Grading Rubrics for software application

Evaluation Matrix for Mobile Application Development			
Software Application	1. Feasibility	2. Effectiveness	3. Private Competition
Program (50 pts)	**(Excellent)**	**(Good)**	**(Fair)**
Program execution	Program executes correctly with no syntax or runtime errors (9-10)		Program executes with a minor (easily fixed error) (2-3)
Correct output	Program displays correct output with no errors (9-10)	Output has minor errors (6-8)	Output has multiple errors (3-5)
Design of output	Program displays more than expected (7-8)	Program displays minimally expected output (5-6)	Program does not display the required output (3-4)
Design of logic	Program is logically well designed (9-10)	Program has slight logic errors that do no significantly affect the results (6-8)	Program has significant logic errors (3-5)
Standards	Program is stylistically well designed (6-7)	Few inappropriate design choices (i.e. poor variable names, improper indentation) (4-5)	Several inappropriate design choices (i.e. poor variable names, improper indentation) (2-3)
Documentation	Program is well documented (5)	Missing one required comment (4)	Missing two or more required comments (2-3)
Evaluation Matrix for Mobile Application Development			
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Mobile Application Concept Development
Evaluation Guidance Document

Evaluation Process

This document provides guidance to members of the Mobile Application Review Committee (MARC) responsible for the evaluation and approval of mobile application, or mobile app, concepts. A mobile application, or mobile app, is any native (downloadable) or Web application specifically designed to be accessed and utilized on a handheld mobile device, such as a cell phone, smart phone, or portable digital assistant (PDA).

The native mobile application evaluation process addresses five criteria, representing the five major factors EPA should consider when developing native mobile apps. Each criterion is defined below, followed by a series of guidance questions meant to assist evaluators in completing the Native Mobile Application Development Evaluation Form. MARC may also consult with technical experts and the Office of General Council throughout the evaluation process.

1. Feasibility: The degree to which it is possible to develop the app or app component.

Acquiring the Necessary Data:
Guidance Question: Does the data exist and is it available to EPA?
- If developers cannot access the data or the data does not exist, the mobile app is not feasible. There may be security, technical, or legal barriers to acquiring the data or using it as intended. Decision-makers should decide whether or not to pursue a strategy to obtain the necessary data to complete the evaluation.

Guidance Question: Is the data current? How frequently is the data updated?
- If the app relies on data that is not current or which updates infrequently, a higher level of scrutiny should be applied as to whether users could misinterpret the data/content and to whether the mobile app concept can be fully realized. If the data does not clearly convey the intended message, the mobile app is not feasible as designed.

Maintaining Conceptual Integrity on Mobile Platforms
Guidance Questions: Can the app run quickly enough on a mobile platform to maintain its conceptual integrity? Will the app have to be significantly modified on the mobile platform due to technical constraints such as bandwidth or functional limitations?
- If implementation will significantly modify the mobile app, it is not feasible as designed. Proposals should be redrafted to reflect all technical constraints prior to development. Decision-makers should consider how technical modifications affect the conceptual integrity of the mobile app.

Maintaining Impartiality
Guidance Question: Is the mobile app for internal or external (public) use? If external, can the technology be adapted to multiple mobile devices?
- Consider the types of mobile applications and technologies available to meet the mission need and reach as wide an audience as possible. Mobile Web is the preferred platform,

and represents the minimum requirement for development, as mobile Web apps can be developed to render on multiple mobile devices. However, native smart phone apps may offer additional functionality and usability. Whether or not to develop native mobile apps will depend on the application requirements, the target audience, and the types of mobile devices accessed by target audience members.

- When developing native mobile apps for the public, careful consideration must be given as to which mobile platforms to utilize. External mobile apps should be accessible on multiple devices, reflecting the current state of the mobile device marketplace. The onus is on the application development team to demonstrate that the mobile platforms chosen for the development of an external mobile app accurately reflect the majority of mobile devices accessible to target audience members.

Ethics rules require that EPA maintain impartiality and not endorse any product, service, company, non-profit or other enterprise. If you intend to develop native mobile apps for smart phones, such as BlackBerry, iPhone, or Android, contact the Mobile Application Review Committee (MARC) to verify the current requirements regarding mobile development platforms. Below is a model to assist evaluators in rating feasibility. Submission forms and contact information for MARC can be found on the Web Guide.

