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## A Smartphone Application for Landscape Plants: A Case Study and Guide to Developing a Decision-Making Application

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**Abstract:** *Smart phone applications are rapidly gaining popularity, and Extension programs are eager to use this teaching tool. But developing an application can be time intensive and costly. Students in environmental horticulture at the University of Florida teamed with the Florida-Friendly Landscaping™ program to develop an application with an extensive plant database. The students and information technology expert from the Florida-Friendly program documented their methodology and developed helpful guidelines for anyone considering an application. With the guidelines, Extension agents can evaluate the adaptability of their program to a database-linked application and determine the feasibility of creating a decision-making application.*

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### Introduction

The use of mobile digital technology is rapidly gaining popularity in education programs. Websites, databases, and applications on smart phones and tablets allow retrieval of information when and where it is needed. Students are finding many uses for mobile technology in fieldwork, design studios, and laboratories, where access to databases can be very helpful. Existing applications for Extension typically include tour guides with a place-based learning focus, such as campus tree tours (LaBelle, 2011).

Graduate students taking landscape design courses in the Environmental Horticulture department at the University of Florida recently teamed up with the Florida-Friendly Landscaping™ (FFL) Extension program to create a smart phone application with a database of over 400 Florida-Friendly landscape plants. The goal of the FFL application project was to create an accurate system based on the art and science of landscaping to guide decision-making when choosing plants for the landscape. The application can be used by anyone planning to purchase plant material or create landscape designs. Studies have shown that consumers often buy landscape plants on impulse, and the portability of smartphones could make the application a powerful tool to help homeowners make better plant purchases at point-of-sale (Allbritton & Mott, 2007, Hodges, Marco, & Hall, 2010, Satterthwaite & Haydu, 2004).

Plant information retrieved from the application includes scientific and common name, type of plant, and status as native or non-native. Information on growing requirements is also available, including light range, soil moisture, pH range, and USDA hardiness zone. Other information includes the rate of growth, hardiness, salt and drought tolerance, and pest and disease tolerance. The final category of characteristics includes visual features such as size, shape, texture, and color. This category sets the application apart for other plant identification applications because it includes design-related information to help the student, designer, or homeowner make design-related decisions.

## **Technical Specifications**

To start the application development process we reviewed the IT (instructional technology) requirements of the Environmental Horticulture department and the Institute of Food and Agricultural Sciences program. After review of the IT requirements, the following programs were selected. For the front-end (the interface with the user), JQuery Mobile was selected to provide support for multiple mobile environments: iPhone, iPad, Android, and Microsoft. For the back-end (connection

with server), ASP.net using Model-View-Controller (MVC) 3 framework was used because ASP.net works best with the IFAS IT Web server environment, and MVC is a standard in back-end Web development. For the database (information storage), Microsoft 2008 SQL Server was used. This was selected because it is recommended by IFAS IT as being supported, secure, and regularly backed-up.

### **Creating the Application: Documenting the Process**

Students documented the process they used to create the database and developed guidelines for creating a data-based application intended for decision-making. Knowledge of landscape design principles, consumer behavior and needs, and plant characteristics was the foundation for development of the system. The guidelines are presented in this article as a guide for educators who are considering developing applications for their courses or Extension programs.

Information for the application was collected from several sources, including an existing Florida-Friendly plant information database that was used as the point-of-beginning to develop the extensive database used in the application. The concepts of a logic model and a Delphi study were used to organize and assess the information. The logic model was used to generate a series of questions to evaluate if an application was do-able and appropriate for a plant database and the anticipated users. The concept of a Delphi study (assessment of information by a panel of experts) was used in two different ways. First, a quasi-Delphi format was used when building the database by confirming plant facts for each plant in at least five different well-regarded plant identification books. The use of expert books served as a substitute for the panel of experts. Second, a panel of horticulture experts was recruited to test the validity of the format as a tool to solve the problem. Faculty, Extension agents, staff, and Master Gardeners with expertise in plant material, landscape design, and consumer behavior as it relates to plant purchasing reviewed the format and offered suggestions for improvement. The guidelines were written as a series of steps, based on the logic model concept, used to develop the application.

### **Guidelines for Creating a Decision-Making, Data-Based Mobile Application**

The steps of the guidelines are presented, first, to decide if an application or other decision-making tool is appropriate for the task and second, to facilitate the application development process.

### **Project Considerations and User Needs**

Steps 1 and 2 guide the evaluation of the relationship between the problem, the information, the user, and technology. It is designed to help the reader decide if a database/decision-making format is an appropriate problem-solving method for the type of project, the information, and the characteristics and needs of the user.

