IPRO 358: Delta Hook Tech
Fall 2009

PROJECT PLAN

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Collaborators Taylor Augy Park – Sparrowhawk, Delta Hook Technologies
Dr. Ronald Kirschner - Heartland Angels

IPRO Team:
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Illinois Institute of Technology
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Team Information

Team name - Delta Hook Tech Team
Motto – Fish on D. Hook

Team Members:

Erik Egland (eegland@iit.edu)
Fourth Year Mechanical Engineering
Erik has experience with the manufacturing processes of surgical products, including automated machining and quality control that he gained through an internship with a surgical products manufacturing company. His engineering coursework in behavior of materials will be called upon during the design and building processes of the prototype. This is the second semester that Erik has worked on this iPRO project so his previous knowledge and experience of the project will be call upon. He is also skilled in Microsoft Office Suite, CAD, and SolidWorks, which will aid in generating technical drawings regarding the prototype. Through this IPRO experience he plans to gain a better understanding of starting/running a business. He would also like to improve his skills of communication with professionals in the workplace.

Nathan Howard (nhoward2@iit.edu)
Third Year Mechanical and Aerospace Engineering
Nathan has experience with automotive repair and design. He has spent time working on the SAE formula hybrid and had an internship at Electro-Motive Diesel. These two experiences have given him design skills that will help in the creation of with new ideas and the development of mock-ups for the team. Nathan is also skilled in many computer programs including Microsoft Office Suite, AutoCAD, Solidworks, Nx5, MatLab, and Maple. Through IPRO 358 he plans to gain a better idea of running a business that will help him in the future.

Yunjung Kim (ykim80@iit.edu)
Fourth Year Business Administration - Finance
Yunjung has experiences on both the overall financial analysis and market research to understand the tarket market by an internship, and she has taken courses in various aspects of marketing, finance, entrepreneurship, accounting, HR, operations management, and business strategy. Based on this knowledge and training, she would like to understand the business's entire flow from the penetration of the market to the growth in the market. Through this IPRO, she especially plans to help identify and understand the target market, as well as new methods of marketing the DHT. As well, she hopes to improve her potential skills including communication, leadership and working with her teammates.

Sewon Lee (slee150@iit.edu)
Fourth Year Business Adiministration - Finance
Sewon has three years architecture experience and two years of business experience, especially finance. She also has taken various business courses in operation management, accounting, human resources and entreprenuership at IIT as well as architectural design studio classes at a previously attended university. This is the first IPRO experience for Sewon and a0s a business team member, she wants to learn and understand how to develop a marketing strategy and how to conduct consumer research. Based upon her various backgrounds, she is confident working on a collaborative team project and

eager to participate in IPRO 358.

Andrew Lichaj (Alichaj@iit.edu)
Fourth Year Business Administration
Entering his final year, Andrew plans on using the skills he has acquired in marketing, finance, business strategy, business statistics, and entrepreneurship throughout his undergraduate career to assist IPRO 358. This is his second IPRO and will draw upon past experiences to help IPRO 358 succeed. Andrew is also skilled in Microsoft Office Suite, Precision Tree, Communications, Quicken and Team Structure. Along with going to school Andrew also participates in the schools soccer team and also works as a coach for two youth soccer teams. His work provides him with an environment where he is his own boss and these experiences will help with IPRO 358. Through this IPRO Andrew seeks to further develop his communication (especially with non business majors), business administration, marketing, and leadership skills.

Nikhil Madan(nmadan3@iit.edu)
Fourth Year Business Administration and Finance.
As an undergraduate student in business he has taken courses in marketing, business strategy, operations management, accounting, finance and economics.He plans to apply all of these acquired skills to this IPRO.Previous work experience includes working as an intern for PECO (Philadelphia), Dean Kletter Consulting (Chicago), Rio Doce Vale (Brazil) and Scottrade (Chicago). He is skilled with Microsoft Office Suite, QuickBooks, Quicken, Peach Tree, SAP and Sage Timberline. He feels this is an excellent opportunity to put his skills to work and also understand the risk and opportunities that exist for a start up firm. He has expert knowledge in PNL statements, balance sheets, statement of cash flows, general ledger and trial balance, reconciliations (bank statements vs. system), depreciation of assets, tax filings, optimal profit levels (O*), budgeting and forecasts (flexible and variances) , internal audits. He is also well versed with various forecasting/ financial models, WACC, NPV, RIO, correlations and regression analysis. Interest in financial markets, equity research, options, commodities and bond markets.

Maggie Ng (mng6@iit.edu)
Fourth year Business Administration - Human Resources
Maggie is eager to contribute her extensive knowledge to the success of IPRO 358. Maggie has demonstrated outstanding leadership skills in her previous IPRO, in which she led the survey team to successfully increase awareness and knowledge among blind swimmers of the appropriate devices available to staisfy their needs in the pool. Her consistent work ethic and knowledge within the team had ultimately pushed them to an overall second place finish in their track. Maggie plans to demonstrate these abilities within IPRO 358 and help determine how to identify the appropriate target market, and implement a variety of strategies to successfully market the DHT. With Maggie's familiarity in marketing, strategic planning, and industry analysis she hopes to interact and communicate effectively with her teammates to assure a winning IPRO team.

