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**From:** Team E4

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**Memo 2: Choosing a Method**

The Pugh chart (fig.) compiled the group’s preliminary concepts together to get an initial estimate of which design accomplished the team’s goals the most effectively. The team chose the spring cannon to be the baseline because it was believed to be the most average out of all the available options. The criteria was selected from the requirement table and simplified into one word descriptions to best accommodate what the group’s overall desires were.

Cost was chosen due to the limited budget. The Points category was chosen because of the requirement of the machine to be able to score the most points. Simplicity was desired due to the lack of time and the danger of a complex design not functioning effectively. Capacity was needed to carry the most of the point scoring objects. Finally, Creativity was chosen due to the originality requirement found in the requirements table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Spring Cannon** | **Conveyor** | **Catapult** | **Helicopter** |
| **Cost** | 0.00 | 0.00 | 1.00 | -1.00 |
| **Points** | 0.00 | 1.00 | 0.00 | 0.00 |
| **Simplicity** | 0.00 | 1.00 | -1.00 | -1.00 |
| **Capacity** | 0.00 | 1.00 | 0.00 | 1.00 |
| **Creativity** | 0.00 | 1.00 | 1.00 | 1.00 |
| **Total** | 0.00 | 4.00 | 1.00 | 0.00 |

Figure - Pugh Chart

The group discussed and voted on the scores of each concept for each of the criteria. The totals lead us to believe that the conveyor design was the most feasible and interesting solution for the problem. The results of the process can be seen above (fig.). Since there was disagreement over whether or not this design would achieve the main goals of the group had to consider the Pugh chart an inadequate method of selecting the final design for two reasons. The first reason is that the criteria were not weighted based on each member’s perception of each requirement’s importance. The second reason the Pugh chart was not the best method to select the concept is because it made the assumption the Spring Cannon was the most average solution, which is incorrect. So the group decided a better method to select the design was the decision matrix.

The decision matrix (Fig.) accomplished the group’s desire to compare each concept because it was more precise than the Pugh chart in comparing the needs, requirements, and concepts. The group decided to add the additional criteria of safety and weight to the decision making process due the requirements of the lab and the ability to transport the device reliably.

After each group member took their stand on what the weight of each criterion needed to be, the group came to the conclusion that the group desired the maximum amount of points possible and that the number of objects the device could get in to the goal in the least amount of time was the groups primary objective. That is why capacity was such a major concern.

After each member discussed the rating of each concept for each criterion, the group used the total scores and found that the conveyor was still the best overall concept. The results of our process can be seen below (fig.).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Importance | | R.C. Helicopter | | Conveyor | | Spring Gun | | Catapult | |
|  | **Raw** | **Weighted** | **Raw** | **Weighted** | **Raw** | **Weighted** | **Raw** | **Weighted** | **Raw** | **Weighted** |
| **Max. value** | 5 | N/A | 5 | N/A | 5 | N/A | 5 | N/A | 5 | N/A |
| **Min. value** | 1 | N/A | 1 | N/A | 1 | N/A | 1 | N/A | 1 | N/A |
| **Safety** | 4 | 0.190 | 4 | 0.762 | 4 | 0.762 | 3 | 0.571 | 2 | 0.381 |
| **Weight** | 2 | 0.095 | 5 | 0.476 | 3 | 0.286 | 4 | 0.381 | 3 | 0.286 |
| **Cost** | 4 | 0.190 | 1 | 0.190 | 3 | 0.571 | 3 | 0.571 | 3 | 0.571 |
| **Simplicity** | 3 | 0.143 | 4 | 0.571 | 4 | 0.571 | 2 | 0.286 | 4 | 0.571 |
| **Capacity** | 5 | 0.238 | 2 | 0.476 | 5 | 1.190 | 2 | 0.476 | 2 | 0.476 |
| **Creativity** | 3 | 0.143 | 5 | 0.714 | 5 | 0.714 | 3 | 0.429 | 3 | 0.429 |
| **Totals** | 21 | 1.000 | 21 | 0.638 | 24 | 0.819 | 17 | 0.543 | 17 | 0.543 |

Figure - Decision Matrix

This method made it clear that the most effective concept was the Conveyor, so the group decided that due to the overwhelming amount of evidence in its favor that the Conveyor design would be the concept we used to solve the problem.