

PROJECT: MARKETPLACE

Version 1.3



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Preface

Special Circumstances

Marketplace is an Android app that allows Army personnel to manage applications on their device. Both landscape and portrait modes are to be supported. Marketplace will accompany deployed ground troops in harsh, diverse field conditions. Therefore, a number of topics require investigation to realistically anticipate use cases.

Among them are:

- Army military occupation codes (MOSs) and ranks
- Army squad organization, weight burden and power requirements
- electromagnetic spectra, optronic sensors and human vision
- color choice best practices vis-à-vis ambient light levels
- touchscreens and touch
- physiology, cognition and disabilities affecting mobile device use

Competitive Analysis

Reviewed the following digital stores for “competitive analysis”:

- Amazon Appstore
- Oculus store
- Google Play Store

User Needs

User Needs		See User Requirements for more.					
ID	Priority	As a user with _____ permission(s),	I want to...	so that...	Source	Notes	
UN-0100	M	DO	find and launch the app	I can access Marketplace.	GEN James C. McConville	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0200	S	DO	trust in Marketplace's robustness and interoperability	I can rely on it to work under even the harshest, most diverse environmental conditions and be compatible with existing or emerging imaging systems.	COL Angelica Martinez	This is in part a hardware/OS consideration. Needs to work with optical systems and both active and passive infrared equipment. Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0201	C	DO	change the screen orientation	I can select portrait (vertical) or landscape (horizontal).	GEN James C. McConville	This is in part a hardware/OS consideration. Inherits admin settings for individuals or groups.	
UN-0300	S	DO	use one or both hands equally well	I can hold and operate with a thumb, for instance, if I'm encumbered, wounded, etc.	MAJ Stein E. Larsgaard		
UN-0301	S	DO	be barehanded or wear MIL-SPEC gloves	I can interact with the system, regardless of capacitance or the glove type, size or material.	GEN James C. McConville	This is in part a hardware/OS consideration. Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0400	M	DO	switch themes/modes	I can compensate for changing environmental conditions.	COL Chris Kirkpatrick		
UN-0401	W	DO	set automatic switching of themes/modes	I can avoid doing it manually or forgetting to do so.	CPT Cameron C. Taylor	This is in part a hardware/OS consideration. Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0500	M	DO	quickly accomplish tasks	I can maintain situational awareness and stay on task, instead of getting distracted by the app.	GEN James C. McConville		
UN-0600	M	DO	manage account details	I can configure and save things like my password and user profile.	LTC Douglas A. Yates	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0601	M	DO	manage settings and preferences	I can configure and save things like auto-update, themes and notifications.	GEN James C. McConville	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0700	M	DO	search for uninstalled apps	I can find and browse apps in the store library.	SGT Dane W. Henry	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0701	S	DO	filter and sort uninstalled apps	I can narrow search results in the store library.	MAJ Stein E. Larsgaard		
UN-0702	S	DO	read an uninstalled app's details	I can research apps in the store library via text, reviews and multimedia.	SGT Logan K. Jackson		
UN-0703	M	DO	install an app	I can use apps from the store library.	COL Angelica Martinez	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0704	S	DO	choose a view for uninstalled apps	I can choose list or grid display of the store library.	COL Angelica Martinez		
UN-0705	C	DO	(un)favorite or (un)bookmark an uninstalled app	I can jump to a particular app or set of apps in the store library.	COL Angelica Martinez		
UN-0706	C	DO	(un)lock an uninstalled app	I can permit or disallow installation, accidental or otherwise, from the store library.	GEN James C. McConville	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0707	C	DO	perform bulk actions on uninstalled apps	I can manage multiple apps simultaneously in the store library.	COL Chris Kirkpatrick		
UN-0800	M	DO	search installed apps	I can find and browse apps in my library.	SGT Mariela Soriano		
UN-0801	S	DO	filter and sort installed apps	I can narrow search results in my library.	GEN James C. McConville		
UN-0802	S	DO	read an installed app's details	I can research apps in my library via text, reviews and multimedia.	LTC Douglas A. Yates		
UN-0803	M	DO	(un)install an app	I can remove apps from my library.	GEN James C. McConville	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0804	C	DO	choose a view for installed apps	I can view apps in a list or grid from my library.	MAJ Stein E. Larsgaard		
UN-0805	S	DO	(un)favorite or (un)bookmark an installed app	I can jump to a particular app or set of apps in my library.	CPT Cameron C. Taylor		
UN-0806	C	DO	(un)lock an installed app	I can permit or disallow uninstallation, accidental or otherwise, from my library.	CPT Cameron C. Taylor	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0807	S	DO	update an installed app	I can ensure the apps in my library have the latest features and improvements.	GEN James C. McConville	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UN-0808	C	DO	perform bulk actions on installed apps	I can manage multiple apps simultaneously in my library.	GEN James C. McConville		
UN-0900	S	DO	access app help	I can consult training materials about store apps.	SGT Tiffani F. Edwards		
UN-0901	S	DO	access Marketplace help	I can consult training materials about the Marketplace app itself.	LTC Douglas A. Yates		

