

Practical Considerations for In-House Development of Mobile Learning



**Mobile Division
Directorate of Distributed Learning**

Army University

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Preface

This publication is a companion to the Practical Considerations for In-house Development. In light of the recent pandemic, and the growth of mobile technology throughout the Department of the Army, it was time to offer some tips and considerations for proponent Centers and schools in terms of mobile technology, instructional strategies, and skillsets.

The goal for the Department of the Army is for the mobile device to become a decisive technological toolbox that meets our needs whenever and wherever. Mobile devices have the capability to dramatically amplify our innate human abilities by providing communication, informational, and task automation capabilities and applications should enable these capabilities. An effort must also be made to keep these applications maintainable and reliable, and to manage risk appropriately. In order to achieve these goals a certain level of speed and agility must be inherent in our strategy.

Army proponents deliver Soldier-created content, institutional instruction, and self-development opportunities through multiple delivery means, including dynamic social networks and mobile devices. In each domain, the use of synchronous, asynchronous, and mobile distributed learning delivery and networking enables the field to exchange doctrine, lessons learned, tactics, techniques and procedures, and other critical information through reach back and on-demand content capabilities.

This is presented as a living document. Your team's success in development can help others who are just beginning the challenge. In that respect, this is a living document and we encourage your input for future versions.

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Practical Considerations for In-House Development of Mobile Learning

Prologue

Mobile computing technologies are emerging within the Department of Defense space, and requirements and circumstances are changing rapidly—as are the threats and risks. Mobile applications (hereinafter referred to as “app” or “apps”) supply the means by which users perform enterprise or mission-specific tasks or to communicate with the public.

The Army Distributed Learning Program (TADLP) established guidelines, standards, and specifications for the development of education and training for delivery from learning and content management systems and more recently from mobile devices. As varied as their mission, the program also provides in-house capability to build mobile products in coordination with your SMEs or contracts for outsourcing the development of mobile courseware and/or mobile learning content. However, some users prefer to establish and/or maintain control of this development by using in-house teams (*See Introduction for definitions*).

This document guides managers and staff on considerations of an in-house development team in the development of mobile learning rather than acquiring these products through the missions of TADLP.

The focus of this paper is to first identify the *minimum essential resources* to establish and maintain a viable in-house development team. Secondly it identifies the proper protocols for bringing your mobile product to TADLP once created and poise it for successful vetting and publishing to TRADOC, DoD, and commercial locations/storefronts. These resources support a quality content design and development efforts best suited for mobile content and interactivity (e.g., knowledge-based activities with simple content interaction). Contractual services may still be required (or preferred) for more intensely interactive content (e.g., gamification, models, and simulations). As a consequence, any shift to in-house development by a proponent or agency may become a mixed operational model, relying on both in-house *and* contractually developed content.

This paper is *not* intended to promise or support any personnel or fiscal resources required to do so. All resources required to establish and support an in-house development team are the total responsibility of the individual proponent or agency and not the Army University. It also remains the responsibility of the proponent or agency to interface with the DDL, Mobile Division team once established for the submittal and publishing of mobile applications. The entire mobile development process should begin with an email to the TRADOC/DDL mobile division at usarmy.jble.CAC.mbx.atsc-tradoc-mobile@mail.mil to ensure needed artifacts are completed for Army approval, as well as prevention of duplication prior to manpower or contractor dollars expended on the build.

Definition of Mobile and In-house development

Mobile. For the purpose of this document, mobile is defined as the ability to perform mission functions and work away from the office.

Mobile App (mApp). According to Wikipedia, Mobile apps are applications a computer program or software application designed to run on a mobile device such as on smartphones, tablet computers, and other mobile devices.

mApps “were originally intended for productivity assistance such as email, calendar, and contact databases, but the public demand for apps caused rapid expansion into other areas such as mobile games, factory automation, GPS and location-based services, order-tracking, and ticket purchases, so that there are now millions of apps available. Apps are generally downloaded from application distribution platforms which are operated by the owner of the mobile operating system, such as the App Store or Google Play Store. Some apps are free, and others have a price, with the profit being split between the application's creator and the distribution platform”

Mobile applications run in mobile web browsers rather than directly on the mobile device.

Mobile Device. A mobile device for the purpose of this document is a handheld computing device with a display that allows for user input. Mobile devices typically rely on mobile networks for the exchange of data communications. Mobile devices provide storage and data processing power, or access to it (thin/zero client), but with the conveniences of portability. Popular forms of mobile devices this strategy refers to are cellular smartphones and tablets.

Mobile Wireless. A wireless infrastructure is one that provides wireless communications to include cellular, WiFi, Bluetooth, and near field communications (NFC). The primary wireless capabilities used and referenced by this strategy are cellular and WiFi.

Mobile Publication. A mobile publication supplements a doctrinal publication and contains text and a range of multimedia (graphics, video, audio, animations). Readers interact using a touch screen to open content, scale, and launch activities. Additional interactions include highlighting, note taking, social media, and video clips. Audiobooks can also be considered a mobile publication.

Mobile App Vetting. (ONLY APPLIES TO mobile APPS) This is the sequence of activities performed after the mApp is developed to determine if the mApp conforms to published Information Assurance (IA)/Information Technology (IT) security requirements.

UNCLASS Public/Approved for Public Release. Training and education material approved for public release or is derived directly from public sources (universities,

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commercial organizations, governments, etc.). Mobile products that process UNCLASS Public data are also made available via commercial mobile application stores. U.S. Army Soldiers can access these mobile applications via commercial mobile stores or via the TRADOC Application Gateway (TAG). This data and related applications can be stored/accessed via employee-owned information systems (EOIS) or government furnished equipment (GFE).

UNCLASS Controlled Unclassified Information (CUI)/FOUO. Training and education material that is marked by the U.S. Army or Department of Defense (DoD) as restricted to members of the DoD or the U.S. Army. This data and the related mobile applications will be processed only on GFE mobile devices. This data and related mobile applications will be hosted on the Defense Information Systems Agency (DISA) Mobile Application Store (DISA ONLY HOSTS mobile APPS) (see link for DISA on the TAG). This data and related mobile products will not be hosted on commercial mobile application stores.

Content Data Review and Validation. This refers to the review of mApps and/or interactive digital publications IAW DoD, DA, and TRADOC policies, directives, and regulations in order to ensure the accuracy, releaseability, and appropriateness of the content.

