Software Development - User Interface Design and Evaluation

B087965

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1 Introduction

This report represents the second of three related assignments which form the assessment for the Software Development module. The aim of this assignment is to design a prototype user interface to the Deck Building card game and to define an evaluation plan that might reasonably be used to evaluate that prototype.

2 Characteristics of a good user interface

A good user interface should make sensible options both obvious and simple to perform and should otherwise be unobtrusive. A user interface tends only to be noticed when it jars with what the user is trying to achieve. In the case of a card-based game such as this, where different options become available at different stages of the game and in response to the user's decisions, the interface should guide the player as to what actions are possible at any given time.

In addition, a good user interface should "feel natural". In the case of this interface, that will involve a skeuomorphic element with objects in the interface deliberately styled to look like real-world objects. The intention is to make the user forget that he/she is interacting with a computer and to encourage the feeling of being immersed in the game.

3 Flow of the game

The user initially is asked to decide the style of opponent against which the game will be played. Once that decision has been made, play continues on a "turn about" basis, with first the player and then the computer playing a turn.

The player is dealt a hand of 5 cards from their own deck. They must then select one or more cards to move to an Active area where the strength and monetary value of the individual cards are combined. They can then choose to use the monetary value to purchase additional cards from the central line of cards or from the supplemental stack and/or to use the strength of their active cards to attack their opponent. Purchased cards are moved to the player's discard pile. They can continue to move cards to the active area, purchase additional cards or attack their opponent until such time as they have played all the cards in their hand into the active area and used up the monetary or strength values accumulated. The strength and monetary value of each card can only be used once per turn - thus a hand with combined strength of 3 can only be used to reduce an opponents health score by 3 no matter how many times the 'Attack' option is selected.

The final option available to a player is to end their turn. Once they have done so, all cards in their hand and their active area are moved to their discard pile and their opponent takes a turn.

Once a player's deck has been exhausted, the cards in their discard pile are shuffled and moved across to act as the deck from which subsequent cards are drawn to make up the hand in play.

After each round of turns, the health status of each player is checked and if either or both has fallen to or below zero, the game is over.

4 Prototype user interface

The interface to be developed will take the form of a desktop graphical user interface to the game engine. Here follows a step-by-step walkthrough of a portion of an example game, with key design sketches to illustrate the intention - but not the fine detail - of the proposed interface.

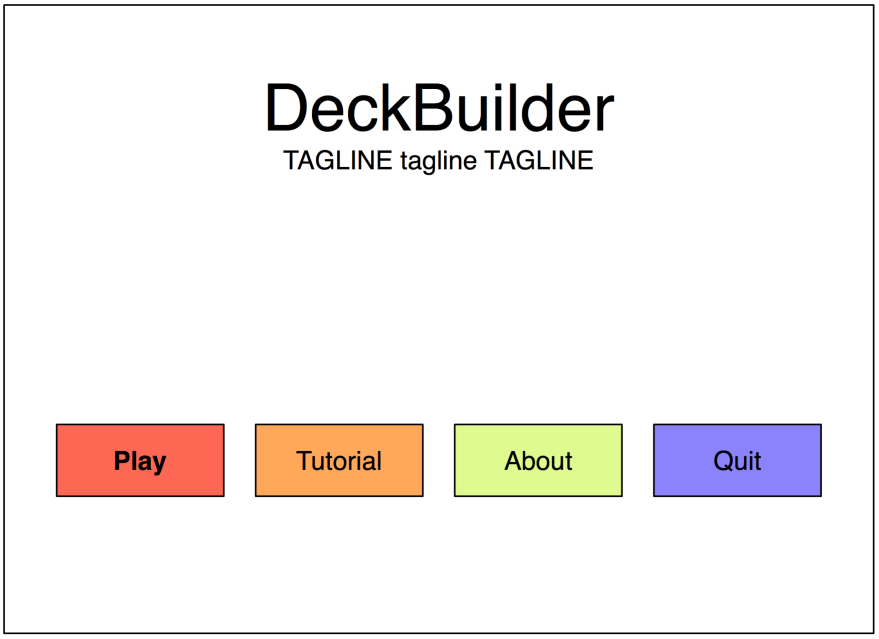

Figure 1: Game startup screen

4.1 General considerations

The interface has been designed to follow the majority of the standard design conventions expected of this kind of game. This game is an instance of a well known genre of games and the people likely to purchase or play the game will probably already be familiar with other instances. As such, they will have expectations about how interface elements will work so it is important not to break those standard conventions. Predictability is a good characteristic of an interface.

Cards and the playing surface or table are represented in skueomorphic form. The card display is described in more detail in later sections.

