INNOVATIVE DESIGN FOR MISSION CRITICAL OPERATIONS



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EXECUTIVE SUMMARY

The growing landscape of new technologies offer a myriad of new opportunities for public safety agencies to make first responders' jobs safer and easier — but only if it the technology works simply and effectively. To effectively assess, protect and respond, public safety agencies need intelligent, well-designed solutions that can quickly capture, manage, correlate and prioritize a wide variety of information. They also want intuitive solutions that deliver real-time information yet allow users to maintain operational focus to provide:

- Improved communications and decision making during emergency response situations
- Streamlined workflows that simplify data input, access and sharing
- Real-time convergence and management of voice, data and video systems for effective incident management
- Enhanced situational awareness for faster, smarter decisions

But like many new technologies, these solutions can also present challenges for your organization. For example, introducing new applications can mean:

- Extensive personnel training requirements
- Modifications to standard operating practices
- Initial periods of operational instability where response times can actually be slower
- User frustration and increased error rates

Through our long-standing partnerships with public safety organizations, Motorola understands the critical and unique dynamics that shape the communications center and first responder environment. With a strong emphasis on product usability and a comprehensive understanding of public safety needs, we designed our next generation application suite, PremierOne[™], to ensure that your organization can transition smoothly to these new technologies.

Providing a logical, predictable transition with minimal operational disruption requires highly configurable solutions that can easily accommodate the variety of differences between public safety agencies, while ensuring high availability, stability and security.

Leveraging the technical knowledge of new and existing personnel requires that public safety applications keep pace with changes in consumer products; however, consumer smartphone application interfaces are not necessarily the most efficient means of accessing and responding to the multi-faceted, real-life needs of the typical public safety environment. Motorola builds on the public safety interaction patterns that we have studied extensively to address the on-the-ground, real-time needs of communication center and responder personnel.

Using standard computer graphical user interface (GUI) tools allows you to maximize your IT investment. New users can access infrequently used functions without being overwhelmed with unknown keyboard shortcuts or command line access. On the other hand, "power users" can access rich command language and extensive keyboard shortcuts, enabling them to quickly respond to complex situations. Dual interaction styles with one common user interface design enables new personnel to perform the necessary operations early on, while providing a path for them to continually learn more advanced interaction.

PremierOne brings together vision, innovation and technology. Our goal is to provide you with purpose-built, next generation public safety technology solutions that are so intuitive, so smart, that it becomes second nature for users to operate even under the most stressful and demanding circumstances. You look to us for our innovation, stability and experience. Because a good partner understands the importance of listening, PremierOne was designed using direct feedback from customers who live and serve in the same dynamic environment as you do.

USABILITY: WHAT IS IT?

Each component – user, task, tool and environment – impacts the way a human interacts with a product or service. Proper usability engineering methods have a fifty-year history rooted in cognitive science, clinical psychology, physiology and ergonomics and are an integral part of our product development process. Additionally, national and international standards have provided guidelines to improve usability of software applications:

- ISO 9241: Ergonomic requirements for office work with visual display terminals (VDTs) (1998) is a multi-part standard that provides requirements and recommendations impacting the usability and ergonomics of hardware, software and context of use.
- ISO 13407: Human-centered design processes for interactive systems (1999) provides guidance on user-centered design methods for software applications. Figure 1 illustrates this process:



FIGURE 1 – User-Centered Design Process

DESIGNED FOR USER ROLES AND NEEDS

User-centered design is both a process and a philosophical approach that recognizes the importance of user input to the successful design of a product or service. In this approach, everyone who interacts with the product is considered. Each user's perspective, assumptions and intentions need to be understood and addressed, including, but not limited to:

- Call takers
- Dispatchers
- Civic population served by your agency
- Communications center supervisors
- Fire fighters
- Emergency medical technicians
- Deployment personnel
- Field supervisors
- IT administrators
- Jail employees
- Police officers
- Records personnel

"Usability is the measure of a user's actions in the process of completing a task through the use of a tool within a given environment."