Keegan Springfield (kspring1@iit.edu)
Fourth Year Business Administration
Keegan's concentration is in entrepreneurship and he has had the benefit of being exposed to numerous startups, including an internship with an entrepreneur who specialized in online retail. He has taken numerous courses in various aspects of business including finance, marketing, human resources, and of course entrepreneurship. He has experience in administering surveys and statistically analyzing data

associated with consumer behavior, which will be useful in determining how to best position DHT technology in the marketplace.

Izmir Yamin (myamin@iit.edu)
Fourth Year Aerospace Mechanical Engineering
Izmir has experience with the aerospace industry specializing in propulsion, robotics and automation, He has also worked on 14 different prototypes that are targeted for commercial applications. His interest in renewable energy system has motivated him to work with PEM Hydrogen Fuel Cell systems and Thermo Electric Generator system. He has a track record in invention and innovation both in the aerospace and energy industries through his involvement in competitions. His has also acquired CAD, CAM, CAE skills through applications such as Star CCM/Design Computational Fluid Dynamics, MATLAB, Simulink, CATIA (Computer Aided 3D Interactive Applications), and Electronic simulation software. In addition, he leads microcontroller projects that help compliment other projects as well. By joining IPRO he plans to improve his communication, leadership, and business skills.

Shaad Zaidi (szaidi7@iit.edu)
Fifth Year Architecture Major
Shaad is very excited to collaborate with the many different fields represented by the students of IPRO 358 and become an essential cog in the system. He has worked extensively in several different countries and on many different architectural teams, each time resulting in winning projects and producing a high quality of work. He brings an intimate knowledge of product detailing to this IPRO and has worked with professors involved in sustainable technologies, in turn, creating mock ups and models of passive / sustainable building systems. Shaad is proficient with programs such as Rhino, AutoCAD and 3DS MAx which are all drafting / 3d modeling software packages and more over knows hows to approach a design problem, such as the one faced in the design of IPRO 358's fish hook. Shaad hopes to work closely with both the production and business teams to produce a winning project, and in doing so learn all he can from his peers and professors.

Team Objectives

During the fall 2009 semester, IPRO 358 plans to continue the development and creation of mock-ups for the Delta Hook Technology (DHT) as well as lay the foundation for a business model for Sparrowhawk, LLC, an early stage company. Sparrowhawk has investigated the concept for an innovative fishing hook that is not currently on the market or ready to be launched. The members of IPRO 358 will work together to design mock-ups of the DHT, test the mock-ups, and determine measures that can be taken to improve the DHT. Subsequent mock-ups will continue to improve based on results of the product testing. Simultaneously, we will be working towards better understanding the consumer's behavior. This will aid in the determination of the probable distribution channels and the strategies to best use them.

The IPRO team will be divided into two sub-teams (business and development) that will work together to achieve their goals.

Business Team Objectives:

- To conduct in-depth research on consumer behavior, focusing on price sensitivity, purchasing behavior of the product (bought in bulk or individually), problem recognition within the market including internal and external stimuli. Also to determine what features are most attractive to the customers.
- To use previous data/research to build positioning strategies for the product in accordance with the major target markets focusing on physiological (safety or performance), situational (single family consumers versus families with kids) and socioeconomic (income group) factors.
- Create a perpetual map of the product space, helping the product team to differentiate the prototype and or series of mockups. The coordinates of the map will be determined after the survey has been conducted.
- Create a distinct marketing mix focusing on promotion and distribution channels, by developing a marketing campaign / sample advertisement for the product.
- Coordinate, communicate, and discuss with the product team the probable cost of goods associated with the DHT technology, the time frame required for the finished product to be developed and to determine a break even point as well as the logistics of manufacturing.
- Utilize the existing resources (focus group/previous data) like Augy Park, members of Sparrowhawk, Windy City Fishing for any further queries

Development Team Objectives:

- Explore different design possibilities to create a mock-up of the DHT that incorporate safety, weedless operation, snag-proof capabilities, and strong holding abilities. This includes…
    - geometry of hooks and shanks
    - total number of pieces in design (base, shanks, hooks)
    - size
    - weight
    - selection of material
    - material treatment methods (e.g. carburizing, quenching and tempering, chrome plating)
- Construct 4-7 mock-ups
- Test mock-ups using finite element analysis along with experimental testing series developed last semester
- Make an appropriate final material selection for shank and hook based on test results
- Determine proper manufacturing processes for final production
- Communicate product ideas to business sub-team make sure the DHT is able to be profitable such as the cost of materials and manufacturing methods (e.g. spring steel, welding, soldering, carburizing)
- Have a working final prototype by the end of the semester

Background

The IPRO team will work with the CEO and entrepreneur behind Sparrowhawk, LLC, Taylor Augy Park, and with Heartland Angels, Inc. “Heartland” is a private equity network that brings together accredited investors with early stage start-up companies and other opportunities. The Heartland Angels' mission is to be a catalyst in the process of innovation by creating forums in which human, intellectual, and financial capitals are joined together for a common purpose.

The project offers an opportunity for students to gain experience in developing the components of a business strategy and plan, as well as, developing and testing designs and mock-ups that demonstrate the value of the innovation and its place in the market.

