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# User-Design for the U.S. Reinforcement of Ukraine

by

**Maitland Montgomery Thull**

An Honors Capstone  
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for the Honors Diploma  
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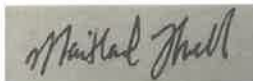
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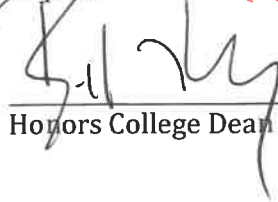
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## **Dedication**

This work is dedicated to my amazing family for all of their love and support.

## **Abstract**

Surrogate or proxy warfare is a subject of great debate among those in power in the United States. It has been implemented with varying degrees of success over the years. However, the current United States reinforcement of Ukraine in its conflict with Russia is the most striking iteration the international community has witnessed in decades. The United States government is pouring billions of dollars into the training, equipping, and arming of the Ukrainian military forces (Baldor and Corder).

Throughout the last several months, reports have come in from Ukraine about the struggles of using the highly technical and complicated United States defense technology with which they are being supplied (Gibbons-Neff and Yermak). Many of the fighting forces in Ukraine are citizens who rose to defend their country but do not have military training or education to help them operate these weapons safely and effectively (Gibbons-Neff and Yermak).

This report discusses the interdisciplinary applications of user-centered design to this complex issue. Focusing on the end user, the hastily enlisted Ukrainian soldier, and adapting the current defense technology to better fit the way it is being used in this conflict is the best way to bring about a quicker, cleaner, and more cost-effective end to Russia's war in Ukraine.

## Introduction

This project began after I took my first user-centered design (UX) course at UAH. As I made my way through the UX course series and became interested in the applications of the discipline, the 2022 Russian invasion of Ukraine began. Along with the rest of the world, I tried to keep up with the deluge of information about the war. I was reading more and more about reports coming in from the Ukrainian defense that detailed their struggles with using United States defense technologies. I decided it would be fascinating to research how user-centered design concepts could be applied to the design and deployment of defense technology, specifically that used for surrogate warfare in Ukraine, to make it easier for foreign civilian soldiers to use.

On February 24, 2022, Russia began its unprovoked assault on Ukraine (Zinets and Vasovic). Russian president Vladimir Putin intended to quickly overthrow the democratically elected government in place in Ukraine and replace it with a puppet government controlled by Russia (Kirby). Instead, the war has raged for over nine and a half months to date, with no signs of stopping (Keaten). The Ukrainians are putting up a staunch resistance and are backed by deep-pocketed Western allies, including the United States (Ryan and Timsit). Yet, the United States cannot allow its forces to engage with Russia directly, even though it has a

vested interest in Russia remaining within its current borders (Ryan and Timsit). Without antagonizing a nuclear power and risking a much larger and more deadly conflict, how can the United States best help Ukraine push Russia out?

So far, the United States has implemented surrogate warfare, also called proxy warfare, as its way of being involved in the conflict in Ukraine without sending its own troops over to fight (Wright). Surrogate warfare is how a nation supports another country or group in fighting a war without directly engaging in the war itself (Hoffman and Orner). By engaging tangentially through surrogate warfare, countries can accomplish their military and political goals without putting their own citizens at risk and facing their larger proxy opponents head-on (Hoffman and Orner). The United States Defense Secretary, Lloyd Austin, announced that the goal of United States support to the Ukrainians in the conflict with Russia was now to degrade Russia's military power to the degree that they would be unable to conduct operations against other nations again, a reorientation of policy that effectively demonstrates a strategy of surrogate warfare (Ryan and Timsit). Billions of dollars are being funneled into weapons and technology to assist the Ukrainian military, which primarily consists of civilian soldiers, in its fight (Wright).

Unfortunately, several key issues are preventing these costly weapons from being utilized most effectively. On-the-ground reports from



Ukrainian soldiers, civilian and otherwise, detail problems including missing pieces, different units of measurement, no included manual, and equipment intricacies (Gibbons-Neff and Yermak). With very little training on highly specialized and complicated weapons systems and no way to learn them quickly, the forces are reduced to trial and error to "figure out what combination of buttons do what" (Gibbons-Neff and Yermak). The many complications are reminders of what can happen when supplying a military with foreign material. Ukrainian Sergeant Pysanka describes the situation best, "It's like being given an iPhone 13 and only being able to make phone calls" (Gibbons-Neff and Yermak).