GOOD DESIGN MEANS UNDERSTANDING YOU

At its foundation, Motorola's design methodology depends on close collaboration with those who most intimately use our technology. Leveraging extensive voice-of-customer and collaborative design research, our dedicated team of Human Factors experts have optimized the PremierOne[™] GUIs (graphical user interfaces) for high stress, information-filled public safety environments.

Critical Need: Intuitive Applications for the Public Safety Environment

We believe the goal of a user-centered design is to create software that helps your personnel complete tasks quickly with minimum errors.

Whether a Computer Aided Dispatch (CAD) operator is trying to capture information from a 9-1-1 call, dispatch a unit to an incident or monitor the status of units in the field, the usability of the system determines the ease and efficiency required to meet these objectives. The need for dispatchers to multi-task makes it essential that the information they need to make split-second decisions is presented at the right time to support their mission critical tasks.

While usability standards can provide guidance, even the most comprehensive standard can still be misapplied when not executed by well-trained designers with thorough knowledge of the needs of public safety users. Motorola's global team of designers immerse themselves in the daily lives of first responders to better understand their behaviors, needs and underlying motivations. The team rides along on hook-and-ladders, in helicopters, on police patrols and in ambulances, and observes communication center personnel in action. They've experienced first-hand the world of public safety personnel, gathering information and insights that enable Motorola to deliver solutions that are not only durable, reliable and dependable, but also "second nature" to use.

Improving Operational Focus and Adoption

Access to mission critical information not only influences the ability of first responders to quickly and accurately respond to incidents and maintain effective communication, but it also has a significant impact on their ability to maintain situational awareness in potentially hostile environments. Distraction due to a poorly designed user interface can present a hazard for mobile users.

Beyond the essential concerns of accurate and welldesigned public safety systems is the need for user acceptance: your personnel must accept new ways to complete their tasks. Countless systems have ultimately failed in practice, not due to missing or inappropriate functionality, but because of the challenges faced when adapting to system-enforced behaviors and user hostility. For a system to be effective, it should have not only the functionality necessary to support advanced interactions, but must also be designed to support critical usability goals and quickly demonstrate improved ease of use as a replacement for existing solutions.

Efficient and Error-Free Task Completion

Interaction design for public safety is focused on efficient and error-free task completion. It is critical in the design process to help prevent errors from occurring, or prevent them from spreading to other parts of the system. When errors do occur, error messages should describe the problem in plain language and assist with recovery by providing clear instructions for resolution.

For a dispatch application, extensible command language and keyboard shortcuts dramatically improve speed, enabling complex tasks to be executed very rapidly.

For mobile applications designed to optimize situational awareness, key actions or options are always readily visible and informational alerts draw the attention of the user without being disruptive. Interface design elements reinforce user-friendly interaction and when additional help is needed, user assistance is:

- Quick and easy to access
- User-friendly and searchable
- · Focused on accomplishing real tasks

Critical Context Sensitivity for Your Environment

Public safety systems are complex, comprising aspects of:

- Centralized command and control
- Task management
- · One-to-one and group communications
- Record keeping
- Personnel management

As a result of this complexity, public safety applications must be designed to respond to critical tasks and unique environmental constraints. Portions of the application that provide communication between individuals – and especially groups – must support effective task collaboration and provide superior communication functionality. When used in a mobile environment, the system should also offer user assistance without distracting users from other primary tasks, such as driving a car or responding to a caller.

The Importance of a Unified Systems Approach

Your agency may have a mix of vendor-supplied and in-house developed systems, including one or more Motorola products or modules:

- CAD
- Mobile
- Records Management System (RMS)
- Jail Management System (JMS)

In mission critical environments, technology must be "second nature" so first responders can focus on the mission and not the technology.