Recreational fishing is a very sizeable market, generating $125 billion of economic output and providing over one million American jobs. Many different fishing hooks are available, retaining the same, basic shape and structure. However, there are many dilemmas that face contemporary fishing hooks. One problem is that fishing hooks are not able to properly fasten onto the fish after embedding. This can be solved by increasing the size of the barb on the fishing hook. However, this would pose a greater difficulty in properly embedding the hook, and it would result in greater damage incurred to the fish. Another problem is that fishing hooks can catch (snag) onto nearby rock formations, algae, weeds, or other vegetation. This problem is approached by utilizing snag-proof guards. However, this increases the manufacturing cost of the product, and is not shown to be conclusively effective. Additionally, barbs can cause damage to the fish during the removal process. Solutions to this problem would be to remove the barbs from the fishing hooks or using a curved or bulbed hook point. However, this would result in a number of additional problems such as dislodging of the fish from the hook and increasing difficulty in embedding the hook. Perhaps the greatest problem facing conventional fishing hooks is the potential danger facing the anglers, especially the younger, or inexperienced ones. The exposed barbed fish hook can pierce through the skin of an angler and cause injuries. The greatest injury is inflicted upon removal of the hook due to the barb. Among major corporations, there appears to be an absence of fishing hooks equipped with all the above mentioned features: barbless, safe, snag-proof, and weedless. Sparrowhawk promises to develop an innovative fishhook, The Delta Hook Technology (DHT), that offers its users these features.

The IPRO team will develop the DHT through product development and the creation of a business framework. The design will comprise of an inverted treble hook (i.e., three barbless J-hooks pointing towards the central axis) with three shanks consisting of a flexible material that offers a planar motion quality. In the standard mode, the three shanks isolate the points of the J-hooks, which harmlessly point inwards. Only an applied force equal to or greater than a fish's bite force is sufficient to drive the shanks toward the center of axis, activating the hook. Therefore, safety increases since the force of the hook colliding with another angler during casting is less than the targeted fish's bite force. In the engaged mode, the J-hooks reorient away from the center of axis resembling a regular treble hook with the points in an impaling trajectory. Once embedded in a fish's mouth, the inward angle of the hook creates a hold. In this scenario, a fish will normally open its mouth to release the hook thereby tightening the hold further. The DHT may be seen both in the engaged and standard modes below in Fig.1 and Fig.2. After the fish is reeled back onto the boat, the hook can be removed without additional injury to the fish and will automatically return to its original shape with the hooks aligned along the central axis. The fishhook incorporating the DHT can be incorporated into a lure or can also be modified to hold live bait similar to a traditional a jig.

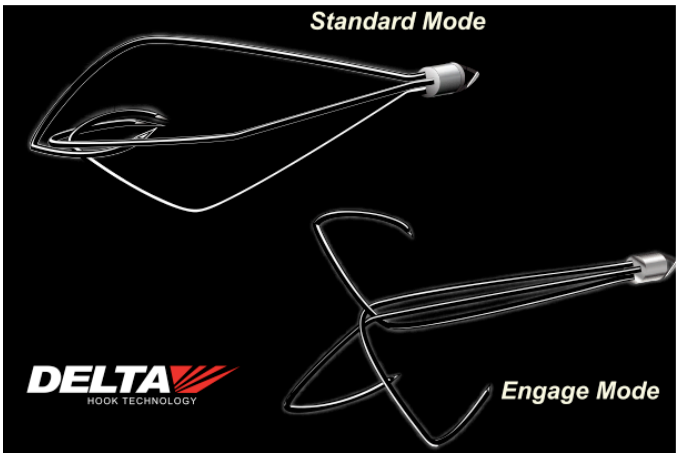

Fig.1. The DHT shown in both the standard mode and the engage mode.

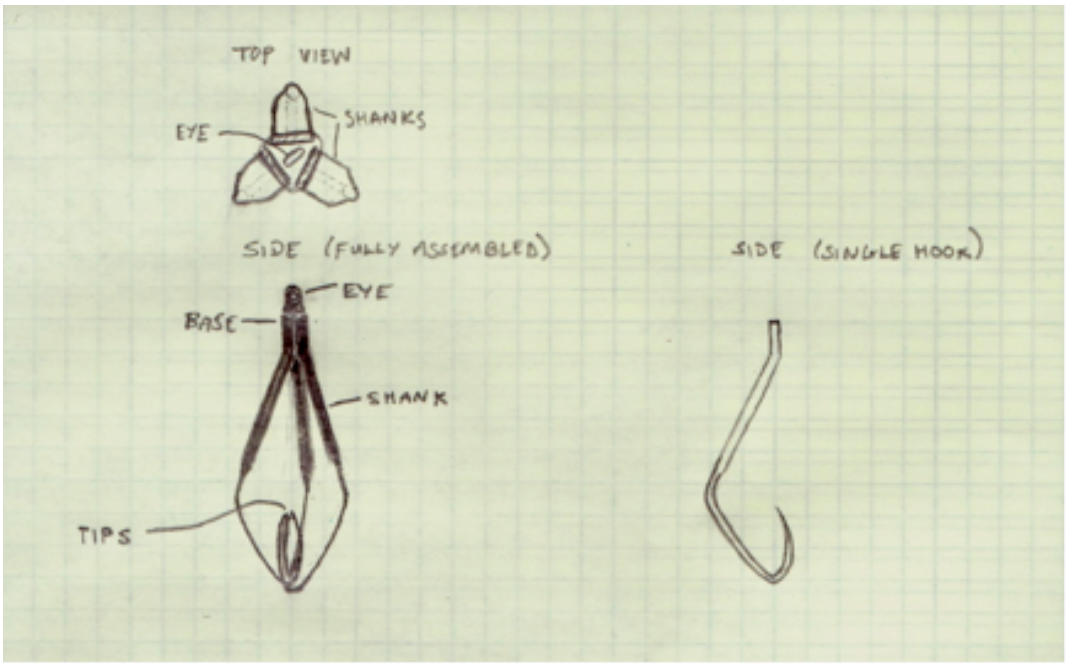

Fig. 2. The physical appearance and the defined sections of the DHT.