TRADOC Application Gateway (TAG). Army Training Information System (ATIS) managed hosting environment which provides centralized location for hosting Command level mobile team, Army, or approved UNCLASS Public mobile products.

DISA Mobile Application Store. This is an online digital electronic app distribution system that allows users enrolled in the DoD Mobility Unclassified Capability (DMUC) program to browse and download white-listed apps for their DMUC enrolled Apple or Android commercial mobile devices.

A working definition of “**in-house development**” is the combined capacity of an organization’s personnel, skill sets, training, software tools, facilities, equipment, and other resources leveraged to rapidly design, develop, and deploy Army mobile products to key stakeholders. Most often, the aggregation of such in-house development resources is referred to as an “in-house mobile development team,” or “mobile cell” denoting the small group structure associated with many mobile projects. A well-functioning in-house development team executes some portions of ALL of the ADDIE components: analysis, design, development, implementation, and evaluation.

Know the Mobile Environment

a. The DDL, Mobile Division learning environment shown in Figure 1-1 below, includes the various user populations and devices, diverse group of potential developers, products, and hosting environments. Every component is dependent to each other and requires the other to operate or provide value.

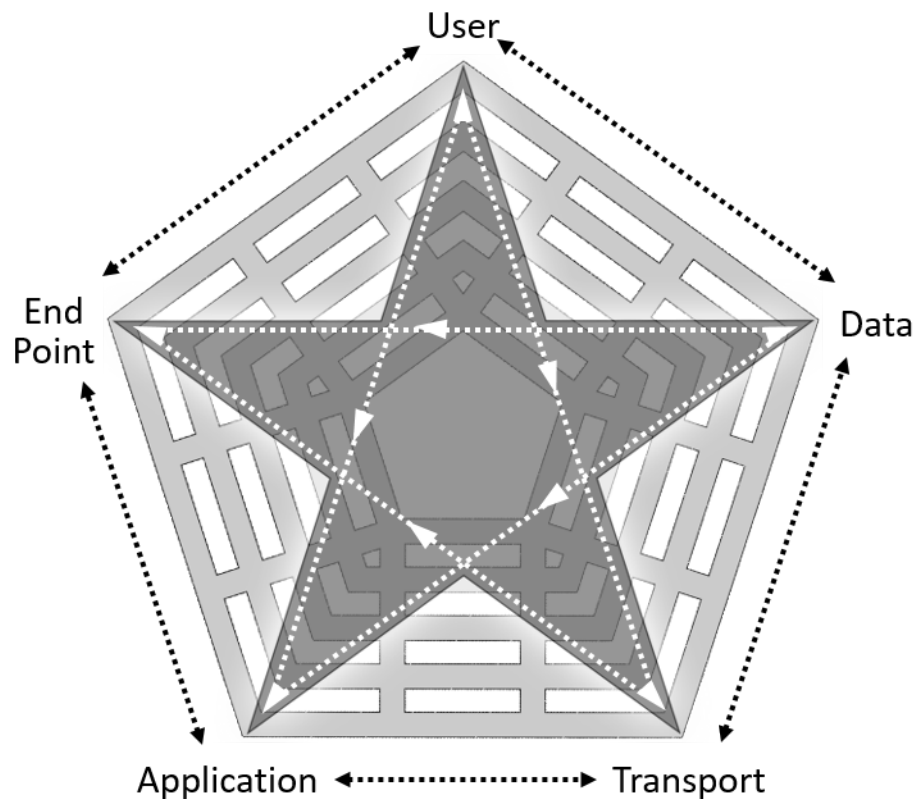


Figure 1-1. Mobile Learning Environment

b. At the top of the pentagon are the mobile product **Users**. This user population, both CAC and non-CAC eligible learners, can include: Soldiers of all ranks, branches, and components; Army Civilians; contractors; and may also include the Joint Force, other DOD organizations, foreign military students, and select Civilian populations. They perform training and education activities on their mobile devices at all locations of work and personal life. These environments can include TRADOC classrooms, Army offices, homes, and deployed locations. Under some conditions cellular data or Wi-Fi signals are strong, but

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disconnected, intermittent and low-bandwidth (DIL) conditions are the norm in austere environments both inside and outside of the continental United States (CONUS). Regardless of the environment, TRADOC users expect to have access to training and educational materials at the point of need. That may mean that content has been preloaded or cached to work “offline” in a DIL environment, or that users can download or view new content under normal bandwidth conditions. Users also expect to be able to work from the platform to which they are accustomed, such as Android, iOS, or Windows.

c. Developers have the critical task during analysis and design to determine how to serve mobile content **Data** to their targeted users. The most common types of products include: reference material, digital publications, performance support/job aids, and perhaps primary instruction. These products can be hosted in a variety of locations including both public and non-public accessible locations and on local devices or the government cloud. All developed mobile application products must come through the DDL Mobile Division (MobDiv) for vetting, approval, and proper publishing under certified Army licenses.

d. The commercial adoption of smartphones and tablets also leads today’s Warfighters to expect that they can use these devices to perform their duties. The term “consumerization” describes the growing tendency for new instructional technology to emerge first in the consumer market and then spread into business and government organizations. Consumerization drives mobile device usage throughout the government. It also effects modes of **Transport**, (Network (NIPR/SIPR) Public or Private that connects the **User to Data** (NetMod, 5G, Cellular)). Because Soldiers benefit from using mobile devices in their daily lives, they expect the same convenience when performing their Army duties. Therefore, TRADOC has begun offering course content and training material via these devices, heavily dominated by Android and iOS. Soldiers also want the flexibility to use their personal smart devices to avoid carrying multiple devices and still have access to a full range of features versus the limited subset of capabilities available from a locked-down government furnished equipment (GFE) device.

f. All **Applications** developed within TRADOC are required to follow DOD, HQDA, and TRADOC policies, directives, and regulations in order to protect sensitive data; preserve privacy; ensure content accuracy, releasability, and appropriateness; and ensure the mobile products’ functionality, performance, reliability, and availability.

g. Developers within the learning enterprise vary in skill, tool sets, and exposure to mobile content development (i.e. Java, Java Android, HTML, JavaScript, and mobile web). The Mobile Division, DDL team is responsible for training shortfalls identified for mobile application (mApp) development teams. The Mobile Division will provide necessary governance to comply with HQDA and DOD policy and provide development training, a

development capability, and commercial, DOD and TRADOC hosting environments via approved, centralized licenses. Periodic updated training and tool sets will be provided to these identified teams when deemed necessary by the Mobile Division.

h. TRADOC schools and CoEs **End Points** are a mix of mobile and desktop/laptop devices, all with a variety of platforms and ownership models. Traditionally, the Army performs training and education on Windows desktops/laptops. However, that is changing with the adoption of newer versions of operating systems, internet of things, Wearables (GFE, Private), (Thick Client, ThinClient, ZeroClient and the incorporation of mobile form factors such as tablets and phones.