WHITE PAPER

MOTOROLA PREMIERONE

The following table describes these solutions:

PRODUCT	HISTORY
CAD	CAD systems are an essential component of public safety operations. The CAD user's operating environment is characterized by real-time information processing. CAD systems provide deployment and tracking of resources for efficient responses to events.
MOBILE	Mobile data applications are used for the on-scene aspect of public safety operations. They are designed to provide messaging, state query functionality and display CAD information in the field.
RMS	Records Management Systems provide agencies with the flexibility to configure entry screens and work flow processes to meet their individual needs. Investigators and officers use these systems to query the records database in an easy-to-use and familiar format. RMS automates the capture of information and is the agency repository and reporting mechanism.
JMS	Jail (or corrections) Management Systems encompass state-of-the-art, integrated applications that automate operational and administrative functions of correctional facilities. JMS provides inmate management and reporting automation.

Over time, public safety applications have become more complex and, in many instances, increasingly isolated in terms of design, features, data and administration. At the same time, the demand for information accuracy, consistency and availability across applications, along with ease of administration, has become increasingly more urgent.

Many agencies today have separate applications that are integrated with varying degrees of success on various platforms, operating systems and GUIs, adding up to a complex administrative burden.

Thanks to years of development work, Motorola PremierOne[™] leverages our in-depth industry knowledge to bring you intuitive applications built on a unified architecture. Our future-ready platform improves decision making with streamlined, intelligent workflows that prioritize activities while allowing you to maintain operational focus and speed response.

What Our User-Driven Design Approach Means to You

We are a global leader in the public safety industry, creating innovative, intuitive applications that are designed to reduce workflow complexity and maximize your operational efficiencies.

Increased operational efficiencies enhance community safety and service, and position you for the challenges of tomorrow. Our passionate commitment to user-centered design includes:

- Customer needs evaluation
- Dedicated human factors design team
- Direct front-line customer evaluation and feedback
- Design for both desktop and mobile environments
- Intuitive government applications for safety and service
- Improved, user-efficient information presentation and interaction
- Common look and feel with consistent behavior throughout the application suite
- Easy-to-learn interface resulting in reduced errors and training costs

How Do You Evaluate Usability?

While specific metrics used to evaluate applications can depend on design criteria, some common questions used to measure public safety applications include how:

- Quickly personnel can complete a task
- Many steps it takes to complete a task
- Many out-of-sequence steps responders have to perform to complete a task
- Distractions impact performance

COMPUTER AIDED DISPATCH: THE CORNERSTONE OF PUBLIC SAFETY OPERATIONS

Often the communications hub of police, fire and EMS operations, the CAD user's operating environment is characterized by real-time information processing, dynamic resource management and time-critical decision making. CAD design needs to focus on the interaction of user interface (UI) components and implementation methods to facilitate efficient communications and effective information management. Seamless integration of services and features are essential in supporting task execution and enhancing performance.

CAD USABILITY GOALS

We understand the dispatch environment is demanding and uncompromising. That is why we are constantly evaluating the public safety user's task environment and looking for ways to improve our interactive design.

Challenges in a dispatch environment often include:

- A diverse set of tasks that range from data entry to dispatching resources
- A high volume of tasks and the likelihood of interruption
- Concurrent monitoring and managing of multiple events and resources and systems
- Real-time information exchange between multiple sources
- Time-critical decisions involving resource allocation

In response to these operational challenges, Motorola PremierOne[™] CAD has been uniquely designed to enable:

Seamless Workflow

- Minimizes the navigation and actions necessary for completing tasks
- Provides consistent and efficient keyboard commands, shortcuts and navigation
- Includes design components that integrate information and support capabilities (for example, address verification and previous incident check)
- Enables effective communications, while being flexible enough to support alternate data, voice and video transmissions

Support for Task Interruption

- Focuses on solutions to help users recover when interruptions occur
- Enhances user ability to easily move between tasks
- Maintains the user's position and progress when navigating between UI components