There is no visible menu bar by default and the game play area displays in "Full Screen" mode. A menu bar appropriate for the platform on which the game is being played appears when the user moves the cursor to the top of the screen. The menu bar typically contains a "File" menu with options to display an "About" dialog and to Quit and an Edit Menu with a full set of (inactive) editing menu item options.

4.2 Game start up

The game starts up with a branded splash screen. The background image is suitably "gothic" or "mediaeval" in keeping with the game's genre and the user's expectations. The splash screen contains four clickable buttons, placed sympathetically to the branding supplied in the background image. These buttons are titled 'Play', 'Tutorial', 'About/Credits' and 'Quit'. Clicking on the 'Quit' button exits the game. Clicking on the 'About/Credits' button causes a popup window to appear. This window contains details of the game's designers and other information as required. Clicking on the 'Tutorial' button walks the user through an example hand, introducing them to the general principles of the game play and the characteristics of the cards that form the decks in the game. Details of the Tutorial will not be discussed further in this report.

A cartoon depiction of the splash screen is shown in Figure 1

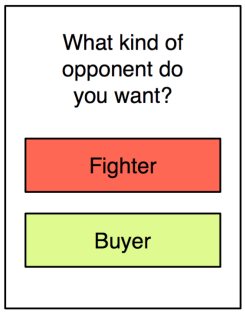

Figure 2: Dialog used to allow user to select their preferred opponent style

4.3 Opponent characteristics options

When the user clicks on the "Play" button, the first thing that is required is for them to choose the style of the opponent against which they wish to play. The choices in the original supplied code were defined as 'Aggressive' or 'Acquisitive'. These words are very similar in appearance and might lead to confusion. In addition, 'Acquisitive' is not a commonly used word. We therefore propose to use the words 'Fighter' and 'Buyer' to signify the two choices. We further propose that the buttons be illustrated with appropriately aggressive (Fighter) and passive (Buyer) iconography to emphasise the differences. The choices of opponent style are presented as buttons in a popup window in response to a click on the "Play" button on the game start up splash screen. A cartoon depiction of the opponent style choice dialog is shown in Figure 2.

4.4 Main game area

Having selected an opponent type, the player then moves on to the main game area. All game play is conducted in this screen, which is depicted in Figure 3.

The lower portion of the screen - shaded in a light beige colour and labelled in Figure 3 depicts the player's current Hand. During the player's turn, this is populated with 5 cards drawn from the player's deck. The player's deck is symbolised by the purple area at the left of the Hand area where an indication is provided of the number of cards remaining in the deck. On the other side of the Hand area (indicated in orange) is represented the player's Discard pile. Again, an indication of the number of cards in this pile is provided. These counter displays allow the player to keep track of when cards he/she holds may turn up again in an active hand.

Above the Hand area is the "Active" area (shaded in grey and labelled). This is the area into which players move cards from their Hand in order to use them to purchase additional cards or to attack their opponent. There are 5 'slots' into which cards can be placed. Between the Hand area and the Active area is a single button which can be used as a short cut to transfer all of the cards remaining in the player's Hand into the Active area. Each card has a monetary value - which can be used to purchase additional cards - and a strength value which can be used to reduce an opponent's health. These are summed across the cards in the active area to give a total value which can be used during the player's turn. The sums are displayed to the left of the Active area in two separate counters, one for money (coloured magenta in Figure 3) and one for strength (coloured cyan). The Active area also has a button which can be used to attack the computer opponent (i.e. use the combined strength value of the active cards to reduce the computer opponent's health and a second button to signify the end of the player's turn.

Above the Active area lies the "Centre Line" (shown in green and labelled) where cards are made available for purchase. These additional cards are drawn from a separate deck. Again, five cards are in this area at any one time. Each has a characteristic cost to buy. Also at this level is the "Supplemental" card region, shaded in lavender. Similar to the Centre line cards,