To convey the necessity of using user-centered design as a tool in this conflict and the theater of war in the future, I will first outline how surrogate warfare has evolved since its inception before then considering the implications of its presence in this conflict. Following the discussion chronicling surrogate warfare for the United States, I will discuss the role of the United States in the Russia-Ukraine war and the efficacy of defense equipment currently in Ukraine. Finally, I will discuss user-centered design as a discipline and address how it could be used to redesign and deploy weapons that are effective for those who operate them.

## **Chapter 1: What Is Surrogate Warfare and How Has Its Use Evolved?**

To fully understand the situation in Ukraine, one must understand the meaning of the term "surrogate warfare." The current tenuous international environment finds the United States increasingly involved in conflicts that apply to our national interests but, for one reason or another, pose an untenable theater. Surrogate armies are a means to extend our fighting ability and interests into dynamics that we would otherwise be reluctant to enter. In addition, military, diplomatic, or political issues and interests can complicate deciding the best action.

The use of proxies or surrogates in warfare has been a constant throughout history. However, as technology has developed, the nature of surrogate warfare has changed. Where once nations sent supplies and trained soldiers to support surrogate wars, now they send advanced weaponry and surveillance technology (Guyer).

In "Surrogate Warfare: The Transformation of War in the Twenty-First Century," a compelling case is made for the extent to which surrogacy is changing the nature of war and the seriousness with which the surrogacy relationship needs to be taken (Krieg and Rickli). The authors define surrogacy in warfare as the process by which the burdens of war are shifted from state and non-state actors to human (or technological) substitutes (Krieg and Rickli).

In contemporary warfare, surrogacy is increasingly taking on different forms, with the term broadening as warfare becomes more and more complicated (Krieg and Rickli). For various reasons, states find direct engagement in complex conflicts increasingly unpalatable and ineffective (Hoffman and Orner). These include insurgency, terrorism, state failure, criminality, and political or national risk. Moreover, while surrogates offer attractive options for engaging in necessary conflict, whether offensive or defensive, they come at considerable costs to their host country (Krieg and Rickli).

The state that funds the surrogate force usually allows the surrogate to pursue its agendas and priorities in a conflict (Thompson). Ideally, for the surrogate-host relationship to function best, the needs and goals of the two entities need to align and be constantly communicated throughout the endeavor (Thompson). This includes the resources, training, and weapons available from the host and the tactical information and burden of combat from the surrogate ground force (Thompson).

In the case of the war in Ukraine, the priorities of Ukraine and the United States align perfectly: depower Russia (Ryan and Timsit). The United States and Ukraine are also established allies, unlike in other surrogate initiatives the United States has been a part of. The United States Department of State "reaffirm(ed) its (the United States) unwavering support for Ukraine's sovereignty," and United States leaders now treat

Ukraine as a NATO ally in all but name (U.S. Department of State).

The tight relationship between the United States and Ukraine is a crucial part of changes to the design of these weapons being feasible. The flow of information and openness between the nations is key to implementing the changes successfully, as well as keeping the resources and technology of the United States secure and out of the reach of its adversaries. This surrogate war differs from those of the past, with their varied results, because of the validity of Ukraine as a unified nation with a common and powerful goal.

The actions the United States can take are loosely limited to those that will not outright engage Russian forces with its own. We do not want to risk the lives of American service members if it can be avoided at all. It is also important to note that this is not a shadow war. It is taking place on the global stage and is highly publicized, critiqued, and supported. The consequences of the relationship between the United States and Ukraine are more visible than in past surrogate and proxy efforts.

## **Chapter 2: The Role of the United States in the Russia-Ukraine War**

With the knowledge of what this type of conflict is and the implications and responsibilities for both parties, we can delve into the role of the United States in the Russia-Ukraine war to date.