Situation Monitoring Support

- Allows dispatchers to monitor pending incidents, personnel and duty roster changes, especially if large-scale incidents develop
- Communicates information that conveys a clear picture of the developing situation

A Focus on Information Sharing

- Maintains efficient information flow for both communications and archival record keeping
- Assists the dispatcher in moving information through the workflow as efficiently as possible
- Includes commands and tools to manipulate information with context-optimized views

Efficient Resource Management

- Monitors and adjusts dispatch assignments, area coverage, unit information and roll calls
- Directly impacts incident response
- Facilitates the allocation of resources

Integrated Services and Features

- Shares information with mobile data terminal applications
- Uses seamless, consistent methods for manipulation and exchange of information across applications

PREMIERONE CAD UI DESIGN

PremierOne[™] CAD has identified UI solutions to satisfy specific public safety operational needs.

Visual Display Elements

- A familiar, consistent framework allows users to focus on tasks
- Icons represent traditional workflow items (physical tickets, forms, schedules, duty rosters, radios, fire arms, vehicles and geographic locations)

The Command Line Interface

- Reduces training time and errors due to a robust, extensible command language
- Enables quick accomplishment of complex tasks with a minimum number of key strokes
- Maintains a history of recently used commands to quickly view and repeat them
- Dynamic help provides real-time answers to user questions

Information Portholes

- Provide a simplified, minimally interactive view of concurrent events
- Increase dispatcher situational awareness and reduce
 response time
- Minimize UI navigation
- Support direct access to task-relevant information
- Support the automated transfer of information from the porthole to other UI components

Work Objects

- Provide organizational structure and functionality
- Allow the input, viewing and updating of task-related information

Work Areas

- Prevent too many overlapping windows from being open at the same time
- Provide balanced functionality between two distinct work areas, the Primary Work Area (PWA) and the Work Assist Area (WAA)
- Display task-critical information without requiring you to view or navigate to other windows
- Permit you to easily switch between different tasks and services without losing track of ongoing activities with tabbed work objects



FIGURE 2 - PremierOne CAD User Interface

Dual-Focus Control

- Provides transparent navigation between the two work areas
- Allows interaction with one work area without relinquishing focus in the other work area
- Eases navigation between work areas without having to first select the desired work area

A Distributed Display Environment

- Can be part of a single workstation, or any number of displays can be common to multiple workstations, enabling a multi-monitor display environment
- Delivers more information and monitoring capability to the user

Adaptive Forms

- · Enable data entry through on-screen forms
- Display data effectively, and in a format flexible enough to account for a range of situations and context
- Support intelligent form building by dynamically placing fields and labels on the screen

MOBILE DATA APPLICATIONS: EXTENDING DISPATCH OPERATIONS TO THE FIELD

When it comes to first responders, we understand that too much information can be just as problematic as not enough. Information overload can overwhelm and inhibit public safety professionals working in stressful situations. First responders don't want or need all available information; they only need the most relevant information.

We recognize that a mobile user's operating environment is characterized by:

- Powerful need for situational awareness and time-critical decision making
- Functioning in an operating environment with frequent interruptions
- Requirements for self-management and status reporting

And because emergency personnel can be frequently interrupted with tasks put on hold or abandoned altogether, it is essential that applications do not allow tasks to either timeout or continually prompt the user for a response.

MOBILE USABILITY GOALS

As a field extension of dispatch operations, the mobile data application has many of the same usability goals as a well-designed CAD application. However, operating in a mobile environment introduces additional constraints that significantly impact the usability goals of a mobile data application.