Why In-House Development?

To develop and maintain an in-house development effort, training, and education managers must understand the scope of this undertaking and answer a basic question of why they are pursuing this path. The first decision points for in-house development should involve a reasonable examination of the goals and objectives of such a move, i.e.,

- *Why would in-house development be advantageous for the Army?*
- *What problem(s) would in-house development solutions for our organization?*
- *Would in-house development produce better, more effective mobile products?*
- *Would in-house development be more cost-efficient than contracting for mobile products?*
- *Does the staff hold the requisite technical skills for such development?*

All of these questions, and associated characteristics, should be analyzed when trying to determine the best course of action for your particular school or agency. Some decision factors to consider might include:

Flexibility – The capability to design and develop mobile products for multiple audiences, purposes, and platforms, depending on current proponent requirements, and the capacity to shift development priorities if proponent needs change.

Responsiveness – The capability to respond to changing proponent needs for mobile products, especially the capacity to rapidly update and modify existing mobile content and learning materials based on lessons learned.

Timeliness – The capability to provide specific, mobile learning products within a relatively short timeframe (3-6 weeks) as opposed to the extended timeframes associated with contractual products (typically, 6-9 months or longer). Timelines, as one would expect, are fluid based on the type of product being developed.

Cost containment – The potential capacity to save money on mobile products by producing them internally, especially as staff becomes more proficient throughout several mobile projects, i.e., to achieve a better return on investment (ROI) for the products over time.

Design options – The capability to develop mobile products that reflect different approaches to design, instead of relying on a single, contractor-provided design template --- e.g., to help proponents create learning objects that can be re-used in different mobile products.

Availability of new tools – The capabilities of new, user-friendly, content authoring tools allows in-house staff to create and develop quality mobile products not previously obtainable by non-programmers.

Table 1-Development Options

<i>In-house development</i>	<i>Outsourced development</i>
<i>You are in direct control of development time</i>	A fixed-term commitment
<i>Your staff will enhance their skills</i>	No resources to re-allocate after the project
<i>Development over several mobile projects should be cheaper</i>	The expertise already available in project management, course design, and so on
<i>Maintenance of mobile product should be easier</i>	More aware of recent industry developments
<i>Fewer copyright problems should arise</i>	Maybe more credible than internal mobile developers
<i>The tools are better and easier to use</i>	Access to the <i>latest</i> specialized software
<i>Likely to produce mobile products faster</i>	The current mobile financial model supports this method

Development options can be useful, for example: mobile managers need to be careful that in-house development activities do not leave them vulnerable to “in-breeding” of organizational bias and agency imperfections (Dodds, 2006). To illustrate, Army mobile operations compel an in-house development team to be attentive to business practices found in TRADOC Pamphlet 350-70-12, Section 508 Standards, and local network standards and practices.

If timeliness is an important proponent consideration for in-house development, then proponents must have some practical understanding of what amount of development time might be required for typical projects. A simple information driven app can take approximately a week to develop, while a higher interactive application involving models or maps may span anywhere from a Moderate (24 weeks) to Complex (40+ weeks).

Finally, it is important to note that the ultimate decision to build in-house development capacity within your organization is NOT necessarily an “all or nothing” decision. It is likely that some projects in the future will require external support for various reasons, and that any shift to in-house development may become a mixed operational model. Additionally, recent versions of Army AVLE task orders and templates have made incremental development of smaller mobile products and learning objects more feasible should the option be necessary.

Minimum Essential Requirements of an In-House Mobile Development Team

Personnel – How many and what kind of personnel do you need to conduct practicable in-house development operations? The development team needs to know what products are required and when, and how products in the user organization look and function. The implementation team has personnel with specific responsibilities is needed to implement the courseware.

Today, the most relevant composition for a typical configuration would involve the following labor categories that represent skillsets:

Labor Category
Software Developer (Digital Learning Content Object Applications)
Instructional Designer and Technologist
Multimedia Artist and Animator
Admin (QA Processor)
Subject Matter Expert
Editor
Narrator/Scriptwriter
Visual Information Specialist
Training Specialist
Training Technician
<i>Computer Systems Engineer/Architect (Section 508 Conformance)</i>
<i>Computer Programmer (Desktop or Notebook Simulations)</i>
<i>Video Game Designer (Serious Gaming, AR and VR)</i>

Table 2 Industry Labor Categories

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The mApps developer position may be somewhat problematic concerning the GS position classification structure. While the user experience (UX) designers decide how the user screens and buttons will work, what ensures the user experience is determined by simple and clear app navigation free of faulty design, excessive bugs and lack of focus on functionality. The user interface (UI) is related screen design, storyboard, and script development, etc. All elements related to the soundness of the experience.

Skill Sets – Beyond the minimum essential personnel, what specific skill sets are required to conduct practicable in-house development operations? As a useful starting point, GS position classification information is helpful for general occupational information and job duties typically associated with the classifications (see “Federal Classification and Job Grading Systems” at the Office of Personnel Management website at: <http://www.opm.gov/fedclass/>). For example:

GS-1701 – Supervisory general education and training: professional work in the field of education and training, by a person that accomplishes work through the direction of other people. The program segment or work directed is administrative, technical, complex clerical, or comparable in nature. The functions, activities, or services provided have limited geographic coverage and support most of the activities comprising a typical agency field office, an area office, a small to medium military installation, or comparable activities within agency program segments.

- Plan and schedule ongoing production-oriented work on a quarterly and annual basis, or direct assignments of similar duration.
- Adjust staffing levels or work procedures within their organizational unit(s) to accommodate resource allocation decisions made at higher echelons.
- Justify the purchase of new equipment. Improve work methods and procedures used to produce work products.
- Oversee the development of technical data, estimates, statistics, suggestions, and other information useful to higher level managers in determining which goals and objectives to emphasize.
- Decide the methodologies to use in achieving work goals and objectives, and in determining other management strategies.
- Act as primary interface for DDL, Mobile Division to ensure all artifacts are received, signed, returned and prepared prior to app delivery for vetting and publishing.