User Requirements

User Req. <small>See Questions for more.</small>							
Req. ID	Priority	User Requirement Name	Description	Justification &/or Comment	User Need Ref.	Notes	
UR-0100	M	Marketplace Icon	Launch app from the Android home screen with a custom icon.	Easy to find. Distinctive visual design.	UN-0100	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0200	S	Field-Testing	Optimize app for field use, meaning built for harsh lighting, sound and vibration.	This is battlefield tech. It must be simple, flexible and reliable. Field-test extensively.	UN-0200	This is in part a hardware/OS consideration. Needs to work with optical systems and both active and passive infrared equipment. Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0201	C	Orientation Swap	Support both portrait and landscape modes.	Different devices and conditions demand adaptability.	UN-0201	This is in part a hardware/OS consideration. Inherits admin settings for individuals or groups.	
UR-0300	S	Thumb Operation	Prioritize (right) hand/thumb-only as predominant operation.	This also implies mostly portrait mode. More research required.	UN-0300		
UR-0301	S	Hand and Glove	Ensure that app supports barehanded or various MIL-SPEC glove use.	Resistance, not capacitive touch, means peripheral placement of large touch targets.	UN-0301	This is in part a hardware/OS consideration. Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0400	M	Modes/Themes	Provide different viewing themes/modes for changing conditions.	Direct sunlight or pitch blackness affect the UX differently.	UN-0400		
UR-0401	W	Auto-Switch Mode	Allow modes/themes to switch automatically.	Reduces cognitive overhead. "Set and forget."	UN-0401	This is in part a hardware/OS consideration. Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0500	M	Shallow Navigation	Race through the UI. No drilling endlessly down menus or complex controls.	No frills UI is all about function, automation and speed.	UN-0500		
UR-0600	M	Account	Set up and manages user account info and login details	Provides ability for guest login, maybe?	UN-0600	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0601	M	Settings	Manage settings for customized user experience.	Controls aspects of communications, automations, updates, etc.	UN-0601	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0700	M	Store Search	Search and browse apps in the store library.	Support for categories and metatags might be useful, too.	UN-0700	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0701	S	Store Filter/Sort	Filter and sort apps in the store library.	Makes finding a particular app much simpler and faster. Ascending and descending by name, category, rating, release date, favorites, update availability, etc.	UN-0701		
UR-0702	S	Store App Summary	Read a store app's details.	Includes description, screenshots, videos and ratings. User can make an informed decision with ample, but brief, app summary and features list.	UN-0702		
UR-0703	M	Store App Install	Install apps from the store library.	This is literally the whole point of the Marketplace.	UN-0703	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0704	S	Store Grid/List Toggle	View apps in a list or grid from the store library.	Makes it much easier to to declutter the interface to scan through a group of apps.	UN-0704		
UR-0705	C	Store Favorites	(Un)favorite or (un)bookmark apps in the store library.	Save a handy link preferred apps, for example, owned, but not yet installed ones.	UN-0705		
UR-0706	C	Store Lock	Lock or protect apps in the store library.	Prevents accidental uninstallation or unwanted changes to settings.	UN-0706	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0707	C	Store Bulk Actions	Perform bulk actions on apps in personal library.	(Un)install, (un)lock, (un)favorite and update multiple apps at a time.	UN-0707		
UR-0800	M	Personal Search	Search and browse apps in personal library.	Support for categories and metatags might be useful, too.	UN-0800		
UR-0801	S	Personal Filter/Sort	Filter and sort apps in personal library.	Makes finding a particular app much simpler and faster. Ascending and descending by name, category, rating, release date, favorites, update availability, etc.	UN-0801		
UR-0802	S	Personal App Summary	Read a personal app's details.	Includes description, screenshots, videos and ratings. User can make an informed decision with ample, but brief, app summary and features list.	UN-0802		
UR-0803	M	Personal App Uninstall	Uninstall apps from personal library.	Self-evident	UN-0803	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0804	C	Personal Grid/List Toggle	View apps in a list or grid from personal library.	Makes it much easier to to declutter the interface to scan through a group of apps.	UN-0804		
UR-0805	S	Personal Favorites	(Un)favorite or (un)bookmark apps in personal library.	Save a handy link preferred apps, for example, owned, but not yet installed ones.	UN-0805		
UR-0806	C	Personal Lock	Lock or protect apps personal library.	Prevents accidental uninstallation or unwanted changes to settings.	UN-0806	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0807	S	Personal Update	Update apps in personal library.	Updates are vital to stability, security, performance, functionality.	UN-0807	Inherits admin settings for individual or group clearance. Content and settings can be predetermined based on rank, role, MOS, deployment status, command, unit, geolocation, date/time, mission, etc.	
UR-0808	C	Personal Bulk Actions	Perform bulk actions on apps in personal library.	(Un)install, (un)lock, (un)favorite and update multiple apps at a time.	UN-0808		
UR-0900	S	Store Training	Learn by accessing training materials about store apps.	Self-help documentation, manuals, instructions, videos, etc. on the apps in the store.	UN-0900		
UR-0901	S	Marketplace App Training	Learn by accessing training materials about the Marketplace app.	Self-help documentation, manuals, instructions, videos, etc. on the Marketplace app itself.	UN-0901		

Questions

ID	Question
QA-0100	Are there colorblind personnel in any MOS that would be using Marketplace?
QA-0101	With severe refractive errors in vision?
QA-0102	With dyslexia or learning disabilities?
QA-0103	With missing digits?
QA-0104	With ESL deficiencies?
QA-0200	What are the implications of using various wearable IR gear while using Marketplace?
QA-0201	What are the implications of using gloves of various types and materials? "Fat finger"?
QA-0300	What if WiFi is interrupted?
QA-0301	What are the specs of the hardware being used?
QA-0302	Is the touchscreen resistive or capacitive?
QA-0303	What version of Android?
QA-0400	What are the different effects of obscurants, such as mud and dirt?
QA-0401	Blood, oil and other fluids?
QA-0402	Humidity and condensation?
QA-0403	Smoke, fog and dust?
QA-0404	What are the effects of movement and vibration?
QA-0500	How do the different feedback modalities affect or are affected by the tactical situation?

