**Apsc 496 Project Proposal – Praxim 3D Haptic Interface for Orthopaedic Surgery**

**Introduction**

Praxim, a French company based in Grenoble, France, markets computer-assisted surgical systems for orthopaedic surgery. Praxim presently markets a small surgical robot, Praxiteles, which is used in total knee replacement (TKR) surgeries.

Recently a new device has been developed that provides hard-surface constraints for Praxiteles, which aids surgeons in performing bone-shaping operations, and minimizing soft-tissue damage to the areas surrounding the site of operation. This device was originally conceptualized and developed by a UBC graduate student, whose final result was a 2-dimensional constraining system; the concept was then explored further by a team of mechatronics students who were able to expand the device’s capabilities into 3 dimensions.

It is Praxim’s wish to improve the design of the robot that was delivered by the previous Mech 45X team in order to make the device smaller, lighter, and able to be sterilized. The purpose of this device will ultimately be to provide a 3-dimensional, constantly adapting set of constraints (changing as the surgeon’s tool changes position over the joint) that will guide the surgeon in performing a quicker surgery, with minimal tissue damage.

The primary stakeholders in this device’s market are the hospitals and their surgeons. The hospitals will benefit from this type of innovation, as they will be able to move patients through the OR quicker, perform more surgeries, and reduce OR operating costs. The surgeons will subsequently be able to perform faster and more precise procedures, concentrating more on their task and having to worry less about causing significant tissue damage. They too may benefit from performing more procedures in a day.

Secondary stakeholders in the device are the patients, whose recovery time will be decreased (again, due to minimal tissue damage). Furthermore, as the number of procedures performed daily should increase, they will have reduced waiting times to have their procedure performed.

Tertiary stakeholders might be rehabilitation facilities and home caretakers, who will work with patients to regain their full mobility and independence; as recovery time is likely shortened, this will allow them to process more patients as well.

As there is not currently a device with similar functionality to Praxiteles or this expansion project on the market, there is a great market opportunity should this device go into production. Praxim’s target market for this device is the network of high-volume arthroplasty hospitals, performing multiple TKR procedures per day. (insert number per year in US? ).

In comparison to the existing prototype, there are a number of improvements that must first be made before the device can be marketed, or even cadaver tested. First, the robot’s size must be decreased, and subsequently its weight, as it is a bone-mounted device and cannot put excessive forces on the bone during the operation. Second, the device must have complete 3D capability, which will allow for fluid performance; a 2D device is somewhat beneficial, but does not provide enough worth to be practically marketed, as the surgeons must constantly adjust the device for each new cut location.

Therefore, it can be concluded that this device, with full 3D functionality, will provide enough value to all stakeholders to justify its purchase and subsequent use; as there is currently no similar technology on the market, it can be seen as a potentially successful disruption into the TKR surgical device market.

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