Supervision and oversight at this level requires significant and extensive coordination and integration of a number of important projects or program segments of professional, scientific, technical, managerial, or administrative work comparable in difficulty to the GS-12 level. Supervision at this level involves major recommendations which have a direct and substantial effect on the organization and projects managed.

GS-1750 – Instructional Systems Specialist: Professional positions, the duties of which are to administer, supervise, advise on, design, develop, or provide educational or training

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services in formal education or training programs. The work requires knowledge of learning theory and the principles, methods, practices and techniques of one or more specialties of the instructional systems field. The work may require knowledge of one or more subjects or occupations in which educational or training instruction is provided.

Instructional Systems Specialist with an emphasis on Instructional Design duties:

- Determine the learning objectives and task learning relationships, cluster learning events, organize course content, and develop instruction design plans;
- Analyze learning problems, select teaching strategies using appropriate models, and develop course plans using this information;
- Identify tasks that can be efficiently and effectively supported by job or skill performance aids;
- Select suitable performance measures or develop new measures required to document effectiveness;
- Develop learning maps and perform learning analyses from the initial training levels through the operating levels of tasks or jobs;
- Derive performance objectives and criterion test items; and
- Use a systems approach to training.
- Act as secondary (or in the absences of a 1701, primary) interface for DDL, Mobile Division to ensure all artifacts are received, signed, returned and prepared prior to app delivery for vetting and publishing.

Instructional Systems Specialist with an emphasis on Instructional Materials Development duties:

- Plan and organize the work, determine possible sources of information, and conduct fact finding;
- Develop or revise the specific content, organization, style, format, emphasis, and treatment of each segment of the instructional courses or systems; and
- Develop finished products including lesson plans, training texts, television programs, programmed texts, or computer-assisted instruction.

NOTE: Preparing lesson plans, course outlines, bibliographies, etc., are normal functions of a teacher or instructor. The function of instructional materials development goes further and may involve preparing complete narrative texts covering the courses or units, supplemental study guides, instructor's manuals, case studies, or practical exercises to be used with the texts.

GS-1084 – Visual Information Specialist: Persons who perform work involved in communicating information through visual means. Work in this series includes the design and display of such visual materials as photographs, illustrations, diagrams, graphs, objects, models, slides, and charts used in books, magazines, pamphlets, exhibits, live, or video-recorded speeches, or lectures, and other means of communicating. The work requires knowledge of and ability to apply the principles of visual design; knowledge of the technical characteristics associated with various methods of visual display; and the ability to present

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subject matter information in a visual form that will convey the intended message to, or have the desired effect on, the intended audience.

Some positions combine visual information work as described above with personal production of finished illustrations, exhibits, and other visual products. This is particularly the case at small agencies utilizing a "generalist" approach in their visual arts organizations. These mixed positions are classified in this series when the work involves the design, production, and display of a variety of visual materials requiring a broader knowledge of the principles and techniques of visual design than is associated with the more specialized fields of illustrating, photography, or exhibits construction. Visual information is most commonly communicated by means of printed material, exhibits, and oral presentations.

- Printed material includes books, pamphlets, magazines, newspapers, posters, and other similar material that is reproduced by one of the printing processes.
- Exhibits may be either two- or three-dimensional and, in addition to printed material, make use of models, artifacts, specimens, dioramas, murals, audiovisual presentations, and electronic devices that permit viewers to access desired information or activate a display.
- Presentations generally consist of formal speeches, briefings, or training lectures using visual materials presented to the audience in the form of photographic slides, overhead transparencies, flip charts, and posters.
- Act as primary interface with DDL, Mobile Division for app graphic interfaces to ensure pantone colors, sizes and press kits espoused by the Department of the Army and established commands or bases are followed in the design of each app as mandated by the mobile process.

Regardless of the means of communication used, visual information specialists do not determine the subject matter content of the material, nor do they decide the audience to which the information is to be presented. However, they must be familiar with audience characteristics such as attitudes, age, and educational and interest level to select those visuals that are best suited to the intended audience. When suitable visual material is not available, they decide its basic content and form and arrange to have it produced by an illustrator, photographer, model maker, or another type of craftsman, or they may produce it themselves.

GS-2210 – Information Technology Specialist (Applications software specialist): Work that involves the design, documentation, development, modification, testing, installation, implementation, and support of new or existing applications software.

Functions commonly performed by employees assigned to this specialty may include:

- Analyzing and refining systems requirements;
- Translating systems requirements into applications prototypes;

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- Planning and designing systems architecture;
- Writing, debugging, and maintaining code;
- Determining and designing applications architecture;
- Determining output media/formats;
- Designing user interfaces;
- Working with customers to test applications;
- Assuring software and systems quality and functionality;
- Integrating hardware and software components;
- Writing and maintaining program documentation;
- Evaluating new applications software technologies; and/or
- Ensuring the rigorous application of information security/ information assurance policies, principles, and practices to the delivery of application software services.

Some specific information technology functions related to mobile applications and mobile devices (whether GS-2210 or GS-1550) might include:

- Develops mobile applications for Android, iPhone, Windows Mobile smartphones and other devices such as iPad, Galaxy Tab, and Microsoft Surface;
- Demonstrates proficiency in multiple programming languages including, but not limited to, Java, C, C++, Objective-C, Windows Mobile, Blackberry, and Symbian;
- Supports and enhances existing applications to ensure maturity for products on the iPhone, iPad, Android, Blackberry, PSP, Palm, and other emerging mobile platforms; and,
- Creates application prototypes with new features or entirely new applications on current and future mobile platforms.

GS-1550 – Computer Sciences Specialist: Professional positions which primarily involve the application of, or research into, computer science methods and techniques to store, manipulate, transform or present information by means of computer systems. The primary requirements of the work are (a) professional competence in applying the theoretical foundations of computer science, including computer system architecture and system software organization, the representation and transformation of information structures, and the theoretical models for such representations and transformations; (b) specialized knowledge of the design characteristics, limitations, and potential applications of systems having the ability to transform information, and of broad areas of applications of computing which have common structures, processes, and techniques; and (c) knowledge of relevant mathematical and statistical sciences.

Typical functions performed by Computer Scientists include:

- Development of software systems using knowledge of techniques, procedures, and processes such as operating system theory, data structures, computer system architecture, Software engineering, and computer communications.
- Development of computer graphics systems using knowledge of graphic display systems, general-purpose graphics languages, and optimization techniques involving

preprocessors graphical algorithms, memory management methods, and high-speed communication links.