Model for Rating Feasibility

• Major data elements do not exist or are not available to EPA; or, • The purpose of the mobile app may not be realized as designed because major data elements are not current or include infrequent updates; or, • Significant technical constraints will affect the conceptual integrity of the mobile app as designed for the chosen platforms; or, • Chosen platforms raise significant ethical issues concerning impartiality.	Low Feasibility
• Minor data elements do not exist or are not available to EPA; or, • The purpose of the mobile app may not be realized as designed because minor data elements are not current or include infrequent updates; or, • Minor technical constraints may require minor design modifications for the chosen platforms; and, • Chosen platforms do not raise ethical issues concerning impartiality.	Moderate Feasibility
• All data elements exist and are available to EPA; and, • The purpose of the app will not be affected by the currency of the data or the frequency of data updates; and, • No technical constraints exist on the chosen platforms that might otherwise affect the conceptual integrity of the mobile app; and, • Chosen platforms do not raise ethical issues concerning impartiality.	High Feasibility

2. Effectiveness: The degree to which the mobile app serves the target audience.

Evaluation Methods
Guidance Questions: What elements determine the effectiveness of a mobile app? What methods are available to evaluate effectiveness?

- Effectiveness is a measure of how well the mobile app will serve the target audience. To evaluate effectiveness, the application development team can forecast the size of the target audience in order to quantify the percentage of target audience members expected to access the mobile app. This method entails surveying statistically relevant samples of target audience members and requires considerable resources. Alternatively, evaluators can perform a qualitative evaluation based on the plausibility of mobile-user-scenarios and supporting evidence. The qualitative method is outlined in the following subsections.

- The size of the mobile-user audience will depend on the mobile app's content and functionality. However, demand for content on Web applications accessed from desktop and laptop computers, does not necessarily imply an equal demand for the same content accessed from mobile handheld devices. Several steps are necessary to evaluate the effectiveness of mobile apps.

Isolating the Target Audience

Guidance Question: What audience is the mobile app intended to serve? How many members of this audience have access to the necessary technology?

- Isolating the audience types for the mobile app is the first step in evaluating effectiveness. Mobile apps produced by government agencies can be categorized as intended for either of two general audience types and then sub-categorized further into multiple audience types. Below are some examples:
    1. Government Employees (Internal)
        - Management
        - General Staff
        - Program Field Staff
    2. Public (External)
        - General Public
        - Environmental Justice Communities
        - Educators
        - Research Groups
- After the audience types are identified, it is then appropriate to define the number of potential users within those groups who will have access to the necessary technology.[1] This process will define the target audience. Below are some examples:
    1. Smart phone users (as a percentage of the audience type)
    2. Smart phone users who access the internet with their device (as a percentage of the audience type)
    3. Users of a particular smart phone platform (as a percentage of the audience type)
    4. Text-message users (as a percentage of the audience type)
    5. Users of devices with cameras (as a percentage of the audience type)

Isolating the target audience can help decision-makers understand the potential effectiveness of the mobile app, in terms of what audiences the device is designed for and the percentage of those audiences that could actually access the app.

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[1] Technical journals and research organization such as Pew provide statistics on mobile phone user demographics and behavioral trends.

Mobile-User-Scenarios

Constructing mobile-specific user-scenarios is the next step in evaluating effectiveness. This process can aid evaluators in determining where, how, and why target audience members will use the mobile app.

Most successful mobile apps offer users one or both of the following: (1) dynamic content in concise and accessible formats, and/or (2) tools that are useful in mobile environments.

Guidance Questions: Does the mobile app provide the user with dynamic content that is regularly updated? How frequent are the updates? Is the content useful in mobile environments?
- Many mobile apps offer dynamic content that users want to access in mobile environments. The fact that such mobile apps provide frequent and convenient updates of high-demand content makes them successful and sustainable. Below are some examples of the types of content demanded in mobile environments.
  a. Updates based on environment (weather, climate, and traffic updates).
  b. Updates based on date/time (news, calendar, social-media, and stock-market updates).
  c. Updates based on events (social-media and calendar updates).

- Mobile Apps that do not provide dynamic content with frequent updates may offer functionality specific to mobile environments. However, users are less likely to download or access a mobile app that they are unlikely to use on a frequent basis.