The difficulty the United States faced when deciding what action to take toward Russia after its unprovoked invasion of Ukraine was immense. Russia is a nuclear power, and without direct confrontation, the United States was understandably hesitant to start an escalating conflict with it (Wright). Instead, the United States began supporting Ukraine in its defense against the Russian forces. The United States is funneling funding and weapons to the Ukrainian forces to bolster their chances against Russia.

The conflict officially became an example of surrogate warfare after United States Defense Secretary Lloyd Austin announced on April 25, 2022, that the goal of United States support to the Ukrainians in the conflict with Russia is to degrade Russia's military power to the degree that they will be unable to conduct operations against other nations again (Ryan and Timsit). This reorientation of policy means that the war's bounds and interests have far exceeded the defense of democratic Ukraine.

Other instances of this type of warfare in the history of conflicts that the United States has participated in are numerous. However, the U.S.

military involvement in Kosovo in the late 1990s is the instance that I will reference for the purposes of this work.

NATO went to war for the first time in its fifty-year history in 1999 in Kosovo (Engel and Zherka). Tensions between Kosovo's Albanian and Serb communities erupted into major violence in the form of the Kosovo War in 1998 (Engel and Zherka). Serbian persecution of Kosovo Albanians led to the Kosovo Liberation Army (KLA) formation. This Kosovo Albanian rebel group fought against the forces of the Federal Republic of Yugoslavia (the Serbian forces). The conflict only ended after the North Atlantic Treaty Organization (NATO) intervened and began airstrikes in March 1999. This intervention resulted in Yugoslav forces withdrawing from Kosovo (Engel and Zherka).

The United States launched Operation Allied Force against strategic positions in Serbia on March 24, 1999, as part of the NATO effort (Belgrade). The bombing effort conducted ultimately ended the ethnic cleansing by Serbian President Slobodan Milosevic in Kosovo. This air war was officially justified as an act of humanitarian intervention, ending the humanitarian crisis of the large outflow of Kosovar Albanian refugees because of that persecution. Minimizing harm to civilians was central to governmental and public consent for the bombing campaign. NATO forces bombed the country for 78 days with alliance aircraft.

Many Americans disagreed with the policy of American involvement

at the time. The Kosovo conflict involved the United States in an undeclared war against a nation that had not threatened the United States or one of its allies. Another main concern was the use of United States troops and the risk they were placed in without vital American interests at stake (Bandow).

With the conflict in Ukraine, the United States has been able to avoid several of these pitfalls that it experienced 20 years previously. No war has been officially declared by Vladimir Putin, the Russian president. The Russian military calls its invasion of Ukraine "a special military operation," but the international community has acknowledged it as an act of war (Kirby). However, unlike in Kosovo, the Russian nation has directly threatened the United States and its ally, Ukraine.

Prior to the Russia-Ukraine 2022 conflict and the United States involvement, the commander of the United States Northern Command, Air Force General Glen VanHerck, spoke at a Center for Strategic and International Studies forum in 2021. He declared that Russia, with its array of hard-to-detect cruise missiles and advanced submarines, posed the "primary threat to the American homeland today" (Mahshie). The escalation has been brewing slowly for years with persistent encroachment attempts on United States airspace and protected waters. Vladimir Putin officially threatened the West with his nuclear capabilities in an address on September 21, 2022, and added, "This is not a bluff" (Faulconbridge).

The other concern that the United States ran into during the Kosovo involvement was the use of American troops to conduct the operation (Engel and Zherka). In the war in Ukraine, American troops have remained outside of the equation entirely. They have helped to train and coordinate getting supplies to the Ukrainian forces, but their physical presence has remained outside the borders of Ukraine, out of Russia's reach. While this has been a prudent decision to avoid repeating the trials of the past, it does place even more weight on the importance of the United States' weapons correctly and effectively functioning as they are the only resource, besides intel and software, that the United States government can offer on-the-ground in Ukraine.



### **Chapter 3: Reporting on the Efficacy of United States Defense Equipment Currently in Use in Ukraine**

The situation in Ukraine is an evolving and active conflict, and, as such, any analysis of it requires accurate reporting and investigation from those journalists in the proximity of the fighting. From many reports coming out of Ukraine, I have selected those that directly reference reports taken on the ground and reporting that focuses on those fighting in the conflict. The end users are so crucial to the impact of the process of user-centered design on a problem, and it is crucial that they are who we focus on when gathering information about the conflict and discussing its issues.