- Development of integrated computer systems using a knowledge of:
 - computer software concepts such as data representation, data structures, file systems, operating systems, computer languages, software development methodologies, and network protocols;
 - computer hardware concepts such as computer architecture, computer communication systems, peripheral control systems, and bus architectures; and
 - mathematics such as calculus, mathematical analysis, probability, linear algebra, statistics, discrete structures, and abstract algebra.

GS 1071 – Audiovisual Production Specialist: Positions that involve supervising or performing work in the production of videotaped and live television programs; live and prerecorded radio broadcasts; motion picture films; broadcast type closed circuit teleconferences; and other similar productions, such as slide shows with sound accompaniments. The work requires the ability to plan, organize, and direct the work of writers, editors, actors, narrators, musicians, set designers, audio and lighting technicians, camera operators, and other associated technical personnel to produce, select, and arrange the actions, sounds, and visual effects required for the finished production. *Audiovisual Production Specialist* is the authorized title for non-specialized positions involved in a variety of functions during different phases of a production to include directing, editing, scriptwriting, camera operating, set lighting, and video electronic graphics. All positions in this series require some degree of creative ability in communicating information through audiovisual means. The grade level criteria assume the possession of a basic degree of creative talent necessary to perform the work.

The labor categories listed above in Table 2, do not quite fit the GS structure or position descriptions. However, there are recommended equivalents. The information technology specialist (GS-2210) or the computer scientist (GS-1550) titles are the suggested classifications. As noted previously, new content authoring (rapid E-Learning) tools may not necessarily require high-level, computer technology programming skills. This particular position and GS classification on the in-house development team should remain adaptable and responsive to local needs and requirements.

<i>Labor Category</i>	<i>GS Equivalent</i>
<i>Project Manager</i>	GS 1701
<i>Software Developer (Digital Learning Content Object Applications)</i>	GS 2210
<i>Instructional Designer and Technologist</i>	GS 1750
<i>Multimedia Artist and Animator</i>	GS 1084
<i>Admin (QA Processor)</i>	GS 0301
<i>Subject Matter Expert</i>	GS 1712

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<i>Editor</i>	GS 0301
<i>Narrator/Scriptwriter</i>	GS 1750/1712
<i>Visual Information Specialist</i>	GS 1084, 1071
<i>Training Specialist</i>	GS 1712
<i>Computer Systems Engineer/Architect (Section 508 Conformance)</i>	GS 1550
<i>Computer Programmer (Desktop or Notebook Simulations)</i>	GS 1550
<i>Video Game Designer (Serious Gaming, AR and VR)</i>	GS 1550

Table 3 Comparison of Labor Categories and GS Equivalents

The Importance of SMEs

The SME requirement will probably vary from project to project, both in terms of actual numbers of SMEs required as well as the type of SME required by the content area to be developed. Part of the difficulty in making an in-house development effort work will be the search for, and availability of, SMEs to work on time-constrained projects. In an out-sourced development project, that effort is typically built into contractual language and project specifications --- in which the contractor is responsible for securing appropriate SMEs.

Complementary competencies

Complementary competencies required by in-house development team members *in addition to* the duties and knowledge, skills, and abilities (KSAs) outlined within the appropriate position classifications fall into three broad categories: administrative competencies, educational competencies, and technical competencies. While not *all* members of the in-house development team need to possess each competency, at least one person on the in-house development team needs to be skilled in each aptitude. Preferably, several members of the team should be proficient in several of the competencies for redundancy purposes and to cover extended absences of team members. Clearly, some of the following competencies overlap with the above GS position classification descriptions; however, they are worth mentioning as specific, practical considerations when launching an in-house development team:

Administrative competencies would include: project management skills, planning skills, costing and budgeting skills, small group interaction skills, client management skills, interviewing skills, liaison skills, quality control skills, and general writing and communication skills.

Educational competencies would include: task analysis skills, training needs analysis skills, subject matter research skills, assessment and evaluation skills, interactive questioning skills, script writing skills, and storyboarding skills.

Training – If existing personnel do not possess the required skillsets for in-house development, what types of training might be useful to enhance their design and development capabilities? Since technologies, software, and equipment change over time, how will you keep your in-house development team up-to-date on the latest knowledge and skill sets necessary to operate efficiently and effectively? How will your in-house development team improve their skills? All of these issues suggest that you will need to consider a training strategy as part of your in-house development efforts. As part of that training strategy, the team leader will need a way to evaluate the technical skill levels of various team members, and monitor those skill levels over time (Shinder, 2006). The team leader will need to establish reasonable timeframes for training activities of team members, and in a small organizational setting, be willing and able to sometimes postpone production activities in favor of training activities. Again, contrasting this without-sourced, contractually developed mobile products, a contractor is paid to *produce* and supply already trained personnel for the task as part of the process, i.e., training is something that you buy “up-front” with the contract.

Web Resources

Requirements for mobile applications change annually as operating systems update. These changes can cause frustration and product disorientation. DDL is attempting to support smaller decentralized teams with assistance in their roll in the process as well as some initial items to think about as you develop for each platform. For immediate information related to guidelines and questions, you can reach out directly to the DDL, Mobile Division team at the website below. Otherwise, here is a small sample of guidelines an in-house development team can utilize for the mission:

- DDL, Mobile Division Division: Process paperwork and guidelines (<https://tadlp.tradoc.army.mil/mobile/index.html>)
- Apple iOS Developer Guidelines (<https://developer.apple.com/app-store/guidelines/>)
- Google Developer Guidelines (<https://play.google.com/about/developer-content-policy/>)

The Process

The development must begin with some clarity so all stakeholders are on the same page. The Mobile application nomination and development process in-house developers claim responsibility for is depicted in Figure 1. This is only a part of the process mobile products must follow when developed for TRADOC and DDL. Part of the process is registration and identification as well as development. The registration element makes DDL aware of the product, prevents duplication of effort, and is notification of future vetting by DDL.