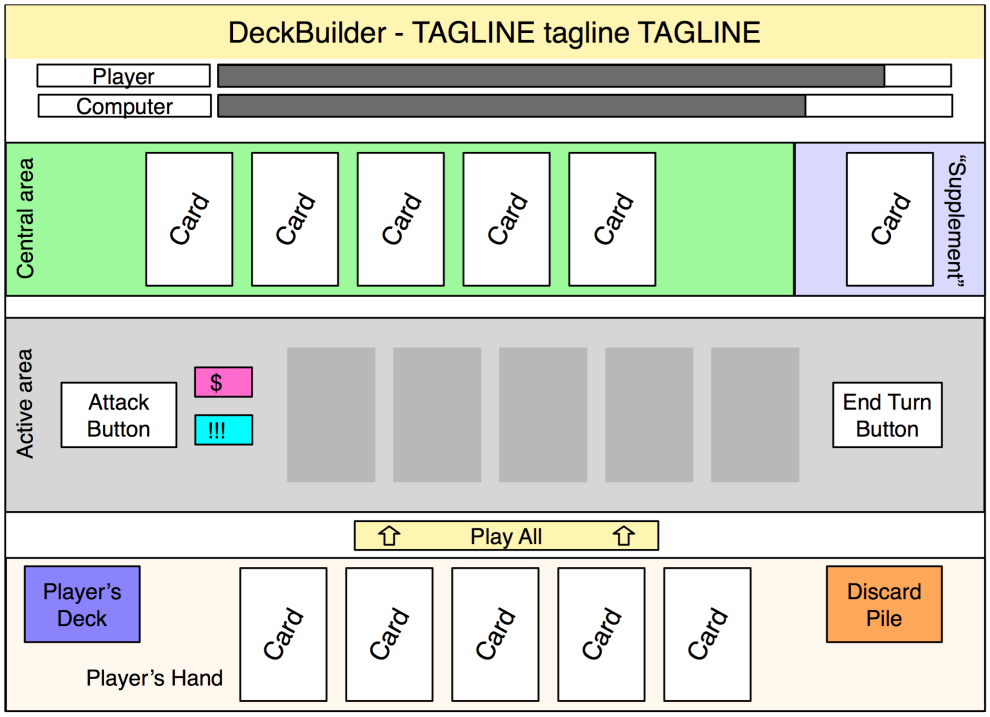

Figure 3: Main gameplay screen. See text for description.

this contains a single card drawn from another deck which can be purchased by a player subject to the total monetary value of his/her hand being sufficient to match the cost to buy of the current supplemental card.

Above the Active area, the relative health statuses of the player and the computer opponent are displayed in "bar-chart" form.

4.5 Card display

The key characteristics of the cards in play are their cost (to buy), their monetary value (i.e. the contribution they make to the purchasing power of a given active set of cards) and their fighting strength value. Their cost to buy is only pertinent when the card is in the Central area or on the Supplement area. The monetary value and strength value is important when in a Hand (so the player can decide which cards to activate in order to achieve a particular goal), when in the Active area (so the player has clear sight of what cards have contributed to the Active buying and attack value totals) and when in the Central and Supplemental areas (so the player can judge the relative long-term worth of the available cards in allowing them to pursue a particular strategy within the game). Cards are therefore depicted with their 'type' (Archer, Serf, Squire, etc.) shown in text form at the top with a graphical representation consistent with the overall "Gothic" look and feel of the application in the main body of the card. Their monetary and strength values are displayed at the bottom left and right of the card respectively. The meaning of each of the values is conveyed/reinforced in two ways, with a text label underneath and an illustrative icon behind the numerical display.

A mock-up of a card display is shown in Figure 4[1],[2]

[1]dollar by Lubo Volkov from the Noun Project
[2]Swords by Mateus Leal from the Noun Project

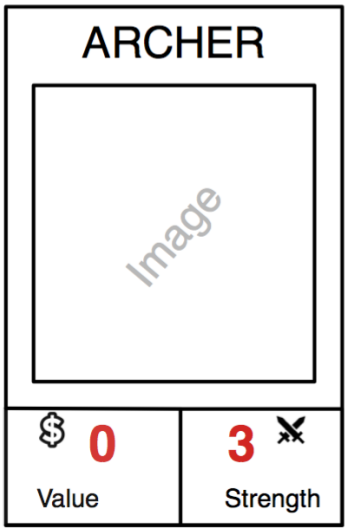

Figure 4: Mock up of the display for a typical card

4.6 Visual cues

The main game area is necessarily very 'busy' as there is a great deal of information to be presented and a limited amount of screen real-estate in which to do so. With the possible exception of the player's deck and Discard Pile which are purely cosmetic and provided for visual effect, nothing in the interface lends itself to being hidden or removed. Consequently, novice users may find themselves overwhelmed by the number of objects on the screen. It is therefore important that we provide subtle assistance by way of visual clues.

We propose to follow commonly-implemented visual conventions in doing so. Items that may be clicked on or selected will be drawn with a gently animated border to attract the user's attention. Items that are inaccessible at any point in the game will be displayed in 'greyed out' with additional cues provided where sensible. Cards available in the Central and Supplement areas will be displayed 'greyed out' and with a 'padlock' icon if the total funds represented in the Active area are insufficient to purchase the card in question. The Attack Button will be greyed out if the total strength represented by the cards in the Active area is zero.