There are many technological aspects that must considered during production of the mock-ups such as material selection, engagement mechanism, and durability. Prior to this IPRO, the sponsor, Augy Taylor Park, created a few mock-ups. One of the previous attempts consisted of a shank that was entirely composed of a flexible, metallic wire. However, this allowed any one of the hooks to twist into an ineffective position. The torsional movement of the hooks was prevented by replacing the shanks with a flat, curved, flexible metal. Overall, each of these mock-ups was much larger than the desired size. These are a few of the countless technological factors that will be accounted for during the design and production of a mock-up.

The previous semester of IPRO 358, summer 2009, created their own mockups, which served several purposes. They represented the progress made by the team as well as a physical manifestation of the design concepts formulated by the team. After each mock-up was created, the team analyzed the

benefits of the design and construction as well as its flaws. The team then attempted to correct the flaws in the design and construction while integrating the benefits into the new mock-ups.
The team's first mock-up consisted of six total parts. Three flexing shanks made out of flat hair clips, and three hooks bent from clothespins. The bonding method between the hooks and the flexing unit was chosen to be epoxy. Epoxy glue as well epoxy putty was explored. The epoxy bond was strong and served its purpose of creating a physical model of the design concept. However, it can clearly be stated that epoxy will not be the final bonding method for the product due to its rigidity and bulkiness. Certain members of the team also explored the possibility of using silver solder which contains no traces of lead and forms stronger bonds. The team decided to create the base out of a cap mold created from epoxy putty. The shape and material chosen for the flexing unit worked as expected. The material allowed the hook to deform elastically while the shape of the flexing unit allowed for the hook to flex with planar motion. This attribute was due to the flat shape of the flexing unit, which, unlike flexible circular components such as wire, allowed only one direction of bending. The second mock-up incorporated a new epoxy base. The body and the flexing unit were joined together using metal specific epoxy glue. The problem with this design was the impedance in the engagement of the hook. Due to the bulky attributes of epoxy, the arms were not able to over-flex properly. The mockups created by the summer team may be seen below along with a traditional treble hook to show the size comparison.

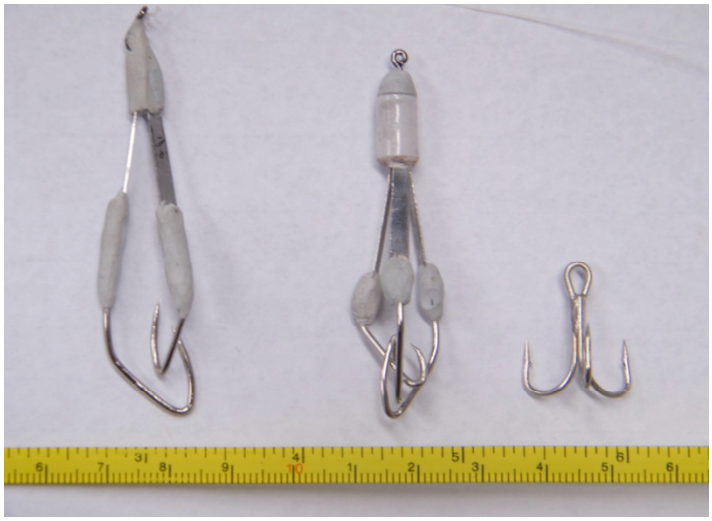

Fig. 3. Shown from left to right, Mock-1, Mock-2, and the traditional rigid treble hook.

To fix the problem of the epoxy while still maintaining one dimensional bending, the team decided to come up with a new design and headed in the direction of a three piece total design made out of A228 which is a high carbon spring steel or commonly referred to as music wire or piano wire however, a mock-up using this material was unable to be constructed due to time constraints.

Having a physical model or mock-up of the design provided great information about the basics of what worked and what didn't. However, to get the most out of each iterative step of the design process, a series of quantifiable tests was created. These tests were created to provide data ranging from material properties to customer satisfaction. This series of tests may be found detailed in last semester's notebook and was created for future teams to aid the design process.

The business team had several objectives for last semester, of which all were covered. The three main objectives were to determine the target market, explore possible marketing methods, and conduct a consumer survey. The current market research done by the business team covered several aspects of the sport of fishing. The research was not limited to possible competitor products, but also included sales information, and national consumer buying habits. Since the current fishing market contains many competing companies, eventually the research became focused on similar bass fishing hooks already popular in the market. Some of the key pieces of information discovered about fishing habits in the United States are:

- 40 million Americans recreationally fish which is more than those who golf and play tennis combined.
- There was approximately $45 billion dollars in retail sales of fishing related items.
- The top five states in terms of revenue are Florida, Texas, Minnesota, California, and Michigan.
- Over $125 billion in overall economic output, including sales of hooks.
- More than 1 million jobs are supported (e.g. retailers, manufacturers, etc.)
- Approximately 10.3 million anglers fish for black bass, making it the largest species market.