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Figure 1 In-House Dev Mobile Application Responsibilities

Part of the DDL Mobile Division registry process is evaluation of whether a mobile application is truly needed, the proponent team should follow these recommended steps for six main components of a project before they start the actual task of application development:

1. Value to the mission. Who is the audience? What is the age of this intended audience? What problem would the app solve? What features are needed? Will it be of value to the identified community?
2. Project scope. What are the constraints or limitations? Is the whole team required? What date is the product required? What happens if there is slippage? Project scope is very important and provides clarity and focus.
3. Technical specifications. These detail the platforms on which the app runs, and the versions of the OS supported by the app.
4. Sketches and wireframes. These make explicit the relationship between different features and functionality. They also illustrate the action-response sequence.
5. Asset creation. What assets will be used in the app? Do they have to be created or are they already available? What are the supported sizes for icons, screen shots, what are the required keywords?
6. Ensuring security and safety of information. For the compilation of information in an app is it still suitable for public release? What would happen if a foreign country were to download the app from the public market? Does information transmittal via the app keep the user's data safe? Who are your station SMEs in your approval line who can assist in the assurances of this safety?

Types of Mobile Apps

Once you have a decision to develop a mobile app, the correct determination of the type of app is the next step. There are three basic types of apps:

1. Native Apps – native apps derive their presentation and logic from platform-specific APIs. For example, native Android apps use a Software Development Kit (SDK) for Java code, and a Native Development Kit (NDK) for C and C++ code; both the SDK and NDK produce native APIs for the Android platform. Native apps provide the best performance among all the apps.
2. Web Apps – Html 5 web apps can be accessed on a mobile device or desktop machine through a browser. Web apps are not truly mobile apps and do require connectivity with the internet. Code is written using HTML5, JavaScript, and CSS, providing a rich user experience.
3. Hybrid Apps - HTML5 hybrid apps combine web apps with lightweight native code wrapping performed through certain JavaScript libraries. As with web apps, the code is written using HTML5, JavaScript, and CSS as well as the ability to access some APIs, extra libraries, and hardware on the device.

Source: DDL, Mobile Division Content Development Strategy Recommendations, MITRE, Northam, McRae, & Asher, Sep 2015

Vetting Mobile Apps.

Vetting refers to the process of identifying all functions within an app; ensuring software meets a specified level behavior, and/or fulfillment of specific requirements. Implicit in the description of this vetting concept is the overarching need for a “qualified” process - one that is formal, has the input of agencies across DDL, and is aligned to a set of specified standards and expectations. As oversight and advocate in the vetting process the personnel in the DDL, Mobile Division team are knowledgeable individuals skilled in identifying threats and risks in mobile code.

The primary goal of the vetting process is to provide a method by which a proponent or station can leverage analysis of mobile apps to provide transparency, traceability, and the ability to quickly consume the information.

While DDL is responsible for the vetting and publishing of mobile applications for TRADOC. It is important to understand the rigors of the process. Mobile applications are tested in three categories, which combine automated and manual processes:

1. Static Analysis. Static Analysis evaluates the source and binary code of a developed mobile app. The analysis attempts to identify all possible issues that could occur within the app.

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2. **Dynamic Analysis.** Dynamic Analysis evaluates the execution of the mobile application. This analysis attempts to identify all possible issues that could occur as the app executes its intended purpose. Dynamic analysis is interested in how the app interacts with the physical device in which it is installed, as well as how it executes connectivity to other outside resources and locations.
3. **Behavioral Analysis.** Combines elements of Static and Dynamic Analysis. As the name would suggest, this type of analysis evaluates possible malicious behaviors involved with the execution of a mobile app, such as certain mobile applications accessing contact lists or camera.

Per guidance given to TRADOC and Directorate, Distributed Learning of Army University during their Audit of Army mobile efforts, the Army Audit Agency mandated these process of TRADOC be given to DA CIO G6 for GOSC level integration and execution of the processes be done by the DDL, Mobile Division team on their behalf.

The result of this integration is PM Army Mobility acting as Authorizing Official of processes and mobile application release, and DDL Mobile Division tasked with ensuring all command mobile applications were vetted properly based on level of release and approved by PM before publishing on the centralized Army licenses. Mobile applications are grouped into two categories: Managed and Unmanaged Applications, as defined below.

1. Unmanaged (UNCLASS Public Mobile Apps Vetting)

- a. Also identified as UNMANAGED apps. The mobile device user obtains these applications from the device's native mobile application store. These applications do not have access to DoD information or DoD information systems in which the mobile device may contain, connect, or communicate. These applications are segregated by the enterprise management system, which controls the devices' capabilities. Examples of these types of applications include weather, restaurant, and public news applications.
- b. Army organizations submit all developed applications to TRADOC/DDL Mobile Division for vetting and release to identified commercial marketplaces.
- c. UNCLASS Public mApps are vetted by the DDL Mobile Division and approved by PM Army Mobility for NIAP compliance and cybersecurity assurance, and then passed via centralized DDL, Mobile Division license to commercial mApp providers such as Apple and Google.

2. Managed apps (UNCLASS CUI Apps)

- a. Also identified as MANAGED apps. These products are controlled and installed by a DoD enterprise management system (e.g. Mobile Device Management, Enterprise

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Mobility Management, Mobile Application Management), applications and/or have access to DoD Controlled Unclassified Information (CUI) or connect to DoD systems that contain CUI. These applications are segregated from unmanaged applications and unmanaged data on the device. These applications may be commercially available through the device's native mobile application stores (e.g. Apple Store, Google Play) or government developed/sponsored.

b. DISA recognizes PM Army Mobility as the primary mApp vetting source for the Army and DDL Mobile Division as Command level mobile team related to UNCLASS CUI mApps. As with UNMANAGED apps, MANAGED mApps must be put through the rigors of the appropriate vetting processes by these entities and released on the centralized license held by them.

c. UNCLASS CUI mobile apps are required to have more stringent IT security controls that meet National Security Agency (NSA) National Information Assurance Partnership (NIAP) standards, per the NIAP Protection Profile for Application Software and the Mobile Device Fundamentals.

d. NIAP Approved GFE mobile devices are required to download and install UNCLASS CUI mobile apps.

e. The NIAP Protection Profile for Mobile Device Fundamentals, Version 2.0, September 2014 provides the requirements for IT Security for GFE Mobile Devices.

Mobile applications that process UNCLASS CUI (FOUO) data are considered to be operating in a restrictive environment, such as DoD and U.S. Army network boundaries. UNCLASS CUI mobile applications and data are governed by DoD and U.S. Army security policy. An Army security official, a Designated Accrediting Authority (DAA), is responsible for implementing IT security controls for these apps and is responsible for the continued monitoring of IT security controls during the lifetime of the application.