Considerations

Myriad factors affect the quality of human-computer interaction. In the field, environmental (terrain, weather, ambient light and noise) and tactical considerations (stealth, mobility, speed, range, endurance and detection) compound design challenges.

The Institute for Defense Analyses has described the dismounted soldier as “the most disadvantaged person on the battlefield” when it comes to carrying equipment with associated power sources. See Tables 4 and 5.

Unsupplied for upwards of 72 hours and carrying in excess of 120 pounds (54 kilograms), a device and its batteries must truly enhance warfighting capability to justify its weight burden.¹ The U.S. Army, due to its size and composition, is the most impacted by this reality, with costs and injuries on the rise, while combat effectiveness diminishes and the supply chain struggles.²

Light and Color

The information below barely scratches the surface of a proper investigation into how color, contrast, ambient light and human physiological properties influence an interface’s design, including layout, component sizes and color/hue.³

Note that optimal color for human perception tops out at wavelengths of 550 to 555 nanometers,⁴ which is in the green-yellow part of the light spectrum.⁵ See Graph 1.

Direct or Bright Ambient Light

- with normal light, the eye’s *photopic response* leans yellow via cone photoreceptors⁶
- light, high-contrast “positive” scheme is recommended
- black or dark green text on yellow or white background
- best for reading scenarios (blocks of text)⁷
- 26 percent higher overall readability⁸
- decreases daytime eye strain
- this is why many first responder vehicles and vests or uniform components are yellow

¹ [IDTechEx: The intelligent soldier system - military wearables](#)

² [Institute for Defense Analyses: An Assessment of the Challenges Associated with Battlefield Power](#)

³ [UX Matters: Applying Color Theory to Digital Displays](#)

⁴ [Olympus Life Science Solutions: Human Vision and Color Perception](#)

⁵ [Eastern Illinois University: Color and Wavelength](#)

⁶ [NDT Resource Center: The Human Eye's Response to Light](#)

⁷ [UX Movement: When to Use White Text on a Dark Background](#)

⁸ [Tatham Oddie Blog: Why light text on dark background is a bad idea](#)

Dim or No Ambient Light

- with low light, the eye's *scotopic response* leans green via rod photoreceptors⁹
- dark, high-contrast "negative" scheme is recommended
- yellow or white text on a dark green background, but **not** blue¹⁰ or black¹¹
- best for scanning scenarios (short lines of text)¹²
- 26 percent lower overall readability¹³
- night-time tactical advantage
- decreases nighttime eye strain
- susceptible to flares and flashes
- "dark mode" may increase battery life,¹⁴ which has implications for individual battlefield power (IBP)¹⁵ and weight
- this is why the images in night-vision equipment are intentionally green¹⁶
- compatibility issues with wearable EM sensors and targeting gear?¹⁷

Physiological and Cognitive Issues

- **WCAG recommendations** – do not rely solely on them!¹⁸
- **hyperopia (farsightedness)** affects about 60 percent of the general population,¹⁹ but only 2.2 percent of young military personnel, so focus is not a problem
- **astigmatism** affects roughly half the general population, but only 6.6 percent of young military personnel,²⁰ so "fuzziness" – called *halation*²¹ – is not a problem. See Table 2.
- **colorblindness** and other visual impairments are a factor.
- **dyslexia** – peach, orange and yellow backgrounds aid reading comprehension and speed²² when this and similar disorders are present²³

⁹ [NDT Resource Center: The Human Eye's Response to Light](#)

¹⁰ [UX Stack Exchange: What Is a Good Color Combination, Visibility for Outside Use?](#)

¹¹ [UX Movement: Why You Should Never Use Pure Black for Text or Backgrounds](#)

¹² [UX Movement: When to Use White Text on a Dark Background](#)

¹³ [Tatham Oddie Blog: Why light text on dark background is a bad idea](#)

¹⁴ [Stack Overflow: What Color Scheme Is Best for Sunlight Readability?](#)

¹⁵ [Institute for Defense Analyses: An Assessment of the Challenges Associated with Battlefield Power](#)

¹⁶ [Explain That Stuff: Night Vision](#)

¹⁷ [Army Times: How the Army uses tech to balance awareness with battlefield distractions](#)

¹⁸ [UX Movement: The Myths of Color Contrast Accessibility](#)

¹⁹ [VSP: What is Nearsightedness and Farsightedness?](#)

²⁰ [MHS: Incidence and Prevalence of Selected Refractive Errors, Active Component, U.S. Armed Forces, 2001–2018](#)

²¹ [Tatham Oddie Blog: Why light text on dark background is a bad idea](#)

²² [Carnegie Mellon University: Good Background Colors for Readers: A Study of People with and without Dyslexia](#)

²³ [British Dyslexia Association: Creating a Dyslexia Friendly Workplace](#)