Nearly all defense ministries thought a land war in Europe would never recur. Post-Soviet Europe shrank its arsenals, defense budgets, and armies to fit the new age. Since then, terrorism has become the more common military threat, requiring expeditionary forces instead of the heavy artillery and tanks that a land war would use. This means that the war in Ukraine is "chewing up the modest stockpiles of artillery, ammunition, and air defenses" that Europe has to offer (Erlanger and Jakes). This places even more importance on the United States' supply of artillery to Ukraine. Without it, they do not stand a chance.

A New York Times report detailing the arsenal issues plaguing Europe offers some sobering numbers. The Ukrainians fire, on average, 6,000 to 7,000 artillery rounds each day, as reported by a senior NATO

official in the summer of 2022 (Erlanger and Jakes). The Russian forces fire 40,000 to 50,000 rounds a day (Erlanger and Jakes). In comparison, the United States only produces 15,000 rounds each month (Erlanger and Jakes). Every round must count, every howitzer must be operational, and every Ukrainian soldier must be able to use what the United States and the European Union can supply.

Reports out of Ukraine in which Ukrainian fighters were interviewed focus on, or at the very least mention, the effectiveness of the weapons the United States has supplied. A report published by the New York Times in June of 2022 titled "Potent Weapons Reach Ukraine Faster Than the Know-How to Use Them" details the problems that soldiers face on the ground (Gibbons-Neff and Yermak). Soldiers have resorted to using Google Translate to decipher instructions for the sophisticated weapons rushed to them, including howitzers, anti-tank guns, and technology like laser-range finders (Gibbons-Neff and Yermak). The complicated manuals for the equipment are all in English and would still require some military training and explanation to understand, even if they were distributed in Ukrainian (Gibbons-Neff and Yermak).

In another part of the article, the culprit for problems is the imperial versus the metric system (Gibbons-Neff and Yermak). The metric system is used in Ukraine, but all of the measurements, parts and tools needed to maintain United States-supplied equipment are in the imperial

measurement system. As a result, Ukrainian soldiers risk damaging the expensive and long-awaited weapons to service them with metric wrenches (Gibbons-Neff and Yermak). Little oversights like this one add up and cost effort, valuable time, and resources to resolve.

Atop the need for tools of war, which Ukraine's leaders often pin their hopes on, the soldiers need to know how to use them. Suppose in-person training from United States forces familiar with the technologies is not an option, which is not for many of those fighting. In that case, the next best bet is designing intuitive weapons for the actual user (untrained Ukrainian, under duress) instead of the elusive ideal user (highly trained American, not under fire). Of course, formal courses would be the ideal solution, but implementing user-centered design to create tools for use in proxy war is an excellent start to solving this complex problem now and preventing it in the future (Rosenberg).

## **Chapter 4: How Concepts of User-Centered Design Can Apply to the Ongoing Crisis**

User-centered design (UCD) is an iterative system engineering design process that focuses heavily on the experience of the user with the end product. UCD has become increasingly important in the development of weapons for military use because, as technology has advanced, weapons have become more complicated (Rosenberg). The goal of UCD in supplying the military is to reduce the amount of training required to use complex and advanced weapons systems by making those systems intuitive and simple to operate (Rosenberg).

UCD applies a top-down approach that decomposes the overall system, user goals, and requirements into their various functions, subfunctions, and tasks (Riva). The task analysis phase is most important, with designers able to comprehensively understand the weapons operators, their work, and their decision-making processes (Riva). Designers use surveys with users and observation of their products in action to identify complications in using their products. This understanding translates into workflows, timelines, HCI design specifications, and prototypes (Riva). Ultimately, application of UCD principles can assist designers in creating elegant, intuitive systems which allow the end-users to have minimal cognitive load while operating those systems (Rosenberg).

