**Project Plan**

This project is basically develop the technology of organ printing and apply it to make our products like heart to help medical improvements and also make profits for the company. In order to implement the project, a project plan is essential. In this project plan, work break down structure including five basic steps, resources and timeline will be discussed in detail using project management tools.

**Five basic steps of this project includes: (WBS)**

1. A new type of heart printer is to be developed
2. Heart cells aggregates

2.1 Biologists study on the aggregation of heart cells 4

2.2 Lab test on the aggregation of cells 2

1. Build the supportive, biodegradable and thermosensitive gel according to a computer generated template (build the first model)

3.1 Design the model using computer software

3.2 Build the first model for testing

1. Medical Testing

4.1 Functional test (to check whether the function of the bio-printed heart works in good condition)

4.2 Clinical trial (implementation and clinical evaluation)

1. Commercialization

5.1 Product prototype

5.2 Design the profit model

5.3 Marketing

**Heart Printer**

In order to implement the bio-printed heart project, a new type of heart printer is necessary. Different from current bio-printers that can only print simple tissues or tissue-like structures, the heart printer should be able to print a more complicated and completed heart as whole. In this step, the estimated time for a newly designed heart printer is 6 months. (6 months)

**Cell Aggregation**

The technology of cell aggregation is important because it directly affects the success of the project. In fact, the main problem in this step is not the aggregation of heart cells. The issue is to keep the heart alive on its own. The solution to this problem is to “encourage[ing] the natural self-organising of cells in that heart, that drives a process called inosculation” (Liat Clark, 2013) <http://www.wired.co.uk/article/3d-printed-whole-heart.> Further study needs to be done in this area. The estimated time for this research and development step is about 3 years including lab test after the technology of cell aggregation has significant breakthrough which estimates to be 1 year from the beginning. This step can be implemented during the same period as designing the heart printer. (3 years)

**Build a testing model**

In this step, the first model for testing use is to be built. There are two sub steps which include model design and model build. Since the technology of heart printer and cell aggregation are well developed after two years, a testing model will not take long time to build. The estimate of building the first model will be about 3 months, and several more models will also be built for testing use, which takes one more month. (4 months)

**Medical Testing**

Medical testing is considered to be important because it puts the theory into practice. First, a functional testing will be implemented to test the hearts’ function outside human’s bodies. The testing should be complete and reliable so that the technology can be further tested on human bodies’ more safely. The estimated time for the testing is about 1 year for functional testing体外测试 and 3 years for clinical trial人体内测试. ( 4 years)

**Commercialization**

To make this technology and the bioprinted heart enter the market, some business processes will be carried out. Commercialization includes three sub steps that are building the latest version of product prototype, designing the profit model and marketing. The estimated time for this step is about 3 months, 1 months for the prototype, 2 weeks for the design of profit model and 1.5 months for marketing. (3 months)

As a result, the total planing period for this project is about 8 years and one month.

Resources that are used to implement this project includes financial, physical, intellectual and labors.