Fingers and Touchscreens

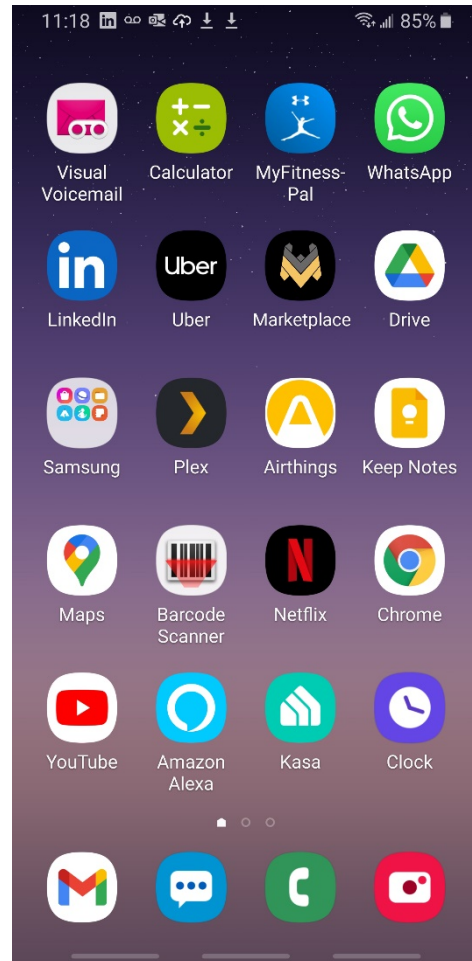
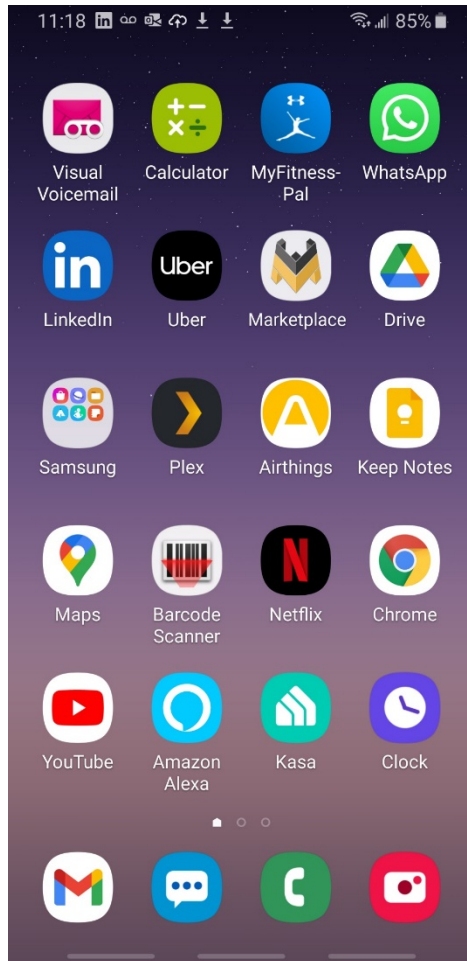
- **gloves** complicate everything in this list, including fingers' tendency to obscure the UI!
- **finger size** – forget the 44px rule – touch targets must be at least 0.4 in x 0.4 in (1 cm x 1 cm), because the average fingertip is about 0.7 in (1.8 cm) wide, while the impact area of the thumb is 1 in (2.5 cm) wide²⁴ See Table 1 for recommendations, including spacing.
- **finger geometry** – the disparity between the intended and actual touch point – called the *contact patch* – and the device's centroid determination can affect accuracy in a phenomenon called *circular error probable*²⁵
- **trembling** – whether from exertion, fear, shock or vibration, shaking affects accuracy

²⁴ [Nielsen Norman Group: Touch Targets on Touchscreens](#)

²⁵ [UX Matters: Common Misconceptions About Touch](#)

Android Home Screen

To launch the Marketplace app, the adaptive icons could look like this:



User Flow

The next sequence demonstrates how a Marketplace user would **change a single notification type** in Settings with a “Yes” confirmation to the optional dialog.

Perhaps admins could schedule, set and manage notification policies for user groups and individuals, effectively granting or denying permissions to do things like toggling all selections simultaneously, customizing themes/modes, or configuring automated functions.

Content, preferences and settings could be locked or hidden according to various criteria, such as:

- security clearance
- rank or MOS
- unit
- geolocation
- mission

Note that detailed annotations will be provided in the next version of this document.



Logo Design

Caveats

It took about **day** and **dozens of iterations**, starting with pen and paper sketches, to complete the design. It is not pixel-perfect, but it was **conceived and built from scratch**. The quality and format would be more polished in real life, maybe with the addition of a glyph for a custom font pack.

Formats



MARKETPLACE

The “default” image shown here is an **SVG** cleaned up and “vectorized” in Illustrator. It is a svelte 57.6 KB in size. The other examples in this document are **PNG** raster images exported from a layered Photoshop **PSD** file.

The asymmetrical “shading” simulates a **3-D object** with a light source situated low at the eight o’clock position, or at about **230 degrees**.²⁶ My OCD-like tendencies usually favor symmetry, but this turned out to be the better aesthetic choice, in my opinion.

Font

The family is **Montserrat** and is of **Regular** weight. Note that the “Marketplace” text is omitted when the Android operating system provides an app label, so the icon is bare in that particular case.

Color

The SVG uses an 8-bit alpha channel and contains only **four colors**: two shades of gray (the lighter is **#6a6969**, while the darker is **#383838**) and two shades of yellow (the lighter is **#f4c365**, while the darker is **#d9a43d**).

It works in **grayscale**, and to a lesser extent in monochrome, too, but color makes it really pop off the screen/page.

I considered **red, white and blue** components, but the overt patriotism came across as forced and fake. The classic **Olive Drab (OD/OG) Green** was just too *obvious*. It was similarly dissatisfied, so I rejected it as facile and unsophisticated.

²⁶ I wondered if the number 230 had any significance at all. The answer is “not really,” even if it is essentially the Celsius melting point for tin. Go figure.