In addition, 'tool tips' will be used to provide further information should it be required.

4.7 Walkthrough of a single turn

4.7.1 Initial state

Figure 5 shows the state of play at the beginning of an example game. Both player and Computer have full health as indicated by the meters at the top of the screen. The player has drawn two Squire cards and three Serf cards from their deck and these are displayed in the Hand area at the bottom of the screen. Five cards have been drawn from the Centre Line deck and these are shown in the Central area. They are an Assassin card, a Crossbowman, a Swordsman, a Catapault [sic] and a Merchant. There is a Levy card in the Supplement area.

There are no cards in the Active area. As a consequence, the available monetary value of the active cards is zero (shown in the magenta box in the Active area). Because of this, none of

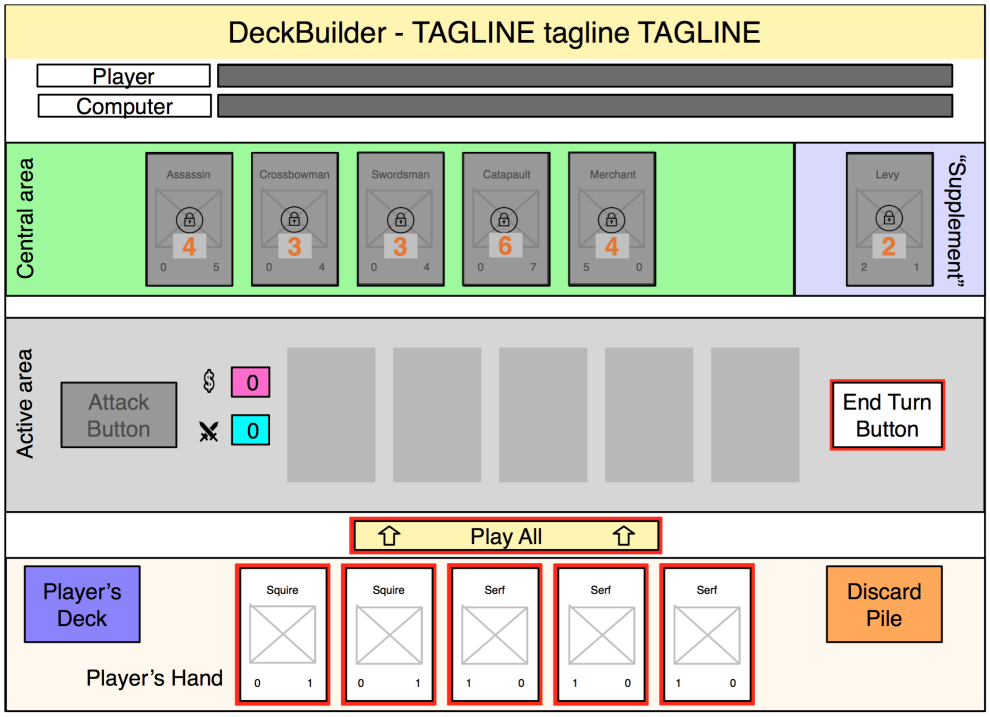

Figure 5: Representation of the screen display at the start of the player's first turn of the game

the cards in the Central and Supplemental areas are available for purchase so they are displayed 'greyed out' with a padlock icon. Each shows the cost to buy for that particular card underneath the padlock icon[3] (in orange in Figure 5). Hovering the cursor anywhere over greyed out card, the padlock icon or the orange cost-to-buy number causes a tool tip to appear which explains that the card is not available because the active hand has too little money available.

In addition, because there are no cards in the Active area, there is a zero total Attack Strength (shown in the cyan box in the Active area). As a result, the option to attack one's opponent is not available so the relevant button for this action is also greyed out. Hovering over the button results in a tool tip that explains that to the user.

Actions available to the user are to play an individual card from the Hand into the Active area, to play all the cards in the Hand into the Active area or to End the Turn. All of these items are highlighted by an animated 'halo' effect, represented in Figure 5 by the red border around the appropriate items. Again, hovering over the items explains that aspect of the game to the user.

4.7.2 User plays a Squire card

The player clicks on one of the Squire cards in their Hand (see Figure 6). That has the effect of moving the card to the Active area where its values contribute to the overall active totals. There is now an Attack Strength of 1 and a combined monetary value of 0. An attack is now possible so the Attack Button is no longer greyed out and has a halo indicating that this action is now available. The combined monetary value is not sufficient to purchase any of the available cards so all remain greyed out and locked in the Central and Supplement areas.