Responsive and cyclical design is how technology continues to grow and evolve as its use does. Although the UCD process is extremely valuable, this approach has to be tempered with an engineering overview that accounts for the entire system and other facets that users may not consider. Because war is so complicated and many details pertinent to design are classified, some of these adaptations may not be possible or feasible. These are merely suggestions based on the application of limited concepts of UCD. The essence of User-Centered Design is not to force the human to adapt to the system but to design a system to fit and support the human (Martin). Currently, Ukrainian soldiers are forced to adapt to the existing design of complicated United States weapons that were designed for different kinds of conflict and for highly trained United States military personnel, which poses the complications discussed herein.

User-centered design is an iterative design process in which designers focus on the end users and their needs in each phase of the design process (Park, Kim and Ko). For this process, the best people to talk to would be those experienced with the situation on the ground in Ukraine. Of those, the selection should be civilians who volunteered or were conscripted without military training. This would ensure the most intuitive design possible. A purposive, random, small-sampled population would be the best fit for this work.

Designers use a mixture of investigative methods, i.e., surveys and

interviews, and generative ones, i.e., brainstorming, to understand user needs and create maximally useful products (Anderson). Since this conflict is so complicated and carries international implications for the United States, these interviews and working conversations may have to take place outside of Ukraine.

User design is already a part of the way many government defense contractors approach new military acquisition requests. A study published in the *International Journal of Human-Computer Interaction* presents the concept testing results of a low-fidelity user-centered design tool applied to the United States military acquisition request process (Martin). In the study, a random, small-sampled population of United States Marines used a user-design based worksheet to aid in their own design process as they prepared a mock acquisition request for equipment modifications (Martin).

The results of the study indicated that the Marines engaged in “robust discovery and design exploration” while using the design worksheet (Martin). This is proof that with the right tools and the right population sample, the pertinent design information regarding any needed modifications to weapons can be extracted from even the most military-minded service members. It stands to reason that the same user-centered design worksheet used in the study could be adapted for use in workshops with Ukrainian soldiers to determine exactly what modifications would most help them. We can speculate on what design improvements would

solve their problems on the ground, but the best information will inevitably come from their experiences using the technology in combat.

The systems and weapons that Ukraine already has on the ground could receive versions of the resulting adaptations, but the overall benefit would be seen in the versions of the weapons currently in production to head toward Ukraine. This application of the user-centered design process would be a great system to have in place for future use and could be applied every time weapons are sent to an ally or surrogate for use in a conflict. A quick brainstorming and worksheet session with the actual operators of the equipment would catch so many problems. Things like language translation and the wrong gauge wrenches would be addressed with the appropriate adjustment as part of a planned process required before every deployment of equipment to anyone other than United States forces.

For an investment of the magnitude seen in the reinforcement of Ukraine, the United States has a duty to its taxpayers and to the Ukrainians risking their lives to make sure those billions of dollars are being used to the fullest extent possible to support the war effort. If that means a manual translated to Ukrainian or the thoughtful inclusion of the correctly sized wrench or the accompanying tripod for a viewfinder, so be it. That extra oversight and planning at the beginning of involvement would pay dividends over the course of the war, saving money and human life

and helping to bring the war to a quicker and cleaner end.

User centered design is a part of the defense industry's current approach, but the application of the design process as a response to address a specific situation or conflict appears to be a newfound use (Rosenberg). Using design as a tool to respond and adapt to a crisis or unexpected situation will be crucial to military success in conflicts now and in the future.



## Conclusion

The war in Ukraine is a terrible reality, and the United States' support of it is necessary to defend Ukraine and to prevent Russia from causing future damage to Europe or the United States. Each hour, dollar, and life invested in the outcome of the war should be best used. The process of user-centered design, iterations of study and design with the end user at the forefront, is a necessary component of addressing this need. Both in the design of the weapons themselves, as well as in the planning and coordination efforts at the beginning of U.S. involvement.

The problem addressed is a complex one, with an even more complicated array of possible solutions. Implementing expedited fixes, like translated and simplified manuals that use the Ukrainian language and the metric system and progressing to redesigned future iterations of the technology could create a path towards faster understanding for use in this and future conflicts: foreign, proxy, or otherwise. Better and more effective use will lead to a faster and less destructive end to the war, for everyone involved.

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