P10041 Managerial Review
MSD I Primary Objectives

- Determine and Refine Customer Needs
- Map Customer Needs To Engineering Specs
- Develop Project Plan
- Thoroughly Document Design Process
- Generate, Refine, and Select Kit Concepts (4)
- Assess Feasibility of Kit Implementations
- Assess and Plan for Mitigation of Kit Risks
- Finalize Designs
- Create Bill of Materials
- Prototype Designs
- Finalize Bill of Materials
- Address Budgeting Concerns and Ordering Concerns (Long Lead Time Parts)
- Create Preliminary Test Plans
- Create Plan Forward (MSD II Schedule)
Project Plan Evaluation

• Customer Needs and Engineering Specs completed on time
• Activity ideation took longer than expected and deserved more time than allotted
• Planned to have system level design completed by week five, but didn’t start until then
• Completed majority of the detailed design phase action items before DDR
• Planned to start prototyping designs for detailed design review, but won’t be starting until MSD II
• Finalizing Kit Design was scheduled for week nine, some designs require focus
• Finalize Bill of Materials was scheduled for week eight
• Risks were successfully foreseen even though all designs not finalized
Causes

• Most of these deviances result from the delay caused by concept generation and Kit selection. To have a sufficient degree of evaluation, many ideas needed to be generated and refined or expanded on.

• Also, as a result of feasibility studies some approaches are being re-examined.

• Being over ambitious in planning, and wanting to rush progress.
What we would do differently

• Requested a postponement of Systems Level Design Review
• Spend more time choosing concept screening methodology
• Have a meeting agenda to make group time more efficient
# MSD II Project Plan