[3]Lock by Jonathan Gibson from the Noun Project

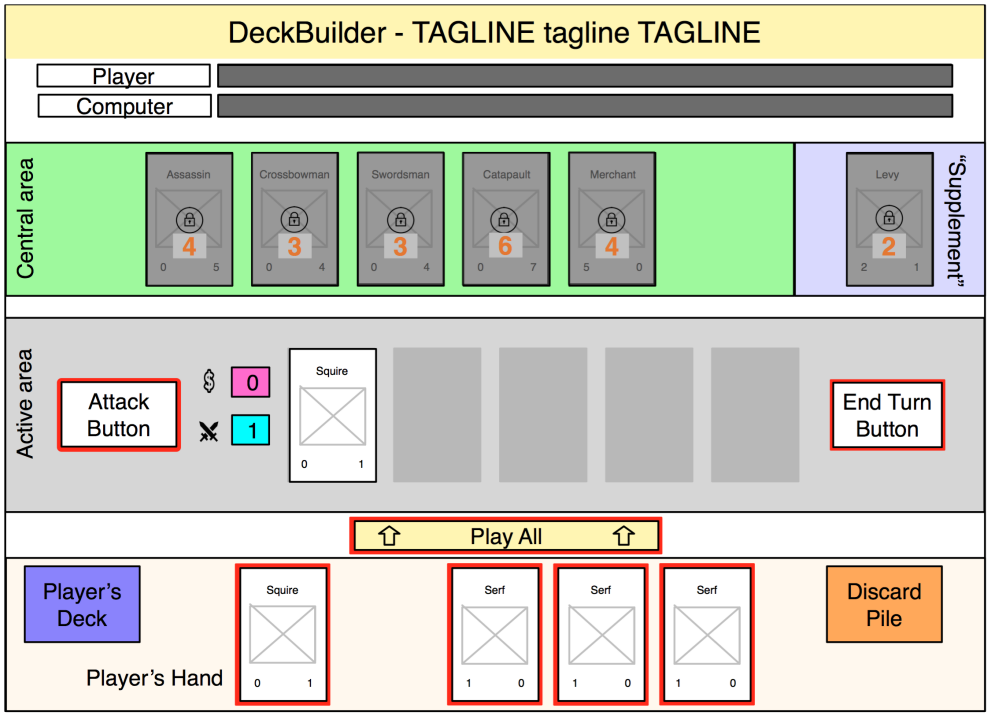

Figure 6: Representation of the screen display after playing a Squire card

4.7.3 Player clicks on the 'Play All' button

Having played a single card, the player now elects to play all their remaining cards into the Active area by clicking on the 'Play All' button (Figure 7). The cards move to the Active area where they contribute to the combined totals of monetary value and attack strength. here are now sufficient funds in the combined active monetary value to match the cost-to-buy price of two of the cards in the Central Area and the single card in the Supplement Area. The player hears the padlocks being unlocked and those cards are now displayed as available with a halo effect.

4.7.4 Player buys the Levy card from the Supplement area

The player now decides to buy the Levy card in the Supplement area by clicking on the card icon (see Figure 8). The card is moved to the player's Discard Pile and the combined monetary value total of the Active area is decreased by 2 (the cost to buy the Levy card). The card in the Supplement area is replaced by another card selected from the Supplement deck which is also a Levy card. There are now no longer sufficient funds available to buy any of the cards in the Central or Supplement areas so all those cards are displayed greyed-out and locked once again.

4.7.5 Player attacks their opponent

The player now takes the option to attack their opponent by clicking on the Attack Button (Figure 9). Their opponent's Health status - indicated by the size of the horizontal bar near the top of the playing area - is reduced by 2 units (the combined sum of the Attack Strength values of the cards in the Active area). Because the attack value has been used, the noted combined Attack Strength value is reduced to zero and no further attack is possible. The Attack Button is greyed out and the only option remaining to the player is to End their Turn.