From this information, the team focused on the black bass, which is a family that includes largemouth bass. Knowing this, the product development team was better able to narrow choices of dimensions for the DHT including both size and holding capacity. The information also clearly shows what a large industry, generating $125 billion of economic output and providing over one million American jobs, the DHT will be entering when it finally hits the market.

Next, the business team developed what is commonly known as a "straw person" to get ideas on possible marketing schemas for the DHT. A straw person is essentially a high-level view of brainstorming possible important features to focus on for both development of the product and retail appeal. Initially, during the brainstorming sessions, the thought there could be two separate versions of the DHT available led our straw person to have two separate levels of product. The team thought that consumers may want a base-level product that offers some of the best features of the DHT, but was fairly standard otherwise. Other consumers may be willing to spend a little more to get a little more, thus a more luxury option was brainstormed. While having two similar but separate products may not come to any sort of fruition, it was decided that the brainstorming for a high point and a low point could have other potential advantages. If only one level of DHT is developed, the end result could share specifications from both sides of the spectrum, making it more of a middle ground product. The straw person spreadsheet can be found detailed in the notebook passed on from last semester.

Finally, the business team crafted a consumer survey and administered the survey to one hundred anglers in the surrounding area. The survey was designed to gauge a person's fishing and spending habits and also gain their insight on a product with features similar to the Delta Hook. Surveys were given at Bass Pro Shop in Bolingbrook, Cabela's in Hoffman Estates, and Henry's Sports, Bait and Marine in Chicago. All three locations were chosen because they are important retailers for the fishing market. Both Bass Pro Shop and Cabela's are large nationwide retailers with a wide customer base and huge inventories. Henry's is a small, local shop located very close to the IIT main campus. Henry's is of particular interest to our team, since a working relationship with a local retailer could potentially be a great starting point for the DHT to enter the market, and could be used in tournaments or other local events. From the survey results, we were able to better understand the DHT's future customers. The survey was designed to give insight into personal preference, but also gauge experience. Fishing is a sport that can be something done a few weekends a year, or done constantly. Several of the surveyed

informed us that instead of going more than 20 times a year, as the survey indicates, they wanted an option for 20 times a week. We want to target active, experienced anglers since they likely have the most knowledge of the entire fishing field. Another major piece of information gained from the survey was ranking the importance of certain features. It was our expectation that the features most important to anglers would correlate to the most important features of the DHT.

These are just a few of the business and technological related accomplishments and challenges that the summer 2009 team faced. The hope is that our fall 2009 team may learn from the past team's experience and start right where they left off.

Team Outlook

All group members participating in IPRO 358 acknowledge and agree to adhere to the following principles of professional, ethical conduct:

- To complete their assigned tasks in a timely and earnest manner and trust in their fellow team members to do likewise
- To seek help and/or clarification when needed to understand what is required of them
- To remain informed of all topics and important issues addressed by the group
- To treat each of the group members with courtesy and respect as dictated by professional standards
- To communicate clearly and effectively when sharing information with the group
- To be present, on time, attentive, and open-minded during group meetings so as to achieve maximal participation and comprehension
- To resolve any grievances among group members quickly and peacefully, thereby maintaining focus on their primary objective
- To provide/accept constructive criticism to/from other group members politely.

Absences or tardiness will not be tolerated 15 minutes after the meeting has started. An unexcused absence will be documented unless the cause is a result of a family emergency, personal illness, unavoidable academically/professionally-related obligation, or commuting obstacle. If the cause is due to the aforementioned criteria, the absence or tardy will be documented as an excused absence within reason. Any ambiguity must be inquired through iGroups for a vote. The circumstances for voting will be determined by the team leader. There will be only one explained absence and one unexplained absence (no warning given beforehand) for a total of two absences. In the case of repeated tardiness, it will be voted upon whether or not it is counted as an absence.

Problems will be discussed and submitted to the group at the beginning of each meeting. All members are encouraged to speak freely. If a team member is reluctant to discuss a problem with the group, the member can vocalize his concerns with either advisor or team leader. The problem will then be anonymously discussed with the entire group. An example of this process is listed as follows:

- After class, the offended individual approaches the overall team leader and informs him of his concerns.
- If the problem cannot be mediated, and if necessary, the team leader will vocalize the concerns regarding the issue during the next meeting.
- If the problem pertains to the overall team leader, the offended individual may approach an advisor regarding the problem. If necessary during the next meeting, the adviser will vocalize the concerns about the issue.

- There will also be a time during the meeting to express any questions/concerns. Note cards will be given at the beginning of the class and during the meeting, and if questions/concerns arise, the questions/concerns are to be written on the card. Towards the end of class, or whenever possible, the cards will be collected and the questions/concerns will be answered. If there is no time left at the end of the meeting, the cards will be collected and the questions/concerns will be addressed at the beginning of the next meeting.

As it relates to the decision-making process, relevant decisions are to be voted upon, with majority rule. There will be a provision for allowing decisions that were struck down to be reconsidered for discussion after a vote. The motion will be set forth by one individual from the majority party. Up to five minutes will be set aside for discussion before the final vote. This will be the decisive vote. There will be communication established in group meetings, as well as outside of meetings. There are many portals we will utilize for discussion: discussion boards on iGroups, Gmail, Google Documents, etc.

Methodology

The Problem:
Creating the envisioned DHT using technology and prototypes from the sponsor and improving on the concept of the design.

- Is there anything missing in the design that would make it better?
- How effective if this technology in a real fishing environment?
- What materials can be used to lower cost yet stay true to its design?
- How is the product assembled?