Challenges in a mobile environment often include:

- Significant levels of multi-tasking between the mobile application and tasks in the surrounding environment
- A critical need to maintain situational awareness of the mobile user's surroundings
- Intermittent operations with a high likelihood of interruption and high levels of distraction
- Physical, cognitive and perceptual challenges due to variable environmental conditions

A well-designed mobile data application addresses the above listed elements along with:

Visual Display Elements

- Large button, touch-screen controls with persistent rules provide feedback on the responder's current state
- Icons represent mobile geographic locations and/or individuals, including roles and key functionality of each location and/or person

Shallow Menu Structures

- Simple to ensure that users do not easily get lost in deep, convoluted menus
- Provide a consistent starting point for actions to greatly simplify navigation and provide learning reinforcement

Support for Multi-Tasking

- Allows task interruption without negative consequence
- Intelligent prioritization of communications
- Maintains user position and progress when navigating between UI components, eliminating information loss

Extended Situation Monitoring

- Allows users to respond to more urgent needs, including the assistance of other mobile personnel
- Maintains direct (or at least peripheral awareness) of a wide-variety of operations
- Supports multi-task monitoring through a "porthole" approach, enabling quick selection of many ongoing activities

PREMIERONE MOBILE UI DESIGN

PremierOne[™] Mobile has identified UI solutions to satisfy specific operational needs for the mobile work environment.

Persistent Services

- Mobile application services never "quit" in the traditional desktop sense
- No need for mobile user to re-establish ongoing task if interrupted
- Last button or field remains "in focus" and last document is still open
- Most-used functions are displayed at global level with easy access throughout the application

Integrated Information Management

- Import mapping information is automatically entered into field-based reporting for efficient re-use of data
- Home screen displays most valuable information with easy drill down when needed
- Mobile video capture allows video images or still clips to be attached to citations and incident management records
- Shifts primary focus to serving the community rather than the needs of the application

Keyboard Shortcuts

- Keyboard shortcuts and a command line interface support mobile users who must frequently multi-task between activities in a critical environment
- Responders can minimize their attention to on-screen controls, and simplify their interaction with the mobile application by entering keystrokes only when they are able



FIGURE 3 – PremierOne Mobile User Interface

Persistent Multi-Modal Interaction

- Touch-screen controls and extensive single-touch keyboard shortcuts automatically increase users' tactile and visual interaction experience
- Text-to-speech readout of messages supports handsfree and eyes-free operations, positively impacting situational awareness

RECORDS MANAGEMENT SYSTEM: FAST AND SECURE ACCESS TO MISSION CRITICAL RECORDS

Whether they're creating reports in the field or accessing and sharing record data, officers and records personnel need a Records Management System that streamlines the capture, organization, management and distribution of information, regardless of format or source. Since every agency is different, it is important for the system to be user-configurable so it can be easily tailored to specific workflows, business processes and reporting needs. Consequently, interaction design must focus on quick data input, easy access to documents and the ability to move quickly between documents without having to drill down through multiple layers to locate information and then display the selected data in various reporting formats.

RECORDS USABILITY GOALS

The PremierOne[™] Records application faces multiple usability challenges since it must work on a desktop and in a mobile environment, while retaining the same interaction patterns and look and feel for each. Users must be able to find their way through what can literally be millions of records to get the information they need in a timely manner.

Interaction design considerations for the touch-screen and desktop records application include:

- The need for mobile workers to move seamlessly from the touchscreen interaction of an MDT to a desktop workstation
- Intermittent operations with a high likelihood of interruption
- Real-time information exchange between multiple sources
- Large volumes of information must be organized and presented in an immediately intelligible manner

In response to these challenges, PremierOne Records interaction design focuses on the following goals:

Consistent Visual Display

- Same look and feel and workflow for the desktop client and the touch-screen client
- Large buttons, text, and other touch-screen controls provide easy "targets" for touch-screen users
- Night mode to allow users to work without night blindness

Shallow Menu Structures

- Ensure that users don't get lost in deep, convoluted menus
- Provide a consistent starting point to greatly simplify navigation and provide learning reinforcement

- Model application structure on the physical structure of an agency so users intuitively understand how the various modules relate to each other
- Provide keyboard shortcuts and a command line to facilitate data entry and navigation