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Detailed Design</td>
<td>20 days</td>
<td>Mon 3/8/10</td>
<td>Fri 4/2/10</td>
</tr>
<tr>
<td>2</td>
<td>Finish all DDR Action Items</td>
<td>13 days</td>
<td>Mon 3/8/10</td>
<td>Wed 3/10/10</td>
</tr>
<tr>
<td>3</td>
<td>Finalize kit designs</td>
<td>3 days</td>
<td>Mon 3/8/10</td>
<td>Wed 3/10/10</td>
</tr>
<tr>
<td>4</td>
<td>Finalize BOMs</td>
<td>2 days</td>
<td>Thu 3/11/10</td>
<td>Fri 3/12/10</td>
</tr>
<tr>
<td>5</td>
<td>Address long lead time parts</td>
<td>2 days</td>
<td>Thu 3/11/10</td>
<td>Fri 3/12/10</td>
</tr>
<tr>
<td>6</td>
<td>Order all parts</td>
<td>8 days</td>
<td>Mon 3/15/10</td>
<td>Wed 3/17/10</td>
</tr>
<tr>
<td>7</td>
<td>Create Assembly Plan</td>
<td>5 days</td>
<td>Mon 3/15/10</td>
<td>Fri 3/19/10</td>
</tr>
<tr>
<td>8</td>
<td>Create Final Test Plan</td>
<td>10 days</td>
<td>Mon 3/15/10</td>
<td>Fri 3/26/10</td>
</tr>
<tr>
<td>9</td>
<td>Begin Prototyping</td>
<td>10 days</td>
<td>Mon 3/15/10</td>
<td>Fri 4/2/10</td>
</tr>
<tr>
<td>10</td>
<td>Kit documentation</td>
<td>20 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/30/10</td>
</tr>
<tr>
<td>11</td>
<td>Create kit lesson plans</td>
<td>20 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/30/10</td>
</tr>
<tr>
<td>12</td>
<td>Create activity worksheets</td>
<td>20 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/30/10</td>
</tr>
<tr>
<td>13</td>
<td>Create take home activity</td>
<td>20 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/30/10</td>
</tr>
<tr>
<td>14</td>
<td>Create kit checklist</td>
<td>20 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/30/10</td>
</tr>
<tr>
<td>15</td>
<td>Testing and Refinement</td>
<td>10 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/16/10</td>
</tr>
<tr>
<td>16</td>
<td>Complete testing as per test plan</td>
<td>10 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/16/10</td>
</tr>
<tr>
<td>17</td>
<td>Document all testing</td>
<td>10 days</td>
<td>Mon 4/5/10</td>
<td>Fri 4/16/10</td>
</tr>
<tr>
<td>18</td>
<td>Final Build</td>
<td>10 days</td>
<td>Mon 4/10/10</td>
<td>Fri 4/10/10</td>
</tr>
<tr>
<td>19</td>
<td>Build all micro-kits</td>
<td>10 days</td>
<td>Mon 4/10/10</td>
<td>Fri 4/10/10</td>
</tr>
<tr>
<td>20</td>
<td>Final Testing</td>
<td>2 days</td>
<td>Sat 5/1/10</td>
<td>Mon 5/3/10</td>
</tr>
<tr>
<td>21</td>
<td>Imagine RIT</td>
<td>1 day</td>
<td>Sat 5/1/10</td>
<td>Sat 5/1/10</td>
</tr>
<tr>
<td>22</td>
<td>Class Room Testing</td>
<td>1 day</td>
<td>Mon 5/3/10</td>
<td>Mon 5/3/10</td>
</tr>
<tr>
<td>23</td>
<td>Document all testing</td>
<td>1 day</td>
<td>Mon 5/3/10</td>
<td>Mon 5/3/10</td>
</tr>
<tr>
<td>24</td>
<td>Project Review</td>
<td>5 days</td>
<td>Mon 5/3/10</td>
<td>Fri 5/7/10</td>
</tr>
<tr>
<td>25</td>
<td>Create project overview</td>
<td>5 days</td>
<td>Mon 5/3/10</td>
<td>Fri 5/7/10</td>
</tr>
<tr>
<td>26</td>
<td>Document the fulfillment of customer need</td>
<td>5 days</td>
<td>Mon 5/3/10</td>
<td>Fri 5/7/10</td>
</tr>
<tr>
<td>27</td>
<td>Evaluate successes and failures</td>
<td>5 days</td>
<td>Mon 5/3/10</td>
<td>Fri 5/7/10</td>
</tr>
<tr>
<td>28</td>
<td>Poster</td>
<td>5 days</td>
<td>Mon 5/10/10</td>
<td>Fri 5/14/10</td>
</tr>
<tr>
<td>29</td>
<td>Create a list of poster requirements</td>
<td>2 days</td>
<td>Mon 5/10/10</td>
<td>Tue 5/11/10</td>
</tr>
<tr>
<td>30</td>
<td>Design Team Poster</td>
<td>3 days</td>
<td>Wed 5/12/10</td>
<td>Fri 5/14/10</td>
</tr>
<tr>
<td>31</td>
<td>Project Final Details</td>
<td>5 days</td>
<td>Mon 5/10/10</td>
<td>Fri 5/14/10</td>
</tr>
<tr>
<td>32</td>
<td>Proofread all documents</td>
<td>5 days</td>
<td>Mon 5/10/10</td>
<td>Fri 5/14/10</td>
</tr>
<tr>
<td>33</td>
<td>Update EDGE</td>
<td>5 days</td>
<td>Mon 5/10/10</td>
<td>Fri 5/14/10</td>
</tr>
</tbody>
</table>
Evolution of Risk Assessments

• As Kit ideas became more refined more individual Kit Risks were created.
• The Team Risks did not grow to a large extent, most Team Risks were mitigated or could not be avoided i.e. loss of team member, or are too far off into the future.
• The original Risk Assessment seen at the SDR did not have comments, and were not mitigated.
Electronic Keyboard Kit
Detailed Design

• PCB Whole Design or Purchase Development Board
  – If using development board I will need a shield to put the DAC, convert signal to
  – bi-polar, implement power amplifier it can be either pcb or protoboard
• Determine method of outputting signal from micro-controller
  – Monophonic? Don’t need extra hardware
  – Polyphonic? Can this be achieved with Pulse Width modulation? Or Would I need DAC
• Determine how to convert signal from unipolar to bipolar, or if not necessary
• Determine design of power amplifier
  – Condition signal and use audio amplifier IC?
  – Make own power amp with power BJTs?
• Select components, and verify that rated specs will not be violated i.e. current/power
• Design will need to consider meeting budget
• To begin build-test activities...
  • Finalize design
  • BOM
  • Order parts
  • Prototype
• EXPECT ALL TO BE DONE IN FIRST WEEK OF MSD II
Electronic Keyboard Kit
Risk Assessment

