the time spent by each member has a specific value. You will need to consider the appropriate value to assign to that time. However, it is important to point out that while student time is not directly compensated,

it is also not a free resource in unlimited supply. Also specific data on the **Retail Price** and **Profit** will not only increase the knowledge of FAD, but will encourage all managers to measure specific information to assess true costs within each category and to allocate appropriate resources to profit centers. It is important that the upper management is receiving up-to-date information for the heads of each department on, at least, a monthly basis. This must be consistent in timing and in terms of information delivered. The correct decisions will only be made if the correct data is delivered in a timely manner. The FAD's ability to gather and analyze information throughout the enterprise will create a more cohesive and profitable company for the future.

As an enterprise Xplant will benefit greatly from a database, which is accessible to the entire company. The suggestions laid out in the previous pages are examples of how the company can develop and benefit from such a database, but it is up to the company as to how it will implement such a database in practice. The members of Xplant know best what additional information would be necessary, and who to assign the tasks of capturing specific data. It is understandable that, for example, individuals who are inoculating might not have time to record every detail of their actions (as this might cut into valuable time). With this in mind the use of less experienced participants (First Years and Second Years) to input the data in some cases might be helpful and resourceful. While not always an option, this could create value for all parties involved. Also, we believe that this database can and should be implemented immediately. Instead of wasting valuable resources on extra software or hardware, we believe that this can be implemented with current resources although in the future, additional hardware and software might be necessary. Using a simple program such as Microsoft Excel might be easiest software to implement immediately and creating user space for Xplant in the school's server would make use of current hardware for the current time. This would also free up financial resources for other more pressing needs. As the Xplant grows, it may be necessary to develop a more comprehensive database solution. However, the Excel solution can be used as an initial tool in determining what data will be captured, how it will be measured, who will input defined data, and how best to provide access points throughout the company. Adaptations to

data collection are inevitable and insightful. Eventually, other software may be required to capture the intricacies and details of information but Xplant needs to begin by taking the first step in the journey by tracking the objective data it has now into Excel. Xplant has done a wonderful job of creating a successful company over the past few years. Now it must enhance the tools it is using to create a more sophisticated and even more successful enterprise for the future. Without data, and the proper kind of data, the company will not be able to achieve the goals it has set forth.

VII. Conclusions and Next Steps

Once again, the Xplant company is to be commended on the superb job it has done thus far. It has an excellent structure, effectively following many of the practices of successful and established companies. Its product is unique, incorporating a sophisticated technology in an attractive consumer product. The integration of a school curriculum into a student run company gives students real-world business experience to complement their biotechnology training. However, as with any company, there is always room for improvement.

We listed improvements that are possible in several main categories of Xplant, ranging from management to marketing, to production and quality control to effective data management. Our recommendations are both short run and long run in nature, and we recognize it is not possible to address all of these issues immediately. However, we believe that a process can be established during this critical time of handoff between the 2nd and 3rd year students to prioritize and begin to implement some of the strategies we suggest.

Our short-term recommendations consist mostly of individually changeable tasks. These consist of time and effort management, effective communication between departments, marketing follow-ups, pricing adjustments, and simple sanitation protocols. All of these steps require the students to be careful and thorough in their work and these simple steps can help reduce contamination, confusion, and increase profitability.

Longer-term goals span different ranges of time depending on the task. The readily achievable long-term suggestions consist of the effective explanation of the Xplant story, implementing effective quality control equipment and processes, and standardization of products through feedback. These suggestions are made with the purpose of continuous improvement each year, as each batch of students adds their own contribution to the process. In addition, other long-term goals such as the utilization of the Internet and the development of databases, we feel are crucial to company maturity and development. The database is especially important as it will help cut down on the year to year information inconsistencies that have been experienced, whereas the Internet will establish an ongoing marketing presence even during times in which students are less engaged in Xplant activities (e.g., during periods of exams or transition).

We feel that these steps need to be taken to help the company grow and expand as the technology that Xplant uses develops as well. Incorporating effective departmental and companywide communication will help the gradual implementation of long-term goals that would not be possible to without it. As some suggestions are utilized, they will build upon each other and more importance is placed upon fluid transition from each class. Xplant is a company with enormous potential and has already established itself with a technologically sophisticated product. The next step is sorting out the intricacies of the market and the unique position of your company. Xplant is an amazing company that has built much potential for itself. We believe that by following these steps, Xplant can realize that potential.

Kohls, Heather

From: Gregorcich, Jan SSND [jgregorc@ssnd-milw.org]
Sent: Wednesday, January 27, 2010 1:39 PM
To: Kohls, Heather
Subject: FW: [Retrieved]Chamarras!

I did send this to Kate.

From: Teresa Samayoa Fernández [mailto:teresamayoa@hotmail.com]
Sent: Wednesday, January 27, 2010 10:32 AM
To: Gregorcich, Jan SSND
Subject: [Retrieved]Chamarras!

Hi Jan! Yes, the term chamarras means either sheets and blankets or sleeping bags. There are some pillows without pillowcases. The mattresses are bare in the dormitory, and there are some blankets here, but usually suspicious of having fleas, so it is best if your people bring their own. Thank you for asking about equipment. We could use wheelchairs and we are particularly searching for a thing called oxygen concentrator. According to Wikipedia: *An **oxygen concentrator** is a device used to provide oxygen therapy to a patient at substantially higher concentrations than available in ambient air. They are used as a safer, less expensive, and more convenient alternative to tanks of compressed oxygen. Common models retail at around US\$800. Leasing arrangements may be available through various medical-supply companies and/or insurance agencies.*

We have a man with a very bad unoperable heart condition, living in one of the villages of the Chupol area. He is even sleeping in a sitting position because he can no longer lay dow flat because he chokes. The hospitals in the area are not willing to lend him an oxygen tank, and less willing to refill it for him if he gets one. We can buy a used concentrator oxygen machine here in Santa Cruz for Q4,000 and today we were trying to decide if we could afford to buy it. But if you could answer us ASAP if MU can send us one with you, then maybe we could rent one for the few weeks it would take to wait until you came. If you bring one, it has to have all its tubes and bottles, and it has to work with 110 electricity. If MU could donate it to us, then we would lend it to anyone in need with the condition that they return it if the patient gets better or if he/she passes away.

Waiting for your answer, Tere.

PD: Do you still have my Father Lorenzo book?