

# Testing, Promoting, and Launching a Mobile Application as an Extension Tool: A Case Study with *IPMPro*

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**SUMMARY.** Mobile device applications (apps) have the potential to become a mainstream delivery method, providing services, information, and tools to extension clientele. Testing, promoting, and launching an app are key components supporting the successful development of this new technology. This article summarizes the considerations and steps that must be taken to successfully test, promote, and launch an app and is based on the authors' experience developing two horticulture apps, *IPMPro* and *IPMLite*. These apps provide information for major pests and plant care tasks and prompt users to take action on time-sensitive tasks with push notifications scheduled specifically for their location. App testing and evaluation is a continual process. Effective tactics for app testing and evaluation include garnering focus group input throughout app development and postlaunch, in-house testing with simulators, beta testing and the advantages of services that enhance information gained during beta testing, and postlaunch evaluations. Differences in promotional and bulk purchasing options available among the two main device platforms, Android and iOS, are explored as are general preparations for marketing the launch of a new app. Finally, navigating the app submission process is discussed. Creating an app is an involved process, but one that can be rewarding and lead to a unique portal for extension clientele to access information, assistance, and tools.

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As the use of smartphones by farmers increases (Walter et al., 2011), apps are becoming a mainstream method for extension professionals to provide information to agriculture clientele. Many agricultural producers, Cooperative Extension Service agents and extension specialists work in remote, outdoor locations with limited access to traditional information resources. Unlike paper publications that can be cumbersome, the information contained within a mobile device app is portable and readily accessible. Depending on the type of app, information can be accessed without Internet connectivity, further increasing the advantage of an app to field-based professionals. App content can be updated at any time, expanding the capacity of extension professionals to quickly address emerging issues. The following article is an overview of the latter stages of developing an app, including

testing, promoting, and launching the app and postlaunch review. The article is based on the authors' experience of developing, promoting, and launching mobile device apps *IPMPro* and *IPMLite* (Fulcher et al., 2012a, 2012b). For information on the early stages of developing an app, please consult the companion article by Fulcher et al. (2013).

## Testing, promoting, and launching an app

**PRELAUNCH TESTING.** App testing is a continual process beginning at the most nascent stage of conceptualization and continuing through launch of the next version (Fig. 1). The earliest stage of testing begins with a well-planned and focus group-vetted concept and design. Client skill level dictates the level of sophistication in the app interface (Drill, 2012). Therefore, early in the app development process, a mock-up of the app

demonstrating layout and functionality should be shown to a focus group, including members and nonmembers of the target market, to garner input about the app concept, functionality, user friendliness (i.e., intuitive flow from screen to screen), as well as market appeal for potential app name and icon. This can be done easily with presentation software such as PowerPoint® (Microsoft, Redmond, WA). During the design of *IPMPro*, we developed a mock-up presentation and the lead developer and programmer described slide-by-slide all of the features of the app so that the focus group could get a sense of the proposed functionality and user interface. Details such as user interface color scheme and loading page appearance were not discussed at this stage. Before meeting with the focus group, the development team brainstormed on potential app names. The focus group generated potential app names and provided feedback on these and on the list of potential names previously generated by development team. The focus group and development team then ranked a composite list of names.

The same focus group can continue to provide feedback during the app development process by serving as beta testers. However, the beta test group should not be composed solely of focus group members (or developers) because they have prior knowledge of the app and thus will not be capable of testing for intuitive user interface and screen flow. Time spent working with a focus group can help to identify and correct potential issues before launching the app, which is much less expensive than resolving issues discovered after launching the app. It is imperative to ensure flexibility in the user interface during the development process and that the programming contract includes provisions for responding to focus group feedback. This is especially important because focus group previews of proposed app features cannot detect all issues, particularly those related to the touch screen. For example, it was not until beta testing *IPMPro* that we learned that the black bars that trigger an alert when touched were too narrow, making it difficult to trigger an alert. As a result of beta testing, these were enlarged.

