Estimation Model

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# Initial Estimation

## 24-Piece Puzzle

My initial estimation for the 24-piece puzzle is that it will take a single person about 5 minutes, two people about 2.5 minutes, and 4 people about 1.75 minutes. A 24-piece puzzle should be straightforward to put together, so it shouldn’t take any one person very long to accomplish it. Then when you add an additional person there is enough pieces that an additional person will help. But when you add two more additional people, I feel like there will be some diminishing returns.

## 100-Piece Puzzle

My initial estimation for the 100-piece puzzle is that it will take a single person about 20 minutes. There are 4 times (roughly) as many puzzle pieces, so it should take about 4 times as long. Then from there, it will continue to go down in time in the same fashion. With two people it will take 10 minutes, and with four people it will take about 6 minutes.

# Experimental Data

## Single Small

The single small puzzle was completed in **2:37.17**. The puzzle was fairly easy, and there were not any pieces missing.

## Single Large

The single large puzzle was a little more difficult due to the number of pieces, and the background color being similar, so a lot of the pieces looked similar and was completed in **18:14.46**.

## Two Small

With two people we were able to complete the smaller puzzle in about half the time, with a time of **01:01.46**. I did the puzzle with my wife, and we are a bit competitive with each other, so I feel like that increased our motivation to speedily finish the puzzle.

## Two Large

Two people also increased the speed at which we were able to finish the puzzle, with a time of just over half, at **09:36.01**.

# Create an Equation

## Variables

|  |  |  |
| --- | --- | --- |
| **Name** | **Description** | **Rational** |
| T | The time in seconds to complete the puzzle | This is the result of the equation. |
| p | Number of puzzle pieces | The number of pieces directly corresponds to the time it will take to complete a given puzzle |
| e | Number of people working on the puzzle | The amount of people working on the puzzle will reduce the number of pieces each person has to add to the puzzle, and allows for parts of the puzzle to be completed asynchronously. |
| M | Motivation of the team to complete the task. Ranges from 0-2 | This is very important when it comes to anything. If someone isn’t motivated, they will be easily distracted and take a long time. If they are motivated, then it will be easier for them to complete the task. |

## Equation

T = (((p\*(1+p/100))/e)\*6)\*m

# Verify the Equation

|  |  |  |  |
| --- | --- | --- | --- |
|  | Equation | Estimated Completion Time (s) | Actual Completion Time (s) |
| Single Sm | (24 \* 1.24) \* 6 \* 0.9 | 160.2 | 157 |
| Single Lg | (100 \* 2) \* 6 \* 0.9 | 1080 | 1094 |
| Two Sm | ((24 \* 1.24)/2) \* 6 \* 0.9 | 62.352 | 61 |
| Two Lg | ((100 \* 2)/2) \* 6 | 540 | 576 |

# Reflection

## Variable Comparison

I think the variables compared reasonably with the equations in the book. The pieces translate nicely into functions, the number of people is similar to number of developers, and the motivation factor wasn’t state 100% as clear, but it was more behind the scenes in several variables, such as person-months.

## Greatest Source of Difference

My biggest problem with the equation is that it seems the puzzle has exponential growth, and I wasn’t sure exactly how to do that. I also think with more data points it could have been a little clearer how the growth would happen in relation to the amount of pieces.

## A More Accurate Model

I would have a much larger test data set. I would want puzzles from 25-10,000 pieces completed in groups ranging from 1-10 people. Then I would want to plot that out, compare the graphs and build the equation based off that. I think it would more clearly show an exponential relationship between time and pieces.