**Table 1.**

An Assessment of the Project Considerations and User Needs

<b>Project Considerations and User Needs</b>	
<p><b>Step 1 - Project Considerations</b></p> <p>Will a database/decision-making format meet project goals?</p> <ol style="list-style-type: none"> <li>1. Identify problem</li> <li>2. Identify desired outcome/goals</li> <li>3. Identify information needed</li> <li>4. Identify technology and delivery method</li> <li>5. Research availability of current systems</li> </ol>	<p><b>Step 2 - User Needs</b></p> <p>What type of format is compatible with user characteristics?</p> <ol style="list-style-type: none"> <li>1. Behaviors and perceptions</li> <li>2. Knowledge/comprehension level</li> <li>3. Skill level with technology</li> <li>4. Expectations of technology</li> <li>5. Use of information -where and when</li> </ol>
<p><b>Evaluation of link between project considerations and user needs</b></p> <ol style="list-style-type: none"> <li>1. Do you have access to the information needed to identify the problem?</li> <li>2. Can the problem be described in a manner that shows adaptability to a decision-making system as a method to solve the problem?</li> <li>3. Can you identify the potential user characteristics, behaviors</li> </ol>	

- and needs?
4. Can you identify the appropriate technology to address the problem?
  5. Can the information be delivered in portable, graphic, simple to use format?
  6. Can the technology be used in the physical setting of the user?
  7. Is the technology the most appropriate for the situation?
  8. What is the cost of the technology to the user?
  9. Can an existing system be adapted to fit the needs of the current problem?
  10. What skills are needed to create a decision-making system with the technology?

### System Features and Information Type

Steps 3 and 4 are intended to help evaluate the technology and type of information to decide if the information is compatible with the technology and if the marriage of the technology and information will help solve the problem.

**Table 2.**

An Assessment of the Technology Features and Information Type

<b>Technology Features and Information Type</b>	
<p><b>Step 3- Technology features</b> What is needed to meet the user needs?</p> <ol style="list-style-type: none"> <li>1. Large database spreadsheet</li> <li>2. Graphic images and icons</li> </ol>	<p><b>Step 4- Information type and user skills</b> Does the information lend itself to a decision-making system and the proposed technology?</p> <ol style="list-style-type: none"> <li>1. Science-based, factual information</li> </ol>

<ol style="list-style-type: none"><li>3. Help menus and screens</li><li>4. Links to database(s)</li><li>5. Quick response</li><li>6. Portability (small size)</li></ol>	<ol style="list-style-type: none"><li>2. Presented in one or two words</li><li>3. Parsed into data bits</li><li>4. User-friendly, non-technical language</li><li>5. Presented in a simple format (table, list, chart)</li></ol>
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**Evaluation of link between the technology and the information used to build the system**

1. Can you identify the features you will need for the system to work as proposed?
2. Will the features present the information in a way that solves the problem?
3. Will the features allow user-friendly graphics and text?
4. Are the features appropriate for the anticipated technology skills of the user?
5. Will the information be appropriate for the comprehension level of the user?
6. Do you have access to science-based information?
7. Do you have access to experts who can verify validity of information?
8. Can the information be presented in a way that facilitates decision-making?
9. Can the information be parsed and spread throughout a database?
10. Do the features allow a link to a data-base or other

information storage format?

11. How much information will be needed (size of data-base)?

### Database and Application Construction

The steps in Table 3 present guidelines for determining the most appropriate format for constructing the database and guidelines for user interface design for construction of the application.

**Table 3.**

An Assessment of the Database and Application Construction

<b>Database and Application Construction</b>	
<p><b>Step 5- Database Construction</b></p> <p>What type of database will work best?</p> <ol style="list-style-type: none"> <li>1. Data types</li> <li>2. Relational databases</li> <li>3. Efficient table construction</li> <li>4. Commonly used database software</li> </ol>	<p><b>Step 6- Application Construction</b></p> <p>What is the best user interface design?</p> <ol style="list-style-type: none"> <li>1. User friendly features (help screens)</li> <li>2. Color schemes, graphics, and text formatting</li> <li>3. Programmer qualifications</li> <li>4. Institutional or company requirements</li> </ol>
<p><b>Evaluation of link between database and user interface construction</b></p> <ol style="list-style-type: none"> <li>1. What type of data do you have and how does the data relate to each other?</li> <li>2. What data can be grouped to one-question, one-answer (one to one) or one-question many- answers (one to many) relationships?</li> </ol>	

3. How will you treat null data and which data can't have null values?
4. What software will make it easiest to input data?
5. What colors and text formatting will make the app easy to see and read?
6. What graphic file types can you use and what size graphics can you use?
7. What kind of help screens and menus will you offer the user?
8. What skill set and software knowledge does your programmer need?
9. Does your institution/company have requirements for how the application should look?

## Summary

Creating the smart phone application database provided an opportunity for the students to identify a problem and develop a technical solution using their expertise and knowledge about plants and landscape design. The project required the students to evaluate the relationship between the problem, the information, the user, and the technology using logic model and Delphi study concepts. Creating checklists for a series of steps helped the students develop a useful and user-friendly application for anyone who specifies and purchases plants for use in the landscape.

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