

Academic Endnotes

1. As a response to one of the panelists, VerroTouch is described as an integrated module that is attached to an existing da Vinci robotic system. Since VerroTouch is the first of its kind of being an integratable add-on to surgical robotic systems, it is difficult for us to find a predicate to show such a model exists. With this information, given the time frame of the course, we are currently unable to pivot to a device similar to VerroTouch that does have a predicate as this would require our business model to be rewritten completely. However given more time, we would be able to pivot towards a device that does have a predicate.
2. One question we were asked is whether this interferes or replaces force feedback on the da Vinci system. Currently, the da Vinci system has a boundary system, where if the surgeon is operating and the controller moves outside the operating boundary of the robot, there is force feedback in the controller to move it back into an operating range, indicating to the surgeon that they are operating outside of the boundary. Since VerroTouch is modular and is essentially an overlay onto the existing system, this will not affect the existing force feedback functionality the system currently has.
3. When asked what our value proposition is for hospitals by the panelists, we would like to indicate this section, where we explain the overall benefit to veteran and new surgeons performing surgery on these robotic systems with VerroTouch. This value, combined with our comparably low price point tested by multiple surgeons (when compared to the 2,000,000 price tag of a brand new surgical robotic system), we believe we are adding both economic, and practical value with our product package.
4. When determining our price range for VerroTouch, we consulted many surgeons who have been involved in group purchasing organizations and generally understand the value for a device such as VerroTouch. However, it was brought to our attention that the price of VerroTouch is too small, leading to revenues that to certain venture capitalists, can be seen as too small or unappealing. Given the time frame of EAS 546, we are unable to determine a new price from surgeons in the limited time remaining, however if we were to continue, we would take this information into consideration and readjust our pricing point, revenue model, and overall financial workbook as a result.
5. VerroTouch plans on protecting its proprietary nature with a patent for our physical product and design. Specifically, VerroTouch is already protected under a utility patent. (Yoffie, 2005) Patents should be acquired for every new generation of product.
6. This section is written under the instruction of Micheal Porter's five force analysis (Porter, 1979), which is typically used in industry analysis, focusing on the competitive

force from buyers, suppliers, incumbents, new entrants and substitutes. We are using this to analyze the competitive landscape for VerroTouch in the surgical robot industry.

7. In the reading “Innovation for Cash”(Andrew et al, 2003), there are three business model, which is integrators, licensors or orchestrators, with integrator have a strong vertical integration and tend to perform everything in house, and the orcheastors in between, focusing on some steps and link with partners to carry out the next. The licensors just license out its innovations. Companies in the electromedical appliances industry generally fall in the categories of licensors or orchestrators, with VerroTouch being the orchestrators.
8. The specification refers to the 13 dimension analysis we mentioned in EAS 546 lectures and this is one dimension. We are differentiating in the broad/ narrow product line and target customer segments from our competitors.
9. The early adopters came from the category based on filling criteria outlined in Customer Discover and Validation (Cespedes et al., 2012). Our early adopters will be the large hospitals who act as opinion leaders in the industry that is more prone to accept the new technology.
10. As stated by our panelists during our pitch, surgeons are not the ones who will be making purchasing decisions for VerroTouch. Generally, as stated in this section, GPO’s (group purchasing organizations) which consist of a wide variety of employees, including surgeons, make purchasing decisions. As a result, by reaching out to surgeons who are generally thought leaders in their field, they will have a significant hand in whether or not a GPO will purchase our product, which stresses the importance of including them in our testimonials and pricing process. While some of the thought leading hospitals like Penn affiliated hospitals do not use GPO, they are having their own Value Analysis Committee. This committee will be sorting a lot of purchasing decisions, which is what we also need to deal with.
11. While it is difficult to pinpoint an exact value of the number of da Vinci systems currently in circulation that are operating, we are able to find a general value for the total number of systems, with the number of total systems that Intuitive are tracking being included in our financial report/calculations to remove any ambiguity.
12. This section is a reference to the “Blue Ocean Strategy” explained in Chan and Mauborgne’s article, *Blue Ocean Strategy*, (Chan and Mauborgne, 2004) where they explain that one way to rapidly grow and expand a startup is to find a niche, unoccupied market. VerroTouch’s blue ocean is the intersection of haptic feedback and surgical robotics as a separate product rather than integrated.