After focus group feedback is taken into consideration and app

development is nearing completion, the programmer can use simulation software such as Android Emulator (Google, Mountain View, CA) and iOS Simulator (Apple, Cupertino, CA). Simulator software is installed on a desktop or laptop computer and creates a virtual mobile device(s). It

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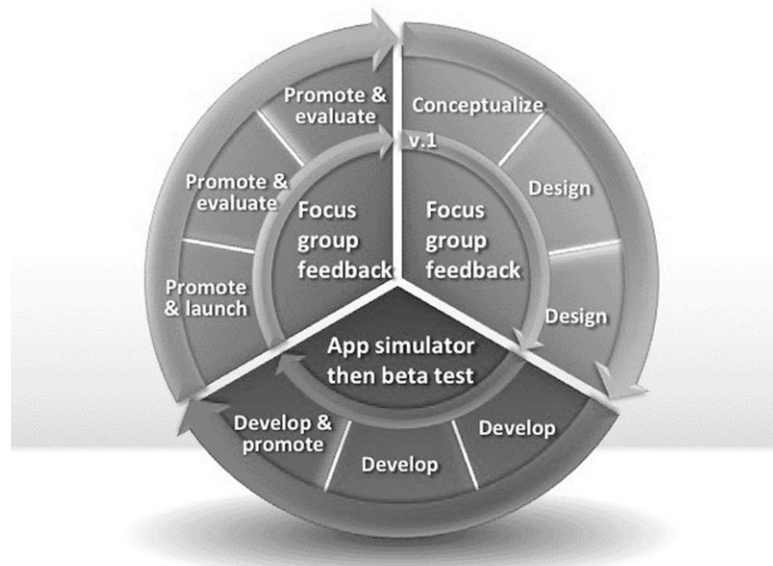
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mimics multiple operating systems and mobile device environments, allowing the developer to detect major problems or inconsistencies in the app before beta testing. There are limitations to simulation software. For example, testing user-specific push notification-based pest emergence and plant care alerts, a key aspect of *IPM-Pro's* functionality, was not possible using a simulator nor was testing the pesticide application recordkeeping feature. Beta testing takes place after simulator testing reveals that coding is operating properly and allows for a more thorough evaluation. During a beta test, an official version of the app is released to a limited audience, and those users evaluate app functionality, identifying problematic configurations so that they can be resolved before the full release of the app. Ad hoc .ipa (application programming interface) for iOS and .apk (application package file) for Android devices are downloaded by select users during beta testing. Loading ad hoc files to mobile devices is a straightforward process for Android devices but is a more complex process for Apple devices. For the iOS platform, the unique object identifier for each test device must be included in the ad hoc code, dictating that a finite list of testers/

devices is identified in advance. Services such as TestFlight iOS SDK v1.2.5 (TestFlight App, Santa Monica, CA) can streamline and increase the feedback that developers receive from the beta test process. With TestFlight, iOS testers can download an app that is not yet in the marketplace directly from a link, rather than the more cumbersome, multistep process. Testers can be divided into groups and different app versions can be distributed by group, facilitating evaluation of a range of features and rapid screening of exploratory features. Likewise, different versions can be sent to internal reviewers (development team members) and external reviewers (focus group members or others not affiliated with the project) and versions can be distributed to test groups representing different audiences (Lite, Pro, etc). Tester engagement can also be tracked and checkpoints incorporated so that at specific points within the app, questions prompt beta testers to address a particular feature or functionality. During beta testing, users should first be allowed to browse the app and note problems or areas that lack intuitive screen flow, without bias being introduced from the development team. Ultimately, testers should be given a comprehensive checklist of



**Fig. 1.** Testing is an integral part of developing an app, and begins with focus group feedback of the initial concept and continues through postlaunch. In this model the process initiates at version 1 (v.1) and continues clockwise in a feedback loop that repeats for version 2 (v.2) and subsequent versions. The inner core: the focus group feedback, simulator, and beta testing reinforce the design, development, promotion, and launch processes.

items to evaluate. An example of select beta test questions for *IPMPro* can be found in Table 1.