However, **yellow** is precisely in the **sweet spot for human vision**. I have a hunch that research would confirm that the majority of Marketplace usage would occur under typical natural or artificial lighting.

I am aware that there is a *potential* conflict with yellow as a cue in system messaging (such as an alert condition), but mobile icons tend to appear mostly on the application loading or Android home screen, so this may be overstated as a problem outside of the desktop context.

Shape

The chevron is a subliminal nod to the **military**. OK, maybe it's not *that* subtle, but I think it works. A G.I. will certainly make the connection immediately, because army enlisted stripes are yellow, even if they are inverted (tip up) from this orientation.

Additionally, it can be said to resemble the head of a downward-facing arrow, which pretty universally symbolizes **downloadable content** – the very definition of a digital store! In conjunction with the lower “legs,” the chevron forms the letter **M**.

Taken as a whole, the icon's shape intentionally looks like **medieval battlements** (the corner of a castle wall) or perhaps a **guard tower**. It is, admittedly, abstract and stylized, but it is meant to convey a sense of solidity, security, safety and robustness.

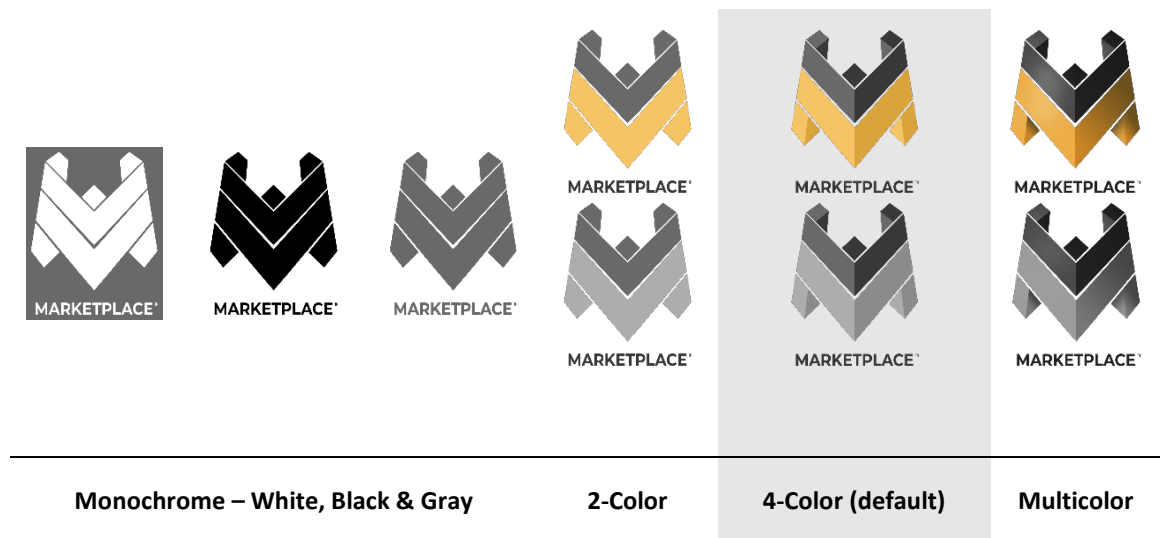
One might also discern the silhouette of an **eagle with outstretched wings**. This heraldic symbol is deeply embedded in U.S. iconography, especially in the seals, emblems and flags of the armed services themselves. This effect is most pronounced in the monochromatic variants shown below.

The eagle, or “crow” in sailor parlance, appears on the **uniforms of many airmen, soldiers and sailors**. Among these are the Army specialist and Navy / Coast Guard petty officer (enlisted) shoulder patches, O-6 commissioned officers' collar insignia, and the most senior enlisted sergeants / petty officers of their respective branch, including the E-9 Sergeant Major of the Space Corps! See Table 3.

Variants

A **horizontal version**, with text to the right of the icon, has not been explored due to time constraints, but would be quite easy to make.

Common in logo design are monochromatic, grayscale and bicolor versions that are suitable for print media or other purposes.



Rubbish

Some **rejected ideas**, also drawing on rank insignia or the shopping metaphor for inspiration, are shown below. These also were handmade by me in Photoshop.



Tables

Table 1

Table 1—Minimum sizes for visual targets on various device sizes			
Target	2.5-inch Phone	3.5–5-inch Phone	9–10-inch Tablet
Text	4 pt / 1.4 mm	6 pt / 2.1 mm	8 pt / 2.8 mm
Icons	6 pt / 2.1 mm	8 pt / 2.8 mm	10 pt / 3.5 mm

🕒 Touch targets:

- 🕒 Minimum—17 pt / 6 mm
- 🕒 Preferred—23 pt / 8 mm
- 🕒 Maximum—43 pt / 15 mm

🕒 Spacing between targets to avoid interference errors, on center:

- 🕒 Minimum—23 pt / 8 mm
- 🕒 Preferred—28 pt / 10 mm UX

Table 2

TABLE 2. Incident diagnoses and incidence rates^a of eye disorders of refraction, active component, U.S. Armed Forces, 2001–2018