13. Here, we reference our early adopters which we categorize based on filling criteria outlined in *Customer Discover and Validation* (Cespedes et al., 2012). We chose large, leading hospitals as they are the hospitals that are typically willing to adopt new technologies within an industry that largely does not often try new technologies without significant evidence of its effectiveness.
14. This is our explanation of how VerroTouch plans to “cross the chasm” (Moore, 2002) between our early adopters, the leading hospitals, and the general market. This is typically a difficult jump to make as early adopters are those who are more innovative and willing to take risks on the products they buy and use, while the general market is more reserved. This is especially true in the medical industry.
15. While there are no current da Vinci systems that have haptic feedback on the market, Intuitive has been researching haptic feedback in general. For a company as large as Intuitive, an upgrade such as haptic feedback does not seem to be a “must have” for surgeons. However when speaking to a software engineer at Medtronic, a rival competitor producing the Hugo robotic surgical system, their market research and overall opinion is that haptic feedback is a necessity for robotic surgery. Without understanding da Vinci's research done on haptic technology, it is difficult for us to determine the comparability of our product to their research.
16. Our sales plan will be based on that described in The Sales Learning Curve by Mark Leslie and Charles Holloway. As explained, we will be incorporating a three-step process consisting of what they recommended, being an initiation, transition, and execution stage. (Leslie/Holloway 2014).
17. One question we received by our panelists was a specification of what generation 2 of our product is and why it is important. While we understood throughout the process that it would improve where the generation one/prototype of VerroTouch lacked which was its ability to pick up vibrations in soft tissue surgeries, we did not explicitly mention this. Here we specify the generation 2, expressing the importance of our R&D expenditure going to this version of our product as it will widen our overall market from orthopedic surgeries/ hard surface surgeries to softer surgeries that involve soft tissue/muscles.
18. These multiple aspects of our competitive strategy are derived from the 13 dimensions of competitive strategy that we have discussed in EAS 546. By analyzing the pertinent dimensions from the given list and determining how our company falls under them, we can determine strengths, weaknesses and entry timing for VerroTouch (as stated in EAS 546 lecture). This is very important as we want to develop a comprehensive defense that will have us prepared to contend with incumbents and new entrants within the surgical robotics/medical device industry.

19. Our self contained solution differentiates us from any incumbents in the industry, something that we want to aim for as discussed in EAS 546, Lecture 4. While most incumbents offer solutions that would take millions of dollars to purchase, by replacing existing surgical robots, the low switching cost to our solution also helps us to build an offensive strategy and take customers from all surgical robot companies.
20. Our strategy for scaling our operations is derived from Thomas Eisenmann and Alison Berkley Wagonfeld's article, "Scaling a Startup: People and Organizational Issues"(Eisenmann 2012). Here, we specifically draw upon the "collaboration" step in Exhibit 3 of this article. We aim to establish stronger connections within the industry, specifically with companies that we integrate our product with such as Intuitive and Surgical Science. This allows us to reach a larger audience and cross the chasm from our early adopters such as Penn Presbyterian, Children's Hospital of Philadelphia, and Thomas Jefferson Hospital, and reach hospitals far outreaching our initial market being hospitals with older generation models of surgical robotics. This also includes our collaboration with our customers that we stress in our joint collaboration program, creating a relationship with our buyers that considers their feedback on our system and incorporates it into future revisions of VerroTouch.
21. Drawing from Dan Rosensweig's quote in "Scaling a Startup: People and Organizational Issues", we want to minimize the number of decision makers for a given problem. There needs to be an organized process for decision making within a given company, where if there are too many decision makers for a given problem, then "it usually means we don't have enough clarity on the owner of the decisions involved". Through this minimization process, we can effectively optimize the amount of time spent on a given issue.
22. As discussed by Eisenmann, maintaining entrepreneurial culture is crucial within a team that begins to scale its operations. In exhibit 1 of Eisenmann's article, it is important to "reignite entrepreneurial spirit" especially as a startup begins to vertically and horizontally expand, leading to less communication between founders. By maintaining these connections, it allows a company to retain its "most valuable asset- its employees".
23. Team Homogeneity is extremely important in maintaining entrepreneurial culture. It is very easy to slip into the mindset of hiring employees that are like minded, or that "fit in" to an existing office environment. However, as expressed by Horowitz, it is important to hire those who bring a new perspective to a team that may not always line up with the mainstream thought process. New hires such as these, along with incredible work ethic and intelligence, are very valuable to a company who is scaling their operations. If we look at a company such as Google, they hire intellectual employees that have "googleyness" or an ability to lead and work with a group of people who share "similar core values and working styles".