**POSTLAUNCH EVALUATION.** Evaluation should continue postlaunch, facilitating creation of a list and prioritization of content and features to update or upgrade. Postlaunch evaluation helps to ensure that the app reflects the needs, wants, and expectations of users, as well as preference changes based on changing markets and advancements in mobile technology. Postlaunch evaluations and design priorities for future versions can come from a variety of sources including previous focus group members and individuals representing a new or growing market for the app.

*IPMPro* version 2.0 is currently being developed. The development team began the process by assessing reviewer comments within the app marketplaces and user feedback shared verbally and via e-mail. After reviewing these comments, the development team used them as well as personal experience using the app as the basis for a brainstorming session. During the brainstorming session, additional needs were identified and an initial prioritization of design enhancements and features was completed. The initial list of prioritized updates was sent to the programmer for cost estimates, and further prioritizations were made based on feature or functionality importance and cost. As with version 1.0, a mock-up in PowerPoint® was developed to verify screen flow and potential changes to database configuration. The mock-up was shared initially with all codevelopers and then with a small focus group containing

current and non-*IPMPro/IPMLite* users representing both the green industry and the home gardener market, as well as individuals who are not deemed potential users. After focus group feedback, modifications were made and the final design plan was sent to the programmer.

**POSTLAUNCH CONTENT UPDATES.** In addition to postlaunch evaluations for developing the next version of the app, the *IPMPro* development team conducts an annual comprehensive evaluation of app content. One of the advantages of an app (web app or native app with web service) to the end user is that timely content updates are possible with a push of the button. Therefore, app developers need to be prepared to update the database as new information is received. For example, with *IPMPro* we are able to access the database and add or change content as needed. This is particularly important for apps with pesticide recommendations as pesticide labels change. The ability to have complete control over app content is very helpful. For example, boxwood blight (*Cylindrocladium pseudonaviculatum*) and rose rosette virus became serious problems after *IPMPro* was initially populated. Because *IPMPro* uses a web service to communicate with the database, we were able to quickly add new content that users had immediate access to without releasing a new version of the app.

**FOCUS GROUPS.** Focus groups were crucial components in both pre- and postlaunch evaluations. Focus group members and beta test groups should represent people inside and outside of the target market and

include both internal (development team) and external (nondevelopment team) individuals. Individuals outside of the market can be friends, relatives, neighbors, coworkers, and colleagues in other fields who have an interest in app development. The main stipulation is that they do not allow bias to influence their critique. Beta test groups should also include individuals for peer review. While there was no formal list of requirements, we selected focus group members with demographics roughly matched with those of our target market: 33% female, 67% male, 83% landscape, 67% nursery production, and 17% home gardener (note that the focus group members can represent more than one business type), but equal weight was placed on their interest in the project, willingness to meet and share their opinion, and established leadership within the green industry or gardening. For *IPMPro/IPMLite*, we did not compensate focus group members.

**PROMOTING.** One of the challenges of launching an app is distinguishing it from the 15,000 other apps currently released each week (Freierman, 2011). Many companies specialize in marketing apps, but word of mouth is a powerful advertising tool and social media make it even easier to reach your target audience. Once the appropriate clientele are aware of the app, ensuring they know how to access the app is extremely important. This is especially important for a web app because such an app is not hosted in a central, platform-specific marketplace [i.e., Google Play and App Store (Apple)], like a native app.

**Table 1. Select questions for beta testing *IPMPro*. Beta testers were first asked to simply evaluate app functionality and navigability, and then specific questions were introduced.**

IPMPro beta tester questions and prompts	
1.	Does the calendar display red dates and black bars? Does touching a black bar trigger the alert information?
2.	Forward and reverse through all months in calendar view. Does the appropriate display appear?
3.	Do all buttons/icons work?
4.	Open five of each alert type; view each information tab associated with the alert and associated images. Do they display properly?
5.	Access alert information from the list view. Does it appear to be fully populated?
6.	Change user type from container to field and from field to landscape and combinations of the three. Does the appropriate alert information display with each user type?
7.	Do pesticide recommendations display?
8.	Enter two pesticide treatment records. Does <i>IPMPro</i> record and compile the records properly? Did you receive the records via e-mail?
9.	Do push notification alerts arrive? At what time? How do they display?
10.	Was navigating from screen to screen intuitive?