	Myopia		Astigmatism		Hyperopia	
	No.	Rate ^a	No.	Rate ^a	No.	Rate ^a
Total	1,381,122	7.8	1,205,354	6.6	491,803	2.2
Sex						
Male	1,101,320	7.2	973,696	6.2	397,079	2.1
Female	279,802	11.6	231,658	9.0	94,724	2.9
Race/ethnicity						
Non-Hispanic white	816,666	7.5	721,274	6.4	303,756	2.3
Non-Hispanic black	219,995	7.3	200,180	6.5	82,679	2.2
Hispanic	188,798	8.8	156,119	7.0	60,378	2.3
Asian/Pacific Islander	61,333	9.8	47,787	7.0	15,311	1.8
American Indian/Alaska Native	10,681	5.2	9,168	4.3	3,953	1.6
Other/unknown	83,649	8.9	70,826	7.2	25,726	2.1
Age group (years)						
≤19	317,757	21.2	147,439	9.4	48,229	2.9
20–24	599,668	9.4	481,864	7.2	153,264	2.0
25–29	240,098	5.9	262,160	6.3	102,551	2.0
30–34	96,763	3.8	126,474	5.0	63,499	2.0
35–39	61,195	3.3	89,809	4.7	56,613	2.3
40–44	41,125	4.2	61,083	6.0	41,429	3.0
45–49	19,040	5.6	27,384	7.8	18,838	3.7
50–54	4,431	5.1	7,310	8.1	5,728	4.3
55+	1,045	4.9	1,831	8.5	1,652	5.0
Service						
Army	556,608	8.2	475,610	6.8	185,417	2.3
Navy	297,430	6.8	275,317	6.1	124,522	2.3
Air Force	302,313	7.4	291,534	6.9	117,250	2.2
Marine Corps	224,771	8.9	162,893	6.0	64,614	2.1
Rank						
Enlisted	1,216,831	8.0	1,028,953	6.6	411,067	2.2
Officer	164,291	6.3	176,401	6.5	80,736	2.3
Military occupation						
Combat-specific ^b	155,190	5.9	148,470	5.4	56,823	1.8
Motor transport	41,667	7.1	37,471	6.3	15,586	2.3
Pilot/air crew	20,135	3.0	29,323	4.4	15,815	2.0
Repair/engineer	345,546	6.5	335,511	6.2	138,367	2.1
Communications/intelligence	272,486	7.2	265,458	6.7	107,440	2.2
Healthcare	126,155	9.5	119,779	8.6	50,894	2.8
Other/unknown	419,943	12.2	269,342	7.5	106,878	2.5

^aIncidence rate per 100 person-years.^bInfantry/artillery/combat engineering/armor.

No., number.