Such applications would be accessed only on GFE mobile devices (devices owned, managed, secured, and monitored by the government). UNCLASS CUI applications are accessed by DoD and U.S. Army personnel with the appropriate security clearance and need to know, per DoD and U.S. Army policy. These applications are expected to use approved cryptography in the application, as well as IT security controls such as authentication, authorization, access control, auditing controls, and other security controls. All of these considerations are part and parcel of the TRADOC/DDL Mobile vetting process and give proponent/agencies cybersecurity assurances otherwise not available with contractor or outside agencies.

(8) UNCLASS CUI mobile apps and data would be expected to provide the following IT security protections:

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- a) Confidentiality
- b) Integrity
- c) Availability

(9) The DoD and U.S. Army Risk Management Framework follows the NIST security control requirements. The general NIST security control categories (families), which have detailed IT security controls within each family, are as follows:

- a) System and Communications Protection.
- b) System and Information Integrity.
- c) Media Protection.
- d) Access Control.
- e) Identification and Authentication.
- f) Audit and Accountability.
- g) Incident Response.
- h) Configuration Management.
- i) Maintenance.
- j) Personnel Security.
- k) Program Management.
- l) Security Assessment and Authorization.
- m) Risk Assessment.
- n) System and Services Acquisition.
- o) Physical and Environmental Protection.
- p) Planning.
- q) Awareness and Training.
- r) Contingency Planning.

The mobile app needs of agencies across DDL and the Department of the Army are extremely diverse, and very much based upon their respective missions. The Mobile Application Division at DDL is in the best position to interpret and assess mobile app code, allowing proponents and stations to assess its own mobile app requirements and use cases. It allows an agency to leverage the analysis and data provided to them through the process to reach a determination on mobile application limitations either within a mobile app or the development of apps by their team. The process described in this document is focused on reviewing an app's functional characteristics, and ensuring compliance with established security criteria, agencies receiving analysis information from other organizations will typically perform additional scrutiny to confirm alignment with their mission requirements.

As a result of the rapidly changing mobility landscape within the Department of the Army, different approaches are needed to combat threats and risks. There is a significant benefit to having skilled and knowledgeable analysts at DDL performing mobile app security vetting

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analysis and generating data that can be used by other agencies to make informed risk decisions regarding solutions to implement within their environments. The primary benefit of receiving vetting information derived from the DDL process is that it gets the final evaluation and approval to as many agencies as possible in the shortest period of time, potentially reducing the need for an agency to purchase or develop the full breadth of analytical skills needed for this type of analytical work. They also ensure adequate security and due diligence in performing a risk determination.

Mobile Application Approval Board

a. Mobile application process mandates Army learning products will be the responsible parties for reviewing or coordinating the review of all products for classification, foreign disclosure, public release, and copyright/proprietary materials/intellectual property IAW AR 25-55, The Department of the Army Freedom of Information Act Program, AR 380-5, Department of the Army Security Program, AR 380-10, Foreign Disclosure and Contacts with Foreign Representatives, AR 27-60, Intellectual Property, and DA Pam 25-40, Army Publishing Program Procedures. DoD 5400.11, DoD Privacy Program; AR 340-21, Army Privacy Program; and OMB Memo M-07-16, Safeguarding Against and Responding to the Breach of Personally Identifiable Information (PII), provide regulatory guidance in safeguarding PII. All elements are part and parcel of the registration process of mobile applications with the TRADOC/DDL Mobile division.

b. Security assurance activities and multiple content reviews occur during the ADDIE process. The content is reviewed initially by the proponent during the analysis phase and initial determination is made on the ability to release the mobile product outside of any restricted environment. The content is reviewed again after development to ensure there are no changes that may impact the ability to release the document outside any restricted environment.

c. The Mobile Approval Board conducts a final review of in house and contract developed mobile products IAW DoD, and DA policies, directives, and regulations and for externally developed mobile products that will be hosted on or linked from the TAG in order to ensure the appropriate steps were taken to:

- (1) Protect sensitive data.
- (2) Preserve privacy.
- (3) Review content for accuracy (proponent).
- (4) Review for ability to release the app outside of any restricted environments.

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(5) Review for appropriateness (proponent).

(6) Ensure mApp functionality/performance (proponent).

(7) Ensure reliability/availability.

d. The following paperwork is required to be submitted to the approval board: 1) Mobile Products Submission to Approval Board; Software Developer's Interview Questionnaire; and the IA Checklist. All supplied by DDL, Mobile Division over the course of the app development process.

e. The Approval Board requires staff representation for the following functions: Information Assurance, Public Affairs, OPSEC, and Staff Judge Advocate. Participants require the appropriate knowledge and authority to make decisions regarding the ability to release the app outside any restrictive environment. The developer is responsible for support and administrative (e.g., scheduling, agenda, minutes) requirements.

f. All required paperwork for proponents and sites will be made available on the TADLP website at <https://tadlp.tradoc.army.mil/mobile/index.html> and must be submitted upon initial discussions and app evaluation process.

One Team One Fight: Your Development Team

Taking on an effective mobile mission requires integration and teamwork at all levels. While in some cases the proponents and sites as the SMEs are able to develop and create effective products for their communities, the DDL, Mobile Division Team at DDL are here to ensure, at a higher level, the code is safe, registered, and validated for release. As mentioned in the “Know Your Environment” section, only through a cohesive process can an app create a perfect storm of learning and operational use that is safe to the user, and in some cases, their family.

a. The overall development process and activities at a high level include:

1. Analysis – Determine if:

- ✓ The task is proponent appropriate and technically feasible.
- ✓ It is legal.
- ✓ It replaces, reinforces, or supplements learning content.
- ✓ It meets priority requirement.
- ✓ Resources are available and approved.

2. Design – Translate topic lists into learning objectives, design assessment and evaluation plan, develop assessment and evaluation plan, determine required technical guidelines and standards for development, and develop final storyboards.

3. Develop – Convert outputs from design phase into finished product.

4. Implement – Implement mobile products IAW DOD and Army requirements for safeguarding information.

5. Evaluate – Validate training objectives are met, assure IA and legal requirements are met, and perform vulnerability assurance.

6. Maintain – Review annually and revise, update, or replace if needed; collect user feedback and make available to developer to refine/tailor mobile product based on user experience.

b. The overall development process and activities at a granular level are as follows:

Proponent/Site Decentralized Development Teams. Technology development personnel will follow all applicable regulations and guidelines on development of learning products and security of mobile applications.

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(1) These individuals work with the functional subject matter experts (SMEs)/app requesters to understand the requirement and assess its feasibility and priority.