Finding an appropriate market for this technology while determining and matching all costs to that market.

- How can the product be made quickly and effectively?
- How and where should the product be marketed?
- Where should the product be manufactured to lower overall costs, depending on the amount needed?
- Where do you go on after the fishing conference?

Create a business plan for the company.

- What considerations need to be taken when dealing with an innovative product? Will traditional business means be applicable?
- What is needed to start a new business and not get overwhelmed by competition in each area of the market?
- What are the current companies with current & future interests in the markets related to the DHT that may be affected?
- Do these companies distribute their own products or have a contract with a third party for distribution?
- What demographics do these companies attract? Who does Sparrowhawk, LLC want to attract with the DHT?
- Will the DHT be used solely for sport fishing? Can it be abused or modified for other applications?
- What is the current state of the marketplace, is fishing on the rise, if so which sectors? What areas in the fishing world are most attractive as entry points for new products?
- SWOT analysis

Plan of Action:
The team will break up into two sub-teams. One sub-team will focus on developing mock-ups of the hook and determining which materials to use. The other sub-team will work on the business aspect of the project, focusing primarily on marketing.

We will carry out extensive data collection from the previous semesters research, regarding the aspects of the prototype developments, methods of testing, and methods of manufacturing. It will be crucial to comprehend the key improvements found from last semester in order to create new designs. It is also important to understand the problems faced in the previous research work in order to identify critical points for accomplishments.

Then research will be conducted on the existing technology regarding the design of a single or triple fish hook configuration that is designed for specific fishing applications. This will give a general idea on how traditional fishhooks perform so a specific DHT design can be established. Selection of the material will follow making sure to meet the corrosion resistance, flexibility, stiffness, and geometrical requirements of the DHT design.

Next, a test bench will be created for the testing of the created mock-ups. This will be crucial to validate the capabilities of the constructed mock-up. These experimental results will be compared to the mathematical modeling done by finite element analysis conducted in parallel to the lab testing. Along with the test bench required for this project a universal tensile station will be needed to accommodate the simulation of a fish pulling during the bite and swimming away from the fisherman. Essentially, this will be a tensile test conducted until failure.

The test bench created will be a fatigue testing station that will simulate a fish bite to measure the hooks fatigue endurance limit. This endurance limit is the number of cycles to failure. A single cycle in a fatigue test is defined as the loading and unloading on the test specimen once.

The manufacturing methods will vary depending on the available technology. Some possible methods include welding, sintering, carburizing, and casting. A caution of reducing manufacturing complexity may help to reduce the manufacturing cost so it will play a big role in determining manufacturing methods.

Since there will be 4-7 prototypes developed, we will need to decide the best prototype design. The key criteria for selecting the best model will be identified through a series of engineering and business considerations. Once all the considerations are taken into account, a final decision can be made by the use of a decision matrix. This matrix will allow for all the criteria affecting the DHT to be evaluated in terms of a scoring system. These scores will help decide the most feasible fish hook design among the 4-7 types proposed, developed, and tested.

The business aspect of this project will focus on primary and secondary research, micro economics (supply and demand), and possible supply chains for the final product. Since the target markets have already been identified our job for this semester would be to analyze the positioning, promotion, and distribution of the product within the target markets. This would be accomplished by conducting surveys at retail stores that sell fishing equipments and identifying various aspects of the customer's pre and post purchase decisions. We will also research various top fishing / outdoor magazines and the

most common ways used to promote hook related products. Supply and demand analysis will help us to come up with the best possible distribution channels and whether a push or a pull strategy would be more suitable after the launch of this product.

Documentation:
Throughout the semester, a notebook will be used to record the results of our research. The mock-ups and business research produced for our programs (for example: surveys, DHT prototypes, step by step instructions, and photos of finished product) will also be provided. The team members will also contribute, in the notebook, to a compendium of ideas for possible implementation and alterations of the design for future semesters of this IPRO to draw upon. Weekly status reports generated by each team will also contribute to our documentation.

The test results will be discussed and analyzed by the development team. The development team will research and devise several solutions to each problem apparent from the results if possible. These solutions will be presented to the business team to evaluate the business implications that may arise such as budget restrictions. The development team will consider the recommendations of the business team and proceed to modification of the mock-up.

The IPRO deliverable reports will be generated as a collaborative process. While the project plan will mostly be written and compiled by a group of three individuals, the entire paper will be reviewed by all group members. The final paper, considerably more involved than the project plan, will be created by as a collaborative effort of the entire group. The separate sub-teams, development and business, will be responsible for providing specialized information regarding the separate sub-teams. Members of each sub-team will be responsible for completing a section of the final paper. The entire paper will then be edited by two from the IPRO group, and later reviewed by the entire IPRO. The deliverables for the midterm presentation, poster, brochure, and final presentation will each have two members that will continue to work on them. This will ensure that each member of the IPRO is able to partake in the documentation of the deliverables and the experimentation process of the DHT process.

Expected Results

Development Sub-Team:

Being that the problem that we are assessing, or rather, our goal is to create a resolved and appropriate prototype, our expected results are to achieve exactly that - provide a fully functioning fishhook prototype to Sparrow Hawk Technologies. In the wider scope of things, there are many steps we expect to complete along the way, such as creating and testing several mock ups (4 - 7), resolving the geometry and material of the hook and finalizing on an applicable production method.