Consistency and Configurability

- Display application elements consistent with PremierOne CAD and Mobile applications, navigation on the left, Primary Work Area (PWA), and a Work Assist Area (WAA)
- Enable agencies to configure the application to reflect their workflow while still working within the overall PremierOne Records navigation structure
- Allow users to open documents in separate windows to create a user experience consistent with known word-processing patterns
- Tailor the screen layout to suit the task at hand

Relevant Information Architecture

- Display only critical information
- Group information in a logical and intuitive fashion
- User roles determine what each user sees
- Data entry forms are structured to the user needs:
- Order fields in a way that makes sense to the user
- Allow users to easily move vertically or horizontally through a document
- Enable quick data entry for required fields
- Provide contextual help
- Allow users to "bring forward" data that is already in the system to prevent double entry of data and assure accuracy
- Perform IBR and UCR error-checking and simplify error corrections
- Allow users to create ad hoc or pre-configured reports to aid in analysis
- Provide an intuitive method to track Property and Evidence

PREMIERONE RECORDS UI DESIGN

The PremierOne[™] Records application has identified UI solutions to satisfy specific operational needs for records and field personnel.

Visual Display Elements

- Familiar, consistent framework allows users to focus on tasks
- Icons represent commonly performed tasks
- "Fractal" design uses the same design pattern throughout the application at different navigational scales, such as navigation tabs, display document tabs and display contextual help tabs
- Clean display of data makes it easy to read and/or enter data in documents
- Displays data in a manner that can be easily scanned
- Distinctive design lets users easily and immediately identify the contents of a page (Lobby, Search Results, Folder View, Document View)
- Large buttons and controls in the touch-screen client aid in accurate navigation and data entry

Work Areas

- Provide organizational structure and functionality
- Allow input, viewing, and updating of task-related information
- Minimize UI navigation by keeping open items easily accessible
- Provide flexible work areas that can be expanded or collapsed to better address the needs of the current task
- Offer access to Contextual Help and detailed "Learn Mode"

Search and Keyboard Shortcuts

- Modify search to reflect a user's preferred search patterns
- Simplify interaction and provide quick access to primary functionality with keyboard shortcuts and a command line interface



FIGURE 4 - PremierOne Records User Interface

Adaptive Forms

- Support intelligent form building by dynamically placing fields and labels on the screen
- Sorting of search results facilitates document location and aids in analysis
- Data from Master Indices brought forward to complete tasks quickly and assure accuracy
- Navigational tabs display metadata, providing users with document or folder details and status
- Users can change the display of forms to suit their work habits

PREMIERONE: INTUITIVELY DESIGNED FOR PUBLIC SAFETY

We understand technology advancement in public safety provides opportunities for police, fire and EMS agencies to serve their constituents in new and more effective ways. And we know that first responders need to concentrate on the situation at hand, not on the technology. Bringing together these two considerations, Motorola blends the art of design with the rigors of social sciences to deliver solutions that are purpose-built for mission critical personnel.

We are unique in our ability and commitment to build a team of leading design experts from across our public safety businesses, along with our incomparable design team specializing in Human Factors research. Our highly skilled designers developed PremierOne[™], our integrated suite of public safety applications, with intuitive user interfaces that optimize crucial functionality while reducing complexity. We focused on reducing keystrokes and providing intelligent workflows that alert users to the availability of critical information without interruption.

PremierOne is designed to break down barriers to information and enable real-time information access and sharing delivering one, common real-time operational view. It transforms the way public safety agencies operate, collaborate and share information by:

- Making critical information front and center for improved decision making
- · Simplifying information input, access and sharing
- · Creating intuitive and integrated solutions to optimize operational efficiency
- Streamlining workflows that speed response and enhance safety

To learn more about how the PremierOne platform can help you simplify your workflows and optimize your operations, contact your Motorola representative or visit **motorolasolutions.com/integratedcommand**.

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