(2) To ensure there are no duplicative app development projects across groups, developers will notify the Mobile Division to ensure there are no redundant efforts produced or in production. All mobile process paperwork (artifacts) will then be signed and completed for the TRADOC process prior to beginning development of the mobile app. On these artifacts decentralized developers will clearly identify when delivery of the app is expected and where it stands in the COE commander's priority for development. They will also identify clearly the development tools used to build the app for insight on issues with the process, should there be any. Return of these artifacts must take place within 10 days of receipt. Return of artifacts to decentralized developers related to missing information or questions related to return artifacts will take place within 2 business days of receipt.

Note: Previously developed mobile apps hosted on commercial storefronts or independently on the NIPR network, will not be grandfathered and require applicable artifacts and appropriate transfer memos signed and provided to Mobile Division per commercial marketplace requirements.

(3) Once approval to begin is established, decentralized developers will engage with the SMEs during the analysis phase of the ADDIE process and develop the product in close coordination with the functional SMEs.

(4) Decentralized developer team will perform the functional testing should the app be second (at decentralized developer site) or third party (contracted out by/on behalf of decentralized developer site) developed. As mentioned in the "Minimum Essential Requirements for an In-House Development Team" an understanding of adult learning theory at action officer level and assurance they understand the target audience and the desired learning outcome is highly recommended to perform this function. During this phase the decentralized developer will also test the app for basic functionality and to determine if it meets the desired outcome. They will provide feedback to the development team and SMEs, who together will make any required changes. This process may involve multiple cycles.

(6) The decentralized development team will validate in pre-test that the app tool used conforms to DA and DOD standards. When complete, the team will forward the app to the DDL, Mobile Division along with a summary and pictures/evidentiary support of the security pre-checks performed.

(7) DDL, Mobile Division will perform the security vetting, determined the app is safe, and validate with decentralized developers. The decentralized development team will then pass appropriate code formats to the DDL, Mobile Division team.

(8) Within the final week of each month, TRADOC Mobile will forward feedback from users on the app to decentralized developers. This feedback will include the

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number of users, any technical issues, and any content issues on the app. Decentralized developers will update any apps requiring change within one month and deliver the app to DDL, Mobile Division for re-vetting and publishing under the centralized license.

DDL, Mobile Division:

(1) This division will program their security vetting mission based on apps that decentralized developer notifies them they are developing based upon command priorities.

(2) Once the Mobile Division receives an app, they will review the pre-checks performed by decentralized developers and validate receipt within 24 hours of delivery (2 business days).

(3) Mobile Division will complete a final security check within 10 business days, and discuss any issues prior to publishing to the TRADOC centralized license.

(4) If other issues are found (e.g., formatting, etc.), DDL, Mobile Division will provide recommendations to decentralized developers, within 24 hours of discovery. Remaining consistent with decentralized developer's responsibilities, reply and rectification of these issues should take place within 10 business days of receipt.

(5) Once DDL, Mobile Division performs the security vetting, determines the app is safe, and validates with decentralized developers, they will publish the app in appropriate locations identified in initial artifact documentation.

(6) Within an established quarterly or monthly timeline, the Mobile Division will forward feedback from users on the app to decentralized developers. This feedback will include the number of users, any technical issues, and any content comments/issues.

Software/Tools – Which software or other technology tools will the organization be required to purchase or license to effectively support in-house development efforts? Which software or technology tools match the development tasks, personnel, and skillsets in your organization? Software languages include but not limited to multiple Java, C, C++, Objective-C, Windows Mobile, and Symbian. Software supports and enhances existing applications to ensure maturity for products on the iPhone, iPad, Android, and other emerging mobile platforms; and creates application prototypes with new features or entirely new applications on current and future mobile platforms. All tools should be identified (including version number) in the registration/artifact gathering process with TRADOC/DDL Mobile team. If you are unsure what tools you should use before starting your team or your team's programming, please contact the DDL, Mobile Division team at usarmy.jble.CAC.mbx.atssc-tradoc-mobile@mail.mil

Facilities/equipment – What dedicated facilities and equipment will be necessary to support in-house personnel? In general, in-house development will involve the agency purchasing many new items that are usually part of a contractor's overhead. The expectation is that the new facilities and equipment resources can be amortized and depreciated over time, i.e., that the cost/benefit should favor in-house development in an extended timeframe (...a better Return On Investment).

Workspace – While current staff may have an adequate workspace, creating an in-house development team will likely involve adding more staff members (more workspaces) and also spawning a need for improved workspace configurations, a conference/meeting room, storage rooms, better lighting, soundproofing, etc. Additions and/or improvements to in-house development team workspaces will, as might be expected, require additional fiscal commitments.

Furniture – Additional in-house development team members will also require office furniture, and existing staff may benefit from upgraded desks and work surfaces, chairs, etc. Special equipment (below) may require special furniture.

Equipment – Investments in new equipment for the in-house development team will consume substantial, up-front, financial resources. In-house development team members will require (and benefit from) high-end computer workstations, with (multiple?) large, high-resolution video displays. (The graphics designer may require an Apple workstation for design and/or graphics software? A mobile applications developer must have an Apple workstation/ laptop to develop iPhone and iPad Applications.) Other equipment needs may include digital cameras and other related photography equipment, video cameras, audio equipment, a projector for the conference room, scanners, high-quality color printers, copiers, high-capacity external drives, and dedicated servers.

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Supplies – Finally, the budget for supplies and other office disposable items should also be increased, as computer paper, ink, imaging paper, DVDs, graphics tools, etc. for the in-house development team will expand (and shift from external contractors).

A typical in-house development team software, tools, and equipment “shopping list” may include some of the following items:

<i>Upgrade government workstations to run selected in-house development software, as necessary</i>	<i>High capacity storage media</i>
<i>Software to design and develop content, e.g.:</i>	<i>Image and/or document scanners</i>
<i>Adobe Creative Cloud</i>	<i>High-end printers</i>
<i>Unity</i>	<i>Digital cameras and other supporting photography equipment</i>
<i>Captivate 360</i>	<i>Digital video equipment</i>
<i>Camtasia</i>	<i>High quality microphones</i>
<i>Adobe AIR</i>	<i>Miscellaneous cables, connectors, etc.</i>
<i>PhoneGap</i>	<i>Various digital devices and platforms to “test” content delivery</i>
<i>Mac OS and Xcode</i>	

Table 4 Development Tools