Guidance Questions: Does the mobile app provide users with functionality or tools that are useful in mobile environments? Are the tools only useful in specific situations?
- Effectiveness depends on the mobile app's sustainability, or the users sustained use of the mobile app. If the tool is situation-based, decision-makers should scrutinize how frequently the target audience will encounter such situations, as well the tool's usefulness on a long-term basis. Below are some examples of mobile apps that provide utility in mobile environments.
  a. Multi-Situational: Usefulness is not bound to specific situations (games, reference apps)
  b. Situation-Based: Use and sustainability depends on how frequently a person encounters specific situations (driving directions, restaurant locators, tip calculators, carbon trackers, calorie counters).
- Situation-based tools provide utility in situations target audience members already encounter in mobile environments (i.e. someone who already exercises might utilize a calorie counter app). If target audience members do not already encounter situations where the mobile app provides utility, the mobile app risks being ineffective.

Guidance Question: Does the app concept include functionality unique to certain mobile devices, such as geo-location tools, date/time stamping, or incorporation of mobile cameras?
- Incorporating such tools does not guarantee a mobile audience, but could enhance the potential for securing specific audience types.

Evaluators should consider the elements summarized above when reviewing mobile-user-scenarios. If a mobile app concept does not include either (1) dynamic content with frequent updates or (2) tools that are useful in mobile environments, evaluators should apply additional scrutiny as to whether the mobile app is effective. Further, if the mobile app is a situation-based tool, it is important to ensure that target audience members will encounter the situations where the tool is useful. Evaluators should carefully scrutinize the plausibility of the suggested target audience, their access to the necessary technology, and the suggested mobile-user-scenarios.

Rating Effectiveness

Mobile-user-scenarios are a critical element in evaluating the effectiveness of mobile app concepts. Mobile-user-scenarios can help evaluators determine the likelihood of target audience members accessing and utilizing the mobile app, especially when analyzed in combination with the known characteristics of the target audience.

Guidance Question: How plausible are the mobile-user-scenarios considering the target audience?

- Based on how the mobile app's content and functionality are likely to appeal to target audience members, evaluators can assign an effectiveness rating to the mobile app concept. Below is a model to assist evaluators in rating effectiveness.

Model for Rating Effectiveness

• The mobile app does not include either dynamic content with frequent updates or tools that are useful to target audience members in mobile environments; or, • The main component of the mobile app is a situation-based tool useful in scenarios that target audience members will rarely or never encounter; or, • The mobile app content is not useful to target audience members in mobile environments; or, • The target audience and/or mobile-user-scenario were not accurately defined.	Low Effectiveness
• The mobile app offers concise dynamic content with frequent updates of information that some target audience members may find useful in mobile environments; or, • The main component of the mobile app is a situation-based tool useful in scenarios that some target audience members may encounter fairly frequently.	Moderate Effectiveness
• The mobile app offers concise dynamic content with frequent updates of information that many target audience members will find useful in mobile environments; or, • The main component of the mobile app is a situation-based tool useful in scenarios that many target audience members will encounter frequently.	High Effectiveness

- While mobile-user-scenarios can provide strong evidence to support or reject development and are useful in vetting out mobile apps that lack the essential elements for success, additional evidence may be considered in the evaluation.

Guidance Questions: Is there any other evidence that should be considered when evaluating effectiveness? Was there any attempt to directly engage members of the target audience? Are there statistical samples showing the interest of members of the target audience with which to quantify a mobile-user-audience?

- Ancillary evidence can be drawn from the popularity of similar or related mobile and Web applications, although the popularity of Web applications can be misleading and should be heavily scrutinized within the mobile context.

- Soliciting feedback from members of the target audience can provide additional evidence to either support or discredit mobile-user-scenarios. Below are some examples:
    1. Focus Groups (understanding trends)
    2. Surveys (statistical sampling)
    3. Online collaborative forums, such as blogs and wikis.

