Executive Summary: Electronic Data Entry Options for IEP Surveys

IEP DUWG 'e-Device' Sub-group

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Take Home Message:

IEP should transition to electronic data entry to improve efficiency and data quality.

Digital data entry methods facilitate more accurate and rapid reporting of survey data - as compared to paper data sheets - by reducing field entry errors, eliminating manual entry QC checks, and improving overall processing efficiency.

Problem:

IEP still uses paper data sheets for most surveys. Most IEP surveys still use paper datasheets for data collection. Paper datasheets increase transcription errors, handwriting errors, increased data transfer time, and potential for data loss when compared to electronic data sheets.

IEP survey leads have significant questions about electronic data entry methods. Several surveys have considered different data entry software and/or hardware devices for collecting field data, but these tools have not been been broadly adopted due to lack of available information about which tools are most appropriate for survey applications.

Methods:

The DUWG formed a sub-team and carried out the following steps:

- Polled IEP survey teams to learn what digital data entry tools are currently used within the IEP network;
- Evaluated the top software tools with interviews/presentations from experienced users and product vendors;
- Conducted software trials using apps specifically configured for IEP survey data collections;
- Developed an open-document forum for exchange of technical information on e-devices across IEP;
- Summarized pros and cons of the top electronic data entry software options.

Solutions:

Two resources have been developed to promote the transition to electronic data entry methods:

- **Summarized and expanded listings of the specific pros and cons of each of the top data entry software apps (Table 1 below)**
- **An open-access html document and Github repository for information related to electronic field data entry software/hardware for IEP Survey applications (Link to Github repo and Electronic data entry document: Introduction)**

Takeaway:

Adopting digital data entry protocols will require time to develop the field data entry software, establish procedures to transfer data to central database, and train survey staff to use these new tools. In addition, IEP surveys will have to budget for the purchase and maintenance of mobile field devices, data loggers and/or electronic fish measurement boards. **In the long term, the savings in time and effort with the reduction in data entry and post-collection processing will significantly outweigh equipment and training time expenditures.**

Table 1:

Table 1: Top software applications used by IEP for field data entry with pros and cons for each criteria category, listed in order reviewed by the DUWG sub-team. The criteria used for comparison are described in the e-device docoument:https://interagencyecologicalprogram.github.io/e-device/software-comparison-criteria.html.

Table 1: The top software tools used for field data entry are listed and the most notable* Pros and Cons of each tool are briefly described for each criteria.

Software	**Forms**	**Data Interface**	**External Devices**	**HW Platform Compatibility**	**Security**	**Business Model/Price**
ESRI Survey123	Pros: Geo-referencing of all objects; map layers available	Cons: Difficult to configure desired format to view/edit data 'on-the-fly' in the field	Cons: Cannot connect to sensors directly	Pros: Can be run on all platform types: ios, Android, and PC (web only)	Pros: thoroughly vetted in state agencies	Expensive; but well established CA state license agreement
MS Power Apps	Pros: Low-code/ No-code; customizable; Uses Excel-like function; AI support — — — — Cons: Even though Power Apps can be run on a Windows system (on/off-line), it cannot read in data from local drive	Pros: Power Platform connection provide easy connectivity to SQL, OneDrive databases — — — — Cons: An Azure license is required to connect to external devices (not available with Power Apps for Government Plans)	Pros: It is possible to control external devices using PowerApps — — — — Cons: An Azure license is required to connect to external devices (not available with Power Apps for Government Plans)	Pros: Can be run on all platform types: ios, Android, and Window (including off-line)	Pros: thoroughly vetted in state agencies	Moderate
Fulcrum	Pros: Intuitive form-building interface; Auto-formating for modern look — — — — Cons: Complex design requires coding; Limits to nesting data	Pros: Provides many types of API connections e.g., to SQL, OneDrive	Cons: Even though Power Apps can be run on a Windows system (on/off-line), it cannot read in data from local drive	Pros: Can be run on all platform types: ios, Android, and PC (web only)	Pros: security audits for projects with aerospace company, toyota, verison, telegraph	Moderate

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Software	**Forms**	**Data Interface**	**External Devices**	**HW Platform Compatibility**	**Security**	**Business Model/Price**
Pendragon	Pros: Provides user-friendly form building GUI that can be expanded/customized with Java coding.	Pros: Data synch as relational tables to a MySQL database on cloud server — — — — Cons: Cannot backup to local laptop (when internet not available)	Pros: Provides API potential for custom data interface with external sensors — — — — Cons: Cannot read in data from local drive; No built in tool for connecting to sensors directly	Pros: Works on iOS/Android phones — — — — Cons: Some custom Java options do not work on iOS devices	Pros: Azure cloud serive is FedRAMP certified — — — — Cons: Pendrogon tool does not have security validations available	Moderate
FEED	Pros: Customized form specific to users application; Designed specifically for fish surveys	Pros: Built on local Access db so compatible will all M.S. connectivity — — — — Cons: No built-in Cloud connectivity; no built-in API	Pros: Can connect to external sensors; uses local area network	Cons: Only works on Windows	Pros: LAN based system so low security risk	One-time configuration fee (~$2000) — — — — Cons: One person company; questions about future company composition
Big Fin	Pros: Designed specifically for fish surveys		Pros: Connects directly to many types of external sensors	Cons: Only works on Android		Moderate

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Software	**Forms**	**Data Interface**	**External Devices**	**HW Platform Compatibility**	**Security**	**Business Model/Price**
PDF/R-scraping	Cons: Not as many options to control PDF form input	Pros: R-based PDF scraped data could be further processed in R — — — — Cons: All data configuratons must be coded by scratch requiring programming skills	Cons: No photo options; no options to connect to external sensors	Pros: PDF forms are usable on all platform types; PDF forms may be used on mobile apps using Adobe Reader app	Pros: low security risk	Pros: Least expensive approach

*The categories without a specified Pro or Con points listed are those where the app meets the basic requirements needed for survey data collection.