24. In this section, we model our milestones off of the milestones stated in "Milestone for Successful Venture Planning" from Zenus Block and Ian Macmillan. While not explicitly stated in the article, The first five milestones line up with our company initiation and the last five milestones line up with our scaling model. These milestones allow us to set goals for our company and its trajectory as it begins and grows throughout the 6 years of private operation. As stated in the article, these milestones help "avoid costly mistiming errors, give logical... milestones for learning and for reevaluating the entire venture... [and] offers a methodology for "replanning" based on a growing body of ever-harder information." (Block and Macmillan 2014)
25. Clarification was added with regards to our panelists' input. We would be unable to undergo a 510k process for FDA clearance of VerroTouch without a production ready model. (Huggins et.al., 2007) A prototype model would not be eligible in these circumstances. However, with the way our milestones are lined up, we should have minimal changes to our development plan since generation one of VerroTouch will have been completed by the end of our prototype run since we will be ready for alpha testing at this point. As stated by the panelist, this alpha model will be constructed under design constraints and a quality management system.
26. Bass Diffusion model is used in this particular section. In the Bass Diffusion model, the innovation coefficient and imitation coefficient are two key hyper parameters used to characterize the mathematical curve. The approach we used to establish an estimate in Bass Diffusion is by referring to the innovation coefficient and imitation coefficient of similar products with similar characteristics. We then weight-in each product based on the likelihood of the product to VerroTouch. Both the model and the approach to find estimates is done by referring to the academic reading *Forecasting the Adoption of a New Product*, and the reading *A New Product Growth Model for Consumer Durables*.
27. Specifically, we used numbers from ConMed Corp and Globus Medical (Pitchbook) as references. These are two companies that match VerroTouch's small size within the industry and a similar level of involvement as what we expect to have. There are not many public companies within the industry that exactly match our size and product type, but we found that since ConMed and Globus Medical are both profitable and sell a suite of medical devices, they could serve as benchmarks for our forecasts.
28. Our capital expenditure will be on year 2 for production equipment and year 4 for prototype production to facilitate research of the second generation, and year 5 for the mass production of generation 2 equipment. We will start spending money on office equipment starting from year 2. In general, our fixed asset turnover ratio is very high since we don't have a lot of fixed assets. The production and assembly will not need equipment that costs a lot, mostly we spend money on R&D equipment purchasing.

29. The financial forecast is developed on a step-by-step basis starting from analyzing industry average ratios, projecting the cost of goods sold, operating expenses, capital expenses, to revenue. The cash flow projection then gives an overview of how much funding is required. The forecast and analysis are developed based on Steps 1 to 4 in the reading, *Assessing a Company's Financial Health*.
30. A panelist during our pitch stated that there need to be more explicit uses stated using the funding we will receive. In this section, we outline all uses for each of the three rounds of financing we will receive.
31. The funding requirement is developed based on the knowledge in Step 5: Assess Future Financing Needs in the reading, *Assessing a Company's Financial Health*.
32. The reason we want to raise only \$2.5 million, \$5.7 million, and \$2.6 million for the three rounds is to prudently plan the finances and make sure there is no over-financing. This is because we want to hold a larger portion of the company's shares and avoid unnecessary expenditures. With less cash, we are better able to solve problems in a smart and lean way instead of spending lots of money on a bulky yet unfit solution. This is based on what we learned in the reading, *"The Spoiled Startup"*.
33. Two panelists brought up the point that raising 2 rounds of money in year 1 and year 2 is tough and we would be constantly searching for money. However, the amount of money we raise in year 1 is not a significant sum at just \$2 million, meaning we can seek the 2 rounds of investment together in year 1. We can also solve the problem by asking Series A and Series B from the same investor since the amount of money for the 2 series combined is \$8.2 million, which is lower than the average check size of most Venture Capitals now.
34. Both the investment offering and our funding requirements are developed based on the knowledge in *Step 9: Formulate Current Financing Plan* in the reading, *Assessing a Company's Financial Health*.
35. A panelist had brought up the point of determining whether or not our business model covers us leveraging reimbursement for specific surgeries, such as orthopedics as stated here. While we did not initially include this in our business plan however we believe that it is very important to consider going forward. However, given the time constraint of EAS 546, we will not be considering this as it would drastically change the very core of the entirety of our business proposal including our financial workbook. However, from our current standing, having a reimbursement with our product might not be as beneficial to us as a company. With the price point of our device being significantly smaller than that of a device that directly operates on a patient, having reimbursement using our product during a procedure would be minuscule to hospitals. Overall, our product would not be of much of a benefit to patients, as it is directly affecting the way surgeons would

feel the robotic operation. The downsides of our product not functioning as intended would not necessarily fall under a surgical reimbursement as it would in no way affect the way the surgery is performed or the patient's well being.

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