• Differences
  – Early risks focused on things that could go wrong with an analog keyboard
  – Risks have evolved to focus on time compression of learning pcb layout or avoiding it by using dev board and protoboard
  – All risks are commented on and a mitigation is determined
• Risk assessment has been continually updated
• Customer Needs
  – Many needs are on track to being met; will be determined after kit design is finalized
  – Some needs won’t be met until MSD2
## Current State of Risks

### Electronic Keyboard

<table>
<thead>
<tr>
<th>ID</th>
<th>Risk Item</th>
<th>Effect</th>
<th>Cause</th>
<th>Likelihood</th>
<th>Severity</th>
<th>Importance</th>
<th>Action to Minimize Risk</th>
<th>Owner</th>
<th>Comments</th>
<th>Mitigated?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not able to interface PCB board with a through hole or socket section for student manipulation.</td>
<td>Money wasted on PCB, kit non-functional</td>
<td>Poor planning, not doing enough research into getting PCBs made</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>Contact professional once design completed</td>
<td>Bryan</td>
<td>Use female headers</td>
<td>Y</td>
</tr>
<tr>
<td>2</td>
<td>PCB creation absorbs a disproportionate amount of fund allocation</td>
<td>Other kits could be compromised or limited in scope, or this kit may need massive redesign</td>
<td>In-effective planning between purchaser, and designer</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>Create Bill of materials and discuss with purchaser, then revise and propose to Debartolo</td>
<td>All</td>
<td>Cost is $33 per board if under certain size</td>
<td>Y</td>
</tr>
<tr>
<td>3</td>
<td>Keyboard doesn’t sound good, meaning that frequencies of oscillators did not match what they were designed to be</td>
<td>Keyboard is dissonant, and not pleasurable to play or hear</td>
<td>Tolerance in components causes electrical resonance point to drift</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>Consider alternate designs that guarantee harmonic intervals, or determine through monte-carlo simulation the worst case dissonance and determine severity of deviance.</td>
<td>Bryan</td>
<td>Implementing a Microcontroller for precise frequency control</td>
<td>Y</td>
</tr>
<tr>
<td>4</td>
<td>Circuitry not durable enough</td>
<td>Kit life will be compromised</td>
<td>No enclosure designed</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>Consider adding enclosure</td>
<td>Bryan/Sheryl</td>
<td>Team seems unfamiliar with design of enclosures for circuitry</td>
<td>N</td>
</tr>
<tr>
<td>5</td>
<td>Kit activity time too short</td>
<td>Kit quality compromised</td>
<td>Kit designed poorly</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Consider adding more things to add in activity</td>
<td>Bryan</td>
<td>Needs to be evaluated by testing</td>
<td>N</td>
</tr>
<tr>
<td>6</td>
<td>Frequency response of filter doesn’t allow designed tones to pass</td>
<td>Kit non functional</td>
<td>Improper planning/design</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>Design oscillators to coincide with speaker frequency response</td>
<td>Bryan</td>
<td>F=1/(2pi<em>R</em>C)</td>
<td>Y</td>
</tr>
<tr>
<td>7</td>
<td>Student Presses all keys at once putting summation amplifier at risk</td>
<td>Kit damage</td>
<td>Improper planning/design</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>Use voltage reducing amps or voltage limiting circuitry</td>
<td>Bryan</td>
<td>No summing amplifier required in design now</td>
<td>Y</td>
</tr>
<tr>
<td>8</td>
<td>Taking too much time to learn pcb layout software</td>
<td>No kit</td>
<td>See Risk</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Study tutorial over break, play with software</td>
<td>Bryan</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>9</td>
<td>Mistake made in pcb layout</td>
<td>Bad build</td>
<td>Rushing through layout</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>Study tutorial over break, play with software</td>
<td>Bryan</td>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>
Electronic Keyboard Kit
Individual Project Status

• Personal responsibilities
  – Help update project plan, and various group document templates
  – Electronic Keyboard Kit
    • Microcontroller Design and Programming
    • Oscillator Testing
    • Filter Testing
    • Amplifier Testing
• MSD1 Project Plan
  – Plan was too ambitious; I did not have enough time to finalize the kit design, plus it was requested that I change design
• MSD2 Project Plan
  – I am following the team MSD2 plan, with my own testing requirements
Electronic Keyboard Kit
Individual Project Status