The key to achieving our main goal will be the development and testing of several mockups, we anticipate that these will provide our group with invaluable information. More specifically, with each set of mockups we will be producing new geometries, testing new materials, new mechanisms and producing new 3d models. In creating and testing several mock ups, each having their own specifications, we will be able to optimize the design of the hook, as with each step we will be able to rule out specific strategies. More over we will do fatigue testing, stress analysis, snag testing (tests that will check how snag free our hook actually is) and functionality testing. We imagine that these tests will provide us with information as to the longevity of our selected materials, the accuracy of our

geometry and the effectiveness of the mechanism, in that, how efficient it is in hooking fish. In this way we will incrementally cut the fat off our project.

The backbone of our project is the research that we plan on completing. Producing an "appropriate" prototype means, one that has assessed the problems of cost and manufacturing technology. To do this accurately we plan to compile research on current fishhook manufacturing technologies, through site visits and conversations with professionals in the field. As to the problems with cost, we expect to resolve those through the testing of several manufacturing schemes and materials, these will help us recognize the most efficient solution depending on what method costs the least amount to produce, whilst still being a quality product.

There are specific hurdles we have to overcome before any of our goals are possible, the fact that this is an extremely innovative project, means that there are not any precedence's in place for what we are trying to do. To create a hook that will work effectively, we must come up with a mechanism that will have planar motion and can be made from the fewest amounts of parts, in that way reducing labor and manufacturing costs. Perhaps there are currently no technologies that can produce some of the parts we require, in which case we would have to either compromise with what already exists or create a new process. Also there are certain tests we may not be able to do on campus and as such we would have to find alternate resources to move forward. Also finding the right material, geometry and mechanism combination will be an arduous process - as there are hundreds of possible combination's based on a multitude of factors, such as whether the geometry and the material compliment each other.

In the end we plan on compiling a large amount of information as to the logistics and functionality of our product, along with all the test results for our mock ups and in doing so be able to show a clear progression of thought through our work. More importantly we intend to provide our sponsor with a working prototype and useful body of information, so that he may be able to turn his vision into a working product.

Business Sub-Team:

The Business Sub-Team will be focusing on evaluating as well as building upon the marketing research conducted by the previous semester's team. They laid the groundwork with an excellent survey which will be more widely distributed by this semester's team, focusing on the numerous Chicago area bait shops, as well as at area marinas. They will target these areas primarily seeking feedback from the "professional" market, and will focus on other locations to survey the youth oriented "safety" market. These other locations may include Wal-Mart, Target, and other retail outlets. The Business Sub-Team will also seek to engage and survey both parents and youths associated with the Boy Scouts of America, for whom safety is always a top concern.

As the Development Team progresses with their research, we plan on incorporating any design decisions including, but not limited to: size, material, and manufacturing process, into an in-depth examination of costs associated with producing and selling the DHT.

In summation, by the conclusion of this semester we expect to have a complete and accurate picture of Chicagoland's fishing consumers' behavior, as well as an idea of probable distribution channels and the strategies to best utilize them. Provided the development team determines the best course of action regarding materials for the DHT, it is also our goal to have an outline of the DHT's costs throughout the production phase and into distribution.

Schedule of Tasks and Milestone Events

Table 1			
Schedule of tasks to be completed-Business Sub Team			
Label	Priority	Title	Projected Due Date
A	1	Design consumer behavior survey	18-Sep
B	1	Conduct consumer behavior survey	25-Sep
C	2	Analyze survey	2-Oct
D	3	Positioning Strategy	16-Oct
E	3	Marketing: promotion	16-Oct
F	4	Supply Chain	TBA
G	5	Finanical analysis	TBA
H	6	Marketing: Pricing	TBA

A. Design/modify consumer behavior survey

Consumer behavior surveys will be conduct and we will modify last semester survey in order for us to understand our target market. Demographics question will be added.

B. Conduct consumer behavior survey

Apart from survey the professional market, we are planning to survey the youth market as well. Exact survey location has not decided yet but survey will conduct at both fishing equipment stores (e.g. BassPro Shops) and other retail stores. (e.g. Walmart and Target)

C. Analyze survey

Collected survey and analyze with previous team result.

D. Positioning Strategy

After analyzing survey result, we will use it for planning DHT positioning. Perceptual map will be prepared to show consumer perceptions of fishing hooks across different brands. Perceptual map helps to identity DHT against its competitors and emphasizing DHT unique benefit.

E. Marketing: promotion

Study on competitors marketing strategies and fishing magazines, and come up with a marketing plan for DHT. It should include DHT's sales strategy, proposed advertising and promotion activities.

F. Supply Chain

This would be accomplished after the finished product has been developed. Supply chain indicates processes of moving goods from the customer order through the raw materials stage, supply, production, and distribution of products to the DHT end customer.

G. Financial analysis

This would be accomplished after the finished product has been developed. Data such as capital, material, labor and manufacturing cost would be obtain for evaluating financial statements (income statement and cash flow), and a financial statement analysis including Return on Investment ratio and Break-even Point.

H. Marketing: Pricing

Determine how to price DHT. The price DHT charge has to be competitive but still allow it to make a reasonable profit. We set our pricing through a process of calculating the cost, estimating the benefits to consumers, and comparing DHT prices to competitors.