Several weeks before release, a professional promotional campaign should be prepared. The promotional package should include a press release (University of Tennessee, 2012), a website, images of app in use, screenshots, testimonials, and the app icon. Most land grant universities are well equipped for preparing press releases, websites, and professional photography. This promotional effort will require coordination among all contributing institutions' communications departments and all developers. Contact information for industry groups and organizations representing the target market, as well as relevant magazines and blogs, needs to be collected and compiled into list serves. The press release should be sent to individuals in the target market, associations, and traditional news media. In addition, promotional text and key words describing the app as well as select screenshots and the app icon must be prepared in advance for the submission. The screenshot file size requirements and other specifications differ for Google Play Developer Console and Apple Application Loader, so access to appropriate software for adjusting image file size is essential. Most importantly, developers must recognize that completing the above mentioned items can require a substantial amount of time during a period when final troubleshooting and testing are also taking place and thus, plan to allocate resources appropriately.

Several approaches exist for marketing for-fee apps. Apple offers 50 promotional codes for free 28-d app downloads. Key leaders within the target market should be identified and given promotional codes as well as journalists and bloggers. Recipients of a 28-d promotional code cannot post a review to iTunes (Apple) unless they purchase the app, and reviews are only displayed within the reviewer's market. For example, a review from a Japan-based iTunes account will not be available to those with a U.S.-based account. An alternative mechanism to promote the app is the purchase and distribution of iTunes gift cards to key members of the target market or to professional app reviewers. However, there is no way to ensure that the iTunes gift cards are used for the intended app, and this could be an expensive marketing strategy. Apple has a bulk purchase program that can facilitate distribution of developer-funded

complimentary downloads to key individuals in the target market. This can also be effective, but expensive even with the bulk purchase discount, which is negotiated directly with Apple on a business-by-business basis. Apple's bulk purchase program can facilitate grant-funded purchases of the app and help coordinate institutional purchases for extension agents and specialists.

Google does not offer promotional features comparable to 28-d free downloads or iTunes gift cards. However, Google recently began a bulk download program for educational purchases. While there is not a mechanism to offer the app at a discount in exchange for the bulk purchase, the program does facilitate mass distribution of the app to users affiliated with educational institutions. Free, permanent downloads for Google apps can be accomplished by sharing the .apk file for manual installation on a mobile device. This requires some level of technological sophistication and allows for the possibility of unauthorized distribution of the app outside the Google Play marketplace.

**LAUNCHING.** Before uploading a Google or Apple app, a Google Play Developer Console or iTunes Connect account is required, respectively. The Google Play Developer Console account requires a one-time fee of \$25 while the iTunes Connect account costs \$99 annually. Uploading the app is somewhat complicated. For iOS apps, uploading the binary code, images, and descriptive information necessitates installing Apple's Application Loader software. Negotiating with the programming firm to include upload of the app and necessary supporting files may be worthwhile. Uploading the .apk file and associated promotional images and data into Google Play Developer Console involves fewer steps, but ideally could also be handled by the programmer. Following upload it may take several days to a week or more for final app approval and market-wide availability of the app in the app marketplaces.

Mobile device apps are a novel mechanism by which extension professionals can convey information to their clientele. App testing and evaluation should occur at several stages and should include members of the target market, testers outside the market, members of the development team, and peer review. Promoting

an app requires a coordinated effort among developers, communication specialists, and graphic artists. Recipients of complimentary copies must be identified, the press release prepared, app icon developed, and a promotional website and screenshots released. These tasks (and others) must all occur in tandem to successfully launch and promote an app. Developing and launching an app is a multifaceted process, but one that can be rewarding and lead to a unique information delivery system for extension clientele.

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