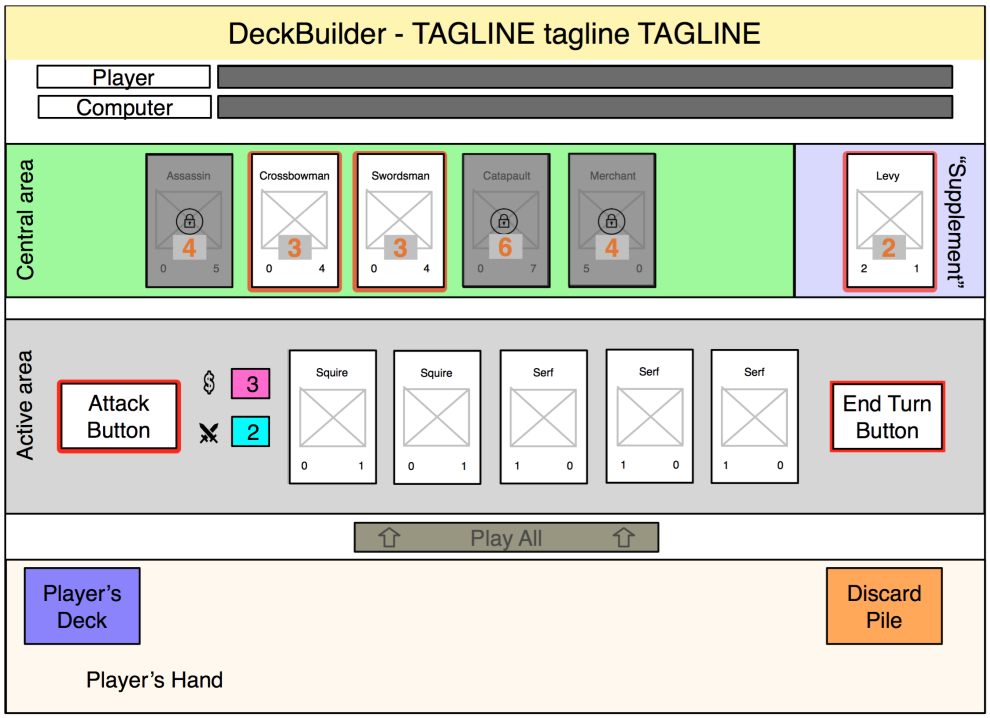

Figure 7: Representation of the screen display after playing all cards

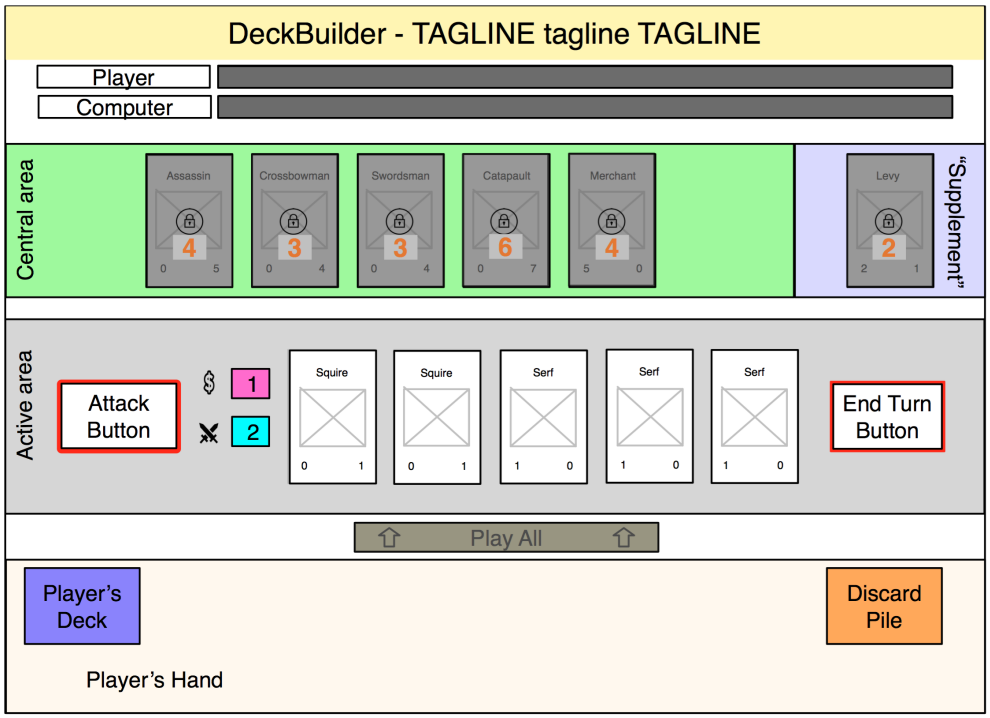

Figure 8: Representation of the screen display after buying the Levy card from the Supplement area. The combined monetary value of the cards in the Active area (magenta box) has been reduced by the cost of buying the card. No further purchases are possible because the player has insufficient funds.