Table 2			
Schedule of tasks to be completed-Product Sub Team			
Label	Priority	Title	Projected Due Date
A	1	mock up 1 construction/review last semester info	15-Sep
B	1	test bench / research existing technology	17-Sep
C	1	test mock up 1/analyze results	22-Sep
D	3	research	24-Sep
E	2	mock up 2 construction	29-Sep
F	2	mock up 2 construction	1-Oct
G	1	test mock up 2/analyze results	6-Oct
H	2	analyze results/plan mock up 3	8-Oct
I	1	mock up 3 construction	13-Oct
J	1	mock up 3 construction	15-Oct
K	1	test mock up 3/analyze data	20-Oct
L	2	analyze data/plan for mock up 4	22-Oct
M	2	mock up 4 construction	27-Oct
N	2	test mock up 4/analyze data/plan for final prototype	29-Oct
O	3	final prototype construction	3-Nov
P	3	final prototype construction	5-Nov
Q	3	test/analyze data from final prototype	10-Nov
R	3	analyze data for final prototype	12-Nov
S	4	final deliverables work	17-Nov
T	4	final deliverables work	19-Nov
U	4	abstract/brochure/poster drafts due	24-Nov
V	4	final report draft due	26-Nov
W	4	abstract/brochure/poster due	30-Nov
X	1	IPRO Day	2-Dec
Y	2	final report due	4-Dec

Project Budget

Item	Estimated Cost ($)
Mock-up Materials/Testing	$200 (material purchasing, testing benches, lab fees)
Prototype Evaluation (e.g. fishing trips)	$150
Business Research	$150 (survey incentives)
Total	$500

Team Structure

The initial steps taken in dividing the team involved identifying the major themes requiring the most attention. In that, the classification of task subsets could be established. Because of this understanding the IPRO group was then divided into two sub-teams. These teams are listed below.

Development Sub-Team:
The development sub-team will focus on finalizing the material selection for the development of DHT, incorporating mathematical modeling such as FAE into the design process, and ultimately producing a prototype along with step by step manufacturing methods.

Team leader:
Shaad Zaidi
Team members:
Erik Egland
Nathan Howard
Izmir Yamin

Business Sub-Team:
The business sub-team will continue the market research build upon the marketing research conducted in the summer and also develop the logistic supply chain for DHT. The group is planned to dividing into two teams: marketing and logistic team.

Marketing Team:
The market team will continue working on market research building upon the marketing research conducted by the previous semester's team. Consumer behavior survey will be conduct again in order to have a better understanding of DHT target market. In addition, marketing team will focus on marketing campaign in this semester.

Logistic Team:
Based on the marketing team's work, this group will focus on the logistics management that is part of the supply chain which plans, implements and controls the storage of goods and services with making the appropriate financial model in order to meet consumer needs and satisfactions.

The business sub-team will meet from 6-6:25pm on Tuesday and Thursday evenings.

Team leader:
Keegan Springfield
Team members:
YunJung Kim
Andrew Lichaj
Nikhil Madan
Maggie Ng
Seewon Lee

Designation of Roles

Project Monitoring Roles

Overall Team Leader: Erik Egland
(In charge of keeping the entire team going and making decisions, liaison with the professors. The leader ensures that all tasks are accomplished in a timely manner. Resolves conflicts if needed)

Development Sub-Team Leader: Shaad Zaidi
(In charge of keeping the development sub-team working and stays focused. This leader ensures that all tasks are accomplished in a timely manner within the team.)

Business Sub-Team Leader: Keegan Springfield
(In charge of keeping the business sub-team working and stays focused. This leader ensures that all tasks are accomplished in a timely manner within the team.)

Development Sub-Team Minute Taker: Nathan Howard
(Writes down all important information discussed in class and posts them on iGroups)

Business Sub-Team Minute Taker: TBD
(Writes down all important information discussed in class and posts them on iGroups)

Agenda Makers: All team members in rotation.
(Writes an agenda of all class meetings and posts them on iGroups before the meeting takes place)

Deliverable Coordinator: Maggie Ng
(Makes sure that all deliverables are completed online and posts the completed deliverable as a nugget on iGroups)

Spy(s): All team members in rotation.
(Reports on what the other team is working on so no confusion ensues with the product development)

Skeptic: All team members in rotation.
(Acts as a skeptic to comments and ideas in order to encourage opposing ideas.)

Optomist: All team members in rotation.
(Keeps the atmosphere happy and calm in order to maintain team morale)

Reflector: All team members in rotation.
(Reflects and comments on ideas given by team members, makes sure nothing is lost in translation from other team members)

Weekly Meeting Report Recorder: All team members in rotation.
(Writes a report on what occurred during the class and what the goals are for the next class)

Works Referenced

"American Sportfishing Association." American Sportfishing Association 8 June 2009 <http://asafishing.org/asa/statistics/saleco_trends/>.
- statistics for anglers and sports fishing

"Chicago Fishing Information | Chicago Fishing Reports | WindyCityFishing.com." 16 June 2009 <http://www.windycityfishing.com>.
- place where the sponsor and other fishermen share their fishing experience. It is also where we can find our focus group, which was picked by our sponsor.

"ESPN - BASS Membership and Tournament News, Information, Standings, Photos, Videos, Blogs." ESPN 16 June 2009 <http://www.bassmaster.com>.
- to learn tournament rules and regulations for largemouth bass fishing.

"USFWS - Management Offices - State, Territorial, and Tribal." United States Fish & Wildlife Service. 14 June 2009. <http://www.fws.gov/offices/statelinks.html>.
- resource for federal and state regulations on fishing