Frederick Zuberer ([fzuberer@kent.edu](mailto:fzuberer@kent.edu))

Dan Maher ([dmaher2@kent.edu](mailto:dmaher2@kent.edu))

Anthony Telerico ([ateleric@kent.edu](mailto:ateleric@kent.edu))  
Winson Li ([wli21@kent.edu](mailto:wli21@kent.edu))

**Warhammer 40k Unit Efficiency Calculator**

**The Problem to Solve**

The problem we are attempting to solve relates to the mechanics of a table-top wargame known as *Warhammer 40,000* or simply *40k*. The game uses model soldiers, tanks, aircraft and terrain to construct the ‘battlefield’ in which players command their forces and seek victory. To facilitate gameplay the system is based on the use of six-sided dice which creates a game based upon random probability and statistical outcomes. Amongst the community for this game is a concept known as “Mathhammer” in which the players who have a knowledge of statistics calculate the various expected average outcomes of attacks made by one unit against another.

Our aim is to create a simple calculator that takes into account the units various stats, any bonuses or determinants and the enemies stats that can negate any damage done. The process for making these attacks is dependent on a pool of six-sided dice that are rolled to generate successful hits, then the number of successes is used to generate how many of those hits effectively wound the target and then finally those wounds are attempted to be resisted by the units saving stats.

With all the information input into the calculator by the user and the calculation run the output would be the statistical average damage dealt for that particular set of dice rolls. This information is valuable as playing the averages is how games of chance are won, and this being a diced based game at the end of the day is a game of chance.

As you can see the process is a simple series of dice rolls. However the best players know how to use their units well, and what their capabilities are. Many new players and even some veteran ones stumble with being able to truly understand a unit's effectiveness. To do so they need to know the statistical average damage output that can be expected from that unit on a variety of targets. This information can help them in many ways:

* Knowing the best role for their units.
* Understanding the threat posed by the opponents units to their own.
* Model kits are expensive for the game, knowing the capabilities of them before spending the money would be wise.
* Gaining a better understanding of the various effects of the bonuses and determinants placed on their own and foes units.

This calculator would be a simple tool able to be used by new and veteran players to better enjoy the hobby. We aim to include functionality that defines the key terms such as ‘Ballistic Skill’ and ‘Feel No Pain Save’ to help the new players grasp the concepts better as well. 40k is a fun hobby enjoyed worldwide, with a thriving community and even international tournament play. Our aim is to give that vast player base a tool that can improve on an already beloved game.

**Who would the customers be?**

The customers would be the 40k playerbase, who also would be the end users of this product. For a unifying name we can say “40k Playerbase''. The player base would want the calculator to be simple to use and account for all modifiers that can affect the dice rolled in the process of making an attack.

While the user base cannot be specifically determined due to the nature of its “table-top” format, a popular forum dedicated to the game called Dakka has over 100K registered users that actively play the game. YouTube is a popular site to find guides and dedicated Warhammer players with hundreds of thousands of subscribers and equally as many views.

We are working with Shieldwall Gaming Club to develop the application. The club has a large player base, active tournament leagues and weekly casual games of 40k. The club is a good representation of how many players participate in and play the game.

**Who are the end users?**

The “40k Player Base” would be the end users. The pool of end users is large, as this is a game enjoyed by players of every description except young children. The average player of the game is a man in their mid to late twenties, working an entry level job and simply looking to enjoy a bit of escapism in a game with friends or indulge a competitive itch. Most players use a phone based application to draft ‘lists’ or rosters of units made using the game's rules they know how to use, and often play with a smart phone at hand.

**Constraints imposed by consumers**

* Calculations need to be accurate (little to no margin of error to be accurate).
* Rule and stat changes impact the process of performing calculations so this needs to be accounted for.
* The calculator is VERY specific so even minute changes must be accounted for. Changes within the overall rule-book of Warhammer 40k impact the calculator as values and statistics might change.
* The calculator needs to be efficient/simple to allow for fast calculations in order to be usable in tournaments (time-limits exist).

**Assumptions/risks**

With a table-top game like Warhammer 40K and with the sheer amount of units that exist within the game currently, the calculator serves to simplify the calculations when dealing damage. Many assumptions must be made as inputting every unit into the calculator would cause the app size to be too large and slow for an app whose purpose is to be fast and efficient. It is assumed that a player owns the core rulebook and a separate rule book that includes the player’s faction and units within the faction. It is also assumed that the player isn’t following an older edition where there are differences in the rules and stats that the app will not be designed for. There is room for expansion to these older editions provided the initial calculator is received well and the request made for that expansion. Our calculator is also meant to be a tool and is not a dictionary for the game itself.

There are a few risks to consider but nothing of serious concern. While editions have changed, they do not change frequently enough that there could be an overlap with development. Updates to the game do release and will more than likely have little to no impact on this core algorithm to gameplay but that chance is always there.