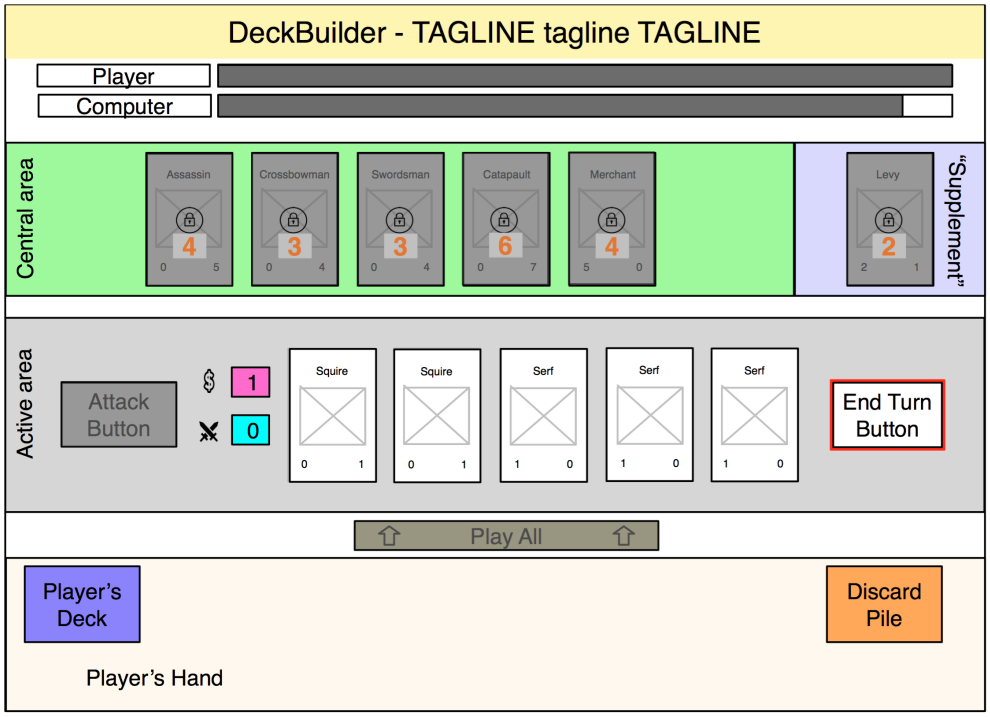

Figure 9: Representation of the screen display after clicking on the Attack Button. The combined Attack Strength total is reduced to zero and thus no further attack is possible. The only remaining possible action is 'End Turn'.

4.7.6 Player ends their turn

When the player ends their turn, their computer opponent plays. Obviously the computer is capable of completing a turn in a fraction of a second but we want to give the impression that there is a semi-human entity on the other side of the game. To do this, we must play the turn as if it were being played by a human. The computer's cards are therefore animated into the Active area as if being played by a human participant. The game engine controls the position of the cursor and simulates clicks on the active elements of the interface, buying cards, launching attacks and ending the turn in exactly the same way as a real player would do. Again, this is a deliberate design decision in an attempt to make the game more immersive and to make it feel more like a human vs human competition.

4.8 Diegetic sounds

Sounds can enhance the experience of playing a computer game, even a card game like this one. As the cards are extracted from the deck and laid in the Hand area, each is accompanied by a game sound reminiscent of a card being played firmly onto a table surface. Likewise, as cards are played into the active area, a similar sound is emitted from the game. As cards in the Central and Supplemental areas become affordable, the sound of a padlock being unlocked is heard. Buying a card from the Central or Supplement areas elicits a 'Whoop' sound in response and attacking one's opponent results in a distinctive 'Thwack!' sound. At the end of a turn, all cards in the Active and/or Hand areas are animated into the player's deck with multiple 'card playing' sounds overlapped. Finally, when a player's deck is exhausted and is recycled from the Discard pile, the associated sound is that of a pack of cards being ripple-shuffled.

5 Design Decisions

The following conscious design decisions have been taken:

No Menu bar - the game occupies the entire available screen
Rationale: The intent is to remove the user from the idea that they are using a computer and to encourage them to feel immersed in the gameplay. A menubar would contribute little to the playing of the game and so is safely considered to be a distraction.

Gothic look and feel to splash screen and cards
Rationale: To conform to the expectations of users of this type of game and to fit with the 'Swordsman' Mediaeval theme of the cards.

Choice of wording in the opponent style choice dialog
Rationale: The words "Aggressive" and "Acquisitive" are words with a similar appearance at first glance but which represent two diametrically opposed poles of game behaviour. Choosing different, more dissimilar words instead makes the interface clearer.

'Traditional' look of the playing surface
Rationale: players of this genre of game will probably have played multiple similar games in the past. Those games have standard conventions which it would be unwise to ignore or break. Familiarity and predictability are important considerations.