Table 3

UNITED STATES ARMED FORCES

ENLISTED RANK INSIGNIA

★★★★★

E-1

E-2

E-3

E-4

E-5

E-6

E-7

E-8

E-9

SENIOR ENLISTED ADVISORS

ARMY

no insignia

PRIVATE PV1

PRIVATE E-2 PV2

PRIVATE FIRST CLASS PFC

SPECIALIST SPC
CORPORAL CPL

SERGEANT SGT

STAFF SERGEANT SSG

SERGEANT FIRST CLASS SFC

MASTER SERGEANT MSG

FIRST SERGEANT 1SG

SERGEANT MAJOR SGM

COMMAND SERGEANT MAJOR CSM

SERGEANT MAJOR OF THE ARMY SMA

MARINE CORPS

no insignia

PRIVATE PVT

PRIVATE FIRST CLASS PFC

LANCE CORPORAL LCPL

CORPORAL CPL

SERGEANT SGT

STAFF SERGEANT SSGT

GUNNERY SERGEANT GYSGT

MASTER SERGEANT MSGT

FIRST SERGEANT 1STSGT

MASTER GUNNERY SERGEANT MGYSGT

SERGEANT MAJOR SGTMAJ

SERGEANT MAJOR OF THE MARINE CORPS SMMC

AIR FORCE

no insignia

AIRMAN BASIC AB

AIRMAN AMN

AIRMAN FIRST CLASS A1C

SENIOR AIRMAN SRA

STAFF SERGEANT SSGT

TECHNICAL SERGEANT TSgt

MASTER SERGEANT MSGT

FIRST SERGEANT E-7

SENIOR MASTER SERGEANT SMSgt

CHIEF MASTER SERGEANT CMSGT

COMMAND CHIEF MASTER SERGEANT CCM

CHIEF MASTER SERGEANT OF THE AIR FORCE CMSGF

NAVY

no insignia

SEAMAN RECRUIT SR

SEAMAN APPRENTICE SA

SEAMAN SN

PETTY OFFICER THIRD CLASS PO3

PETTY OFFICER SECOND CLASS PO2

PETTY OFFICER FIRST CLASS PO1

CHIEF PETTY OFFICER CPO

SENIOR CHIEF PETTY OFFICER SCPO

MASTER CHIEF PETTY OFFICER MCPO

COMMAND MASTER CHIEF PETTY OFFICER FORMC

FLEET / FORCE MASTER CHIEF PETTY OFFICER FLTMC

MASTER CHIEF PETTY OFFICER OF THE NAVY MCPON

COAST GUARD

SEAMAN RECRUIT SR

SEAMAN APPRENTICE SA

SEAMAN SN

PETTY OFFICER THIRD CLASS PO3

PETTY OFFICER SECOND CLASS PO2

PETTY OFFICER FIRST CLASS PO1

CHIEF PETTY OFFICER CPO

SENIOR CHIEF PETTY OFFICER SCPO

MASTER CHIEF PETTY OFFICER MCPO

COMMAND MASTER CHIEF CMC

AREA / DCO / DCHS MASTER CHIEF PETTY OFFICER MCHP

MASTER CHIEF PETTY OFFICER OF THE COAST GUARD MCPG-CG

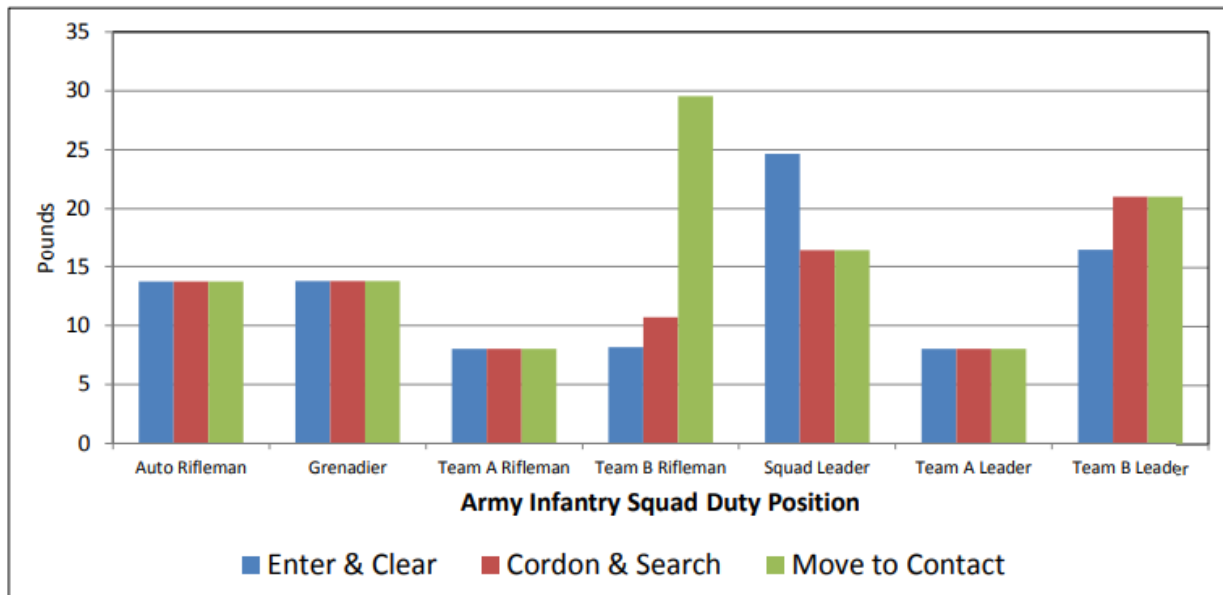
Table 4

Army's TECD 2a soldier load baseline (2012)

72-Hour Mission, Squad Leader			
Item	Qty	Lbs	Total (lbs)
Common Equipment			107.49
Squad-Leader Equipment			
M4 (Rail system, sling, BUIS, collapsible butt-stock)	1	7.50	7.50
Magazines with 30 rounds each	7	1.30	9.10
M150 RCO (ACOG)	1	1.10	1.10
Weapon Light w/battery	1	0.65	0.65
AN/PEQ-15 w/battery	1	0.49	0.49
PVS-20 (ENVG) w/battery pack	1	1.98	1.98
MOLLE Rifleman Kit Pouches (Grenade pouch x2 / Double Mag Pouch x3, utility pouch x2)	1	1.66	1.66
M67 Frag Grenade	2	0.93	1.86
M83 Smoke Grenade	2	1.00	2.00
Nett Warrior EUD w/cable (See Below)	1	2.00	2.00
SWIPES (charging cup, radio pouch, side adapter, battery cable)	1	0.50	0.50
SWIPES conformal battery (carried)	1	2.40	2.40
SWIPES conformal battery (extra)	1	2.40	2.40
M24 Binos	1	1.26	1.26
AA batteries	20	0.05	1.00
Compass and map (Set)	1	0.35	0.35
Squad-Leader Equipment Subtotal			36.25
Total of Squad Leader and Common Equipment			143.74