- Surveys of target audience members can produce statistically relevant samples from which to infer the percentage of likely users within that audience. By quantifying the percentage of likely users after a given period of time, evaluators can more accurately assess effectiveness and cost-effectiveness. For comparative purposes, evaluators can ask for the following information when statistical data is available:
    1. Description of the audience types
    2. Size of the target audience
    3. Report on survey analysis
    4. Forecasted mobile-user-audience after x months
    5. Formula and basis for calculation

Evaluating effectiveness is a multiple-step process and evaluators should carefully consider the plausibility of mobile-user-scenarios and weigh all evidence within that framework. This will allow for a comprehensive effectiveness evaluation.

3. Risk of Private Competition: The degree to which the government would have to compete for market share with private sector developers.

Guidance Questions: Is there a risk of private sector competition? What is the level of that risk?
- As mobile apps are relatively easy and inexpensive to develop, EPA could risk competing for market share with private sector developers. While EPA does not compete for profit, a risk of private sector competition could signify that developing the mobile app would be an inefficient use of government resources. Therefore, it is necessary to assess the potential for duplication in the private sector. However, risk of private sector competition is relative and depends on several factors. Below is a model to assist evaluators in rating the risk of private competition.

Model for Rating Risk of Private Competition

• Major components of the mobile app represent inherently governmental functions; or, • The mobile app is designed to serve needs specific to government employees; or,	Low Risk

• The data and content needed to develop the mobile app is not available to the public; or, • The mobile app has a low effectiveness rating.	
• No major components of the mobile app represent inherently governmental functions; and, • The mobile app is designed for public audiences; and, • The data and content needed to develop the mobile app is available to the public; and, • The mobile app has a moderate effectiveness rating or a mobile app already exists that offers similar content and functionality.	Moderate Risk
• No major components of the mobile app represent inherently governmental functions; and, • The mobile app is designed for public audiences; and, • The data and content needed to develop the mobile app is available to the public; and, • The mobile app has a high effectiveness rating or a mobile app already exists that offers duplicate content and functionality.	High Risk

Guidance Question: Can the mobile app concept be enhanced or modified to minimize the risk of private competition?

- Evaluators and decision-makers should carefully consider the risk of private sector competition, as it can affect the accuracy of effectiveness calculations. Recognizing the level of risk prior to development provides decision-makers and developers the opportunity to enhance or modify their mobile app concepts. If similar mobile apps already exist, developers and decision-makers may consider adding additional content or functionality to better serve the target audience. The risk of private sector competition should not automatically preclude government justifications for developing the mobile app. Evaluators should weigh the potential risks against other criteria, such as effectiveness and government justification.

4. Cost-Effectiveness: The relative cost to develop the mobile app.

Guidance Question: What is the total development cost to EPA? What methods are available to estimate cost-effectiveness?

- Representing the calculation of inputs over outputs, cost-effectiveness can be measured by the development cost divided by the forecasted audience size. This basic formula will produce a per user development cost estimate. Below is an example:
  - ➢ $30,000 (total cost) / 6,000 users (forecasted mobile-user-audience after six months) = $5 per mobile-user after six months.

- Recognizing that different mobile apps will have different target audiences and different goals, it may be more appropriate to utilize a cost-effectiveness formula that measures the percentage of the target audience served after a given period of time. Below is an example:

> ➤ $30,000 (total cost) / 15% (percent of target audience served after one year) = $2,000 per percent of the target audience served.

- More complex formulas can also be utilized, in order to appropriately weight target audiences that may justify higher costs per mobile-user. For example, certain underserved communities might represent high priority target audiences, justifying a greater financial investment per mobile-user served.

<u>Guidance Question</u>: Are the mobile app platforms intended for development the most cost-effective options for providing the target audience with the desired content and/or functionality?

- This evaluation process outlined in this document can be used to compare multiple methods of achieving the same outcomes. For instance, it may be possible to commit the same content to a smart phone app, a text-messaging service, and a Web page designed specifically for mobile browsing. By utilizing the evaluation process in this way, decision-makers can compare fluctuations in effectiveness and cost by comparing cost-effectiveness measures among multiple mobile platforms and technologies.

- The evaluation matrix below can be utilized as a comparative tool for evaluating the same mobile app concept using different mobile platforms. This can help decision-makers recommend the most appropriate platforms for development.

Evaluation Matrix for Mobile Application Development

	1. Feasibility	2. Effectiveness	3. Private Competition	4. Cost-Effectiveness
App 1				
App 2				
App 3				
App 4				