Display Hand, Active, Central and Supplement areas on the main screen
All the available (or potentially available) options need to be visible to a player in order to allow them to fully consider their strategy for this and subsequent turns. Although this makes for a crowded screen, gameplay would be detrimentally affected with alternative designs (e.g. a tabbed interface) requiring information to be swapped in and out of view.

Display monetary value and strength value on cards
Rationale: Players need to know what value a particular card provides in the game. Displaying it in clear form on each card puts that information 'front and centre'.

Display player and computer health in bar form
Rationale: The columnar display allows much quicker comparison of the health score between human and computer opponent than a digital numerical display.

Display the cost-to-buy on cards in the Centre Line and Supplement areas
Rationale: The user needs to know ahead of time what the costs of each card are so they can select cards to play to meet those requirements.

Highlight available buttons and items
Rationale: To help guide the user through a complex series of options by indicating which are active and available at any given time (affordance).

Emphasise unavailable state of buttons and items by dimming
Rationale: Again, to help guide the user through a complex series of options by indicating which actions and items are not available at any given time.

Indicate 'locked' state of cards for purchase with the padlock icon
Rationale: The padlock icon reinforces the visual clue provided by the 'greyed out' state of the card but implies that the card can be made available by unlocking. The tool tip and game instructions describe the reasons for the card being locked (an insufficiency of funds).

Sound effects

Rationale: To provide 'reward' and feedback for actions taken in the game. Secondly to provide extra, subtle hints that the user is playing a *card* game rather than interacting with a computer. The more feedback we provide, the more engaged the user will tend to be (up to a point).

Animation of the computer turn at human speed

Rationale: To make the game feel more like a human vs human competition and to provide a mental break between turns (and thus to make the game more enjoyable with an even-paced flow).

6 User Interface Evaluation Plan

There are multiple levels of interface evaluation. Here we will consider two levels which are potentially the most important.

6.0.1 Game Publisher Project Team

If we assume that the game is part of a commercial or publishable package - which we must if we are considering a wider review of usability of an interface - then the first key group that must review the interface will include project team members. Within the project team, there are two separate groups that will be invited to take part in the evaluation.

The first group represent the Branding and Marketing team. They need to assess and approve the overall 'look and feel' of the interface to ensure it is consistent with the brand identity and that it fits the design aesthetic which presumably makes up part of the project brief. The method of evaluation will include presentations and reviews of all graphical material included in the game with the output in the form of a series of recommendations for refinements of those elements to be actioned by the Design team.

The second group constitute a group of Testers, independent of the Development team. Their role is to attempt to break the interface by exploring all possible routes through the game interface in an attempt to identify logic or crashing bugs within the product. They will trial the interface on a variety of different hardware systems and their outputs will be recorded as items in the project's bug-tracking/issue-tracking system.

6.1 Usability Testing

Separate from artwork design critiques and bug-hunting is the issue of usability testing. Groups of testers recruited from a range of backgrounds and environment if possible should be asked to play the game for a controlled period of time and their experiences and interactions recorded and analysed. Much of this kind of testing requires the collection and analysis of qualitative rather than quantitative data which makes analysis harder than a 'time to complete task A' type analysis. However, with sufficient numbers of participants and with well-controlled experimental and questionnaire design, patterns can be extracted from the data and potential improvements in the interface design identified and implemented.

Testers should be asked a series of controlled questions before and after playing the game. For example, users may be asked how keen they are to play the game before they first interact with the system and how much they enjoyed playing the game after they have completed the testing. The first question provides a baseline against which to control the response to the second. Testers should also each be given a controlled scripted set of instructions and then should be allowed to play the game for a set period of time. Whilst playing the game, they should be observed and aspects of their apparent interaction with the system should be noted. Some groups of users may be asked to take part in 'think aloud' test sessions in which they play

the game whilst talking out loud about what they are thinking, looking for and finding in real time. Others may be asked to wear eye-tracking equipment to measure and monitor the areas within the interface to which their eyes are naturally drawn during the game flow.

In this case, we may also explore some of the design decisions more fully by using A/B testing. For example, we might ask a group of users to play the game twice - once with sound effects and once without with the order of those two alternatives assigned at random. Those users will be asked their preference for the two different versions. From this, a preferred option can be determined based on the proportions of responses favouring each of the alternatives.

7 Conclusions

There are many issues that need to be addressed in user interface design. In all instances, however, the aim of the design process must be to produce a system that makes using the system beneath the interface as simple as possible. Sensible options should be made obvious through affordance principles and there should be no hidden surprises.

Often many rounds of iteration between end user testers and developers are required before a suitable final interface can be arrived at. Throughout the process it is important for developers to remember that it is the user that is ultimately the arbiter of what constitutes a good - and bad - interface design.