Table 5

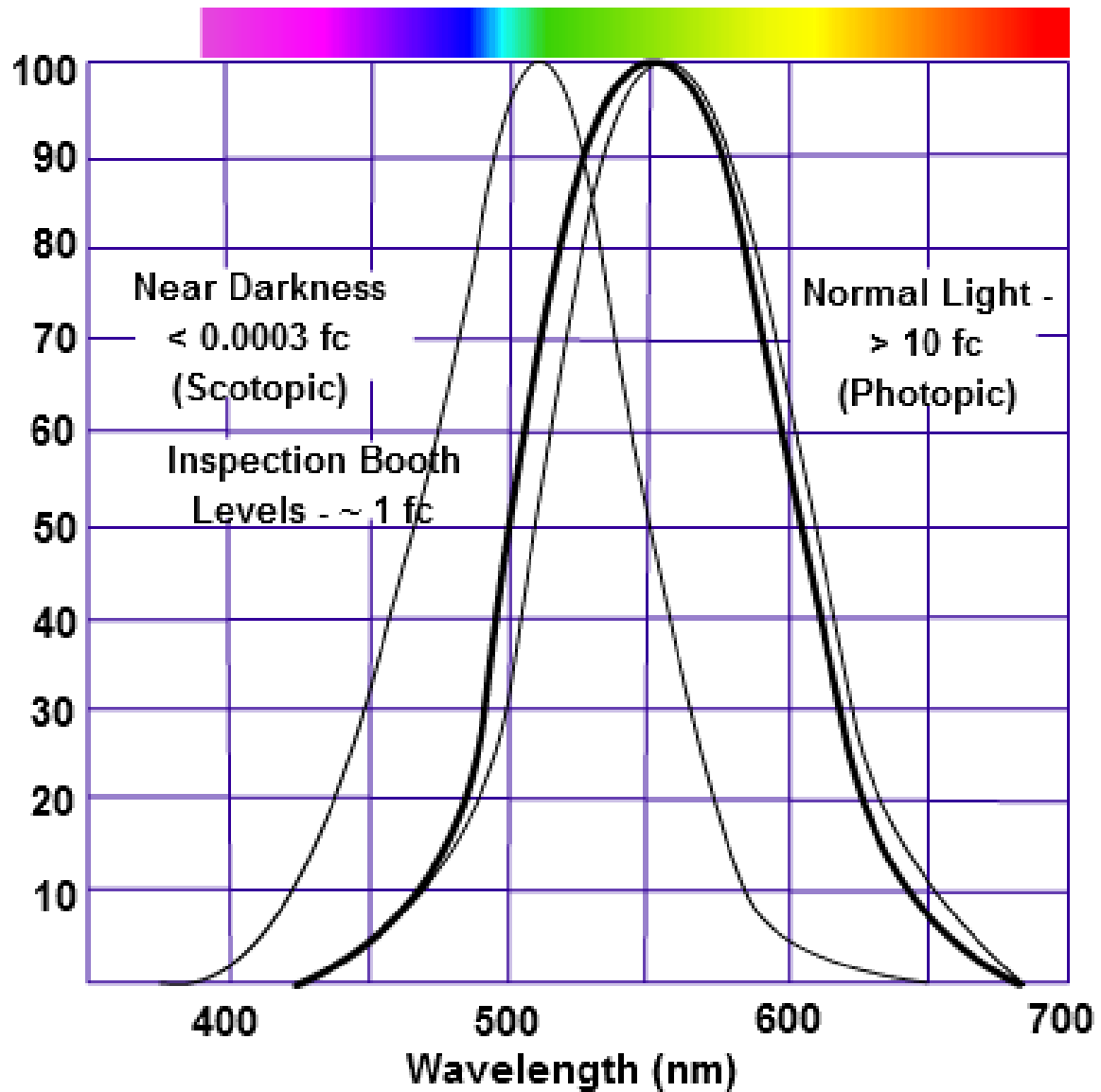
IBP Baseline: Power-Related Weight for 72-Hour Missions



* Power-related weight includes batteries and devices to move or manage power, not the devices that actually consume the power

Graphs

Graph 1



Works Cited

1. "Applying Color Theory to Digital Displays" from <https://www.uxmatters.com/mt/archives/2007/01/applying-color-theory-to-digital-displays.php>
2. "An Assessment of the Challenges Associated with Battlefield Power: Addressing the Power Budget Burdens of the Warfighter and Squad" from <https://apps.dtic.mil/sti/pdfs/ADA608764.pdf>
3. "Color and Wavelength from <https://ux1.eiu.edu/~cfadd/3050/Ch17Color/Color.html>
4. "Common Misconceptions About Touch" from <https://www.uxmatters.com/mt/archives/2013/03/common-misconceptions-about-touch.php>
5. "Creating a Dyslexia Friendly Workplace" from <https://www.bdadyslexia.org.uk/advice/employers/creating-a-dyslexia-friendly-workplace/dyslexia-friendly-style-guide>
6. "Good Background Colors for Readers: A Study of People with and without Dyslexia" from <https://www.cs.cmu.edu/~jbigham/pubs/pdfs/2017/colors.pdf>
7. "How the Army uses tech to balance awareness with battlefield distractions" from <https://www.armytimes.com/news/your-army/2020/01/14/how-the-army-uses-tech-to-balance-awareness-with-battlefield-distractions/>
8. "Human Vision and Color Perception" from <https://www.olympus-lifescience.com/en/microscope-resource/primer/lightandcolor/humanvisionintro/>
9. "Incidence and Prevalence of Selected Refractive Errors, Active Component, U.S. Armed Forces, 2001–2018" from <https://health.mil/News/Articles/2019/09/01/Incidence-and-Prevalence-of-Selected-Refractive-Errors?page=3>
10. "Night Vision" from <https://www.explainthatstuff.com/hownightvisionworks.html>
11. "The Human Eye's Response to Light" from <https://www.nde-ed.org/EducationResources/CommunityCollege/PenetrantTest/Introduction/lightresponse.htm>
12. "The intelligent soldier system - military wearables" from <https://www.idtechex.com/de/research-article/the-intelligent-soldier-system-military-wearables/8131>

13. "The Myths of Color Contrast Accessibility" from <https://uxmovement.com/buttons/the-myths-of-color-contrast-accessibility/>
14. "Touch Targets on Touchscreens" from <https://www.nngroup.com/articles/touch-target-size/>
15. "What Color Scheme Is Best for Sunlight Readability?" from <https://stackoverflow.com/questions/5155903/what-color-scheme-is-best-for-sunlight-readability>
16. "What Is a Good Color Combination, Visibility for Outside Use?" from <https://ux.stackexchange.com/questions/38334/what-is-a-good-color-combination-visibility-for-outside-use>
17. "What Is Nearsightedness and Farsightedness?" from <https://www.vspdirect.com/vision-hub/what-is-nearsightedness-and-farsightedness>
18. "When to Use White Text on a Dark Background" from <https://uxmovement.com/content/when-to-use-white-text-on-a-dark-background/>
19. "Why light text on dark background is a bad idea" from <https://tatham.blog/2008/10/13/why-light-text-on-dark-background-is-a-bad-idea/>
20. "Why You Should Never Use Pure Black for Text or Backgrounds" from <https://uxmovement.com/content/why-you-should-never-use-pure-black-for-text-or-backgrounds/>