- Plan for MSD2
  - Finish up all MSD1 action items
  - Follow project plan to complete all testing, building, and document writing
- Preliminary test plan is started
- What I would have done differently
  - Not wasted time on Analog design since it is not the industry standard anyway
  - Made a meeting agenda/action item template to maximize efficiency of the team’s time together
Hearing Aid Kit
Detailed Design

• Open design activities
  • Finalize design
  • BOM
  • Order materials for prototype

• Major subsystems
  • Speakers will be purchased; speaker box design still needs to be determined
  • Electrical circuit has been reviewed; new circuit ideas still need to be researched
  • Cup telephone has been reviewed and design will work

• Budget
  • Based on partial BOM, the budget should be met
  • Will be determined after BOM is finalized

• To begin build-test activities...
  • Finalize design
  • BOM
  • Order parts
  • Prototype

• EXPECT ALL OPEN DESIGN ITEMS TO BE DONE IN FIRST WEEK OF MSD2
Hearing Aid Kit
Risk Assessment

• Differences
  – Early risks focused on things that went wrong with the ear kit
  – Risks have evolved to more technical things that can go wrong with a new design
  – All risks are commented on and a mitigation is determined

• Key Risks
  – Most key risks deal with circuit assembly and usage issues

• Risk assessment has been continually updated

• Customer Needs
  – Many needs are on track to being met; will be determined after kit design is finalized
  – Some needs won’t be met until MSD2
Hearing Aid Kit
Individual Project Status

• Personal responsibilities
  – Project organization (EDGE, templates, TO DO lists)
  – Communications Kit
    • Homemade speaker testing
    • Cup telephone testing
    • Electrical circuit testing
  – Hearing Aid Kit
    • Electrical circuit comparison
    • Speaker design
  – Compared to the original project plan, I am behind schedule

• MSD1 Project Plan
  – Plan was too ambitious; I did not have enough time to finalize the kit
design since my overall kit and circuit design changed

• MSD2 Project Plan
  – I am following the team MSD2 plan, with my own testing requirements
Hearing Aid Kit
Individual Project Status

• Plan for MSD2
  – Finish up all MSD1 action items
  – Follow project plan to complete all testing, building, and document writing

• Preliminary test plan is complete

• What I would have done differently
  – Researched electrical circuit options more thoroughly in the beginning of the design phase
  – Checked the project plan more often so I would have realized when I got off track and could have worked harder to get back on schedule
  – Made a meeting agenda/action item template to maximize efficiency of the team’s time together
Xylophone Kit
Detailed Design

- Open design activities
  - Schematics/Drawings
  - BOM
  - Preliminary Test Plan
  - Ordering materials for Prototype
- Major subsystems
  - Most current base design still has to be reviewed
  - Bar materials have been reviewed and will work
- Budget
  - Based on partial BOM, the budget should be met
  - Will be determined after BOM is finalized
- To begin build-test activities...
  - Finalize Schematics/Drawings
  - BOM
  - Order parts
  - Prototype
- EXPECT ALL OPEN DESIGN ITEMS TO BE DONE IN FIRST WEEK OF MSD2
Xylophone Kit
Risk Assessment

• Differences
  – Risks have evolved to focus more on the current base design
  – All risks are commented on and a mitigation is determined

• Key Risks
  – The size/weight is still a concern
  – Risks involving a noticeable difference in sound have been mitigated

• Risk assessment has been continually updated

• Customer Needs
  – Many needs are on track to being met; will be determined after kit design is finalized
  – Some needs won’t be met until MSD2
Xylophone Kit
Individual Project Status

• Personal responsibilities
  – Project organization (EDGE, templates, TO DO lists)
  – Base design testing
  – Compared to the original project plan, I am behind schedule

• MSD1 Project Plan
  – Plan was too ambitious; I’m behind on detailed drawings and schematics

• MSD2 Project Plan
  – Following the team MSD2 plan, with my own testing requirements
Xylophone Kit
Individual Project Status

• Plan for MSD2
  – Finish up all MSD1 action items
  – Follow project plan to complete all testing, building, and document writing

• Preliminary test plan is still in progress

• What I would have done differently
  – Checked the project plan more often so I would have realized when I got off track and could have worked harder to get back on schedule
  – Figure out a way to maximize the efficiency of the team’s time together ie, how to make sure we didn’t get off track