What Factors Affect General Aviation Pilot Adoption of Electronic Flight Bags?

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Understanding the Factors Affecting General Aviation Pilot Adoption of Electronic Flight Bag (EFB) Technology

Troy E. Techau

August 14th 2017
Agenda

• Background of EFB Adoption

• Basics of Technology Acceptance

• Researching Acceptance of EFBs

• Implications for Flight Training
EFBs – A Significant Capability

• EFBs = most categories and types of operation
• Support many functions (charts, weather, traffic, etc.)
• CPDLC and more to come

Reproduced from http://www.avidyne.com/products/ifd/ifd100.html
Ohme (2014) showed 21% of pilots chose not to use EFBs.

Lytle (2015) documented pilot comments on EFBs:

- **Likes:**
  - Improved functionality (zoom, highlight, night visibility)
  - Consolidation of resources (all in one place)
  - Improved efficiency (speed of access, updating)

- **Dislikes:**
  - Poor training (“trial and error” fielding approach)
  - EFB limitations (processor speed, hardware issues)
  - Regulatory limitations (capabilities available – not allowed)
Why Does Pilot Acceptance Vary?

• Is EFB adoption affected by:
  ✓ ease of use?
  ✓ availability of training? ✓ expected utility?
  ✓ cost factors? ✓ social factors?

• Are there differences in pilot adoption of EFBs due to:
  ✓ age? ✓ tablet computer experience?
  ✓ gender?
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Researching Technology Adoption

- **DOI**: Diffusion of Innovations
  - Rogers (1962)

- **TRA**: Theory of Reasoned Action
  - Fischbein & Ajzen (1975)

- **TAM**: Technology Acceptance Model
  - Davis (1986)

- **TPB**: Theory of Planned Behavior
  - Ajzen (1991)

- **UTAUT**: Unified Theory of Acceptance and Use of Technology
  - Venkatesh, Morris, Davis, & Davis (2003)
• Unified Theory of Acceptance and Use of Technology (UTAUT2) (Venkatesh, Thong, & Xu, 2012)

• Exogenous Factors

✓ **Performance Expectancy** - does the system help me perform?
✓ **Effort Expectancy** – how easy is it to use the system?
✓ **Social Influence** – do others think I should use the system?
✓ **Facilitating Conditions** – is there a system support infrastructure?
✓ **Hedonic Motivation** – is the system fun to use?
✓ **Price Value** – is the system worth the cost?
✓ **Habit** – do I use the system as automatically based on learning?
Behavioral Factors and Moderators

• Behavioral Factors
  ✓ Behavioral Intention
  ✓ Actual Use Behavior

• Moderators:
  ✓ Age
  ✓ Gender
  ✓ Experience (with the target technology system)
UTAUT2 Structural Model

Performance Expectancy\(^1\) (PE)

Effort Expectancy\(^2\) (EE)

Social Influence\(^2\) (SI)

Facilitating Conditions\(^2,3\) (FC)

Hedonic Motivation\(^2\) (HM)

Price Value\(^1\) (PV)

Habit\(^2,4\) (HT)

Behavioral Intention (BI)

Use Behavior (UB)

Notes:
1. Effect on BI is moderated by age and gender.
2. Effect on BI is moderated by age, gender, and experience.
3. Effect on UB is moderated by age and experience.
4. Effect on UB is moderated by age, gender, and experience.
5. Experience moderates the effect of BI on UB.
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Research Design

• Quantitative non-experimental research design:
  ✓ survey data collection
  ✓ structural equation modeling (SEM) analysis

• UTAUT2 survey instrument adapted for EFBs

• Focus on general aviation (GA) pilots
  ✓ researcher interest
  ✓ most closely represent consumer-oriented decision-making regarding EFB at the individual level
## UTAUT2 Results – Other Technologies

<table>
<thead>
<tr>
<th>Author</th>
<th>Technology Studied</th>
<th>Year</th>
<th>Significant Correlation to BI or UB Observed</th>
<th>Modulating Effect Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>PE</td>
<td>EE</td>
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<tr>
<td>Devine</td>
<td>Nurse Use of Social Media</td>
<td>2015</td>
<td>X</td>
<td>X</td>
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<td>Bryant</td>
<td>Graduate Student Academic Use of Multi-modal Tablets</td>
<td>2016</td>
<td>X</td>
<td>X</td>
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<td>Koman</td>
<td>Baby Boomer Acceptance and Use of Mobile Device Cyber-Security</td>
<td>2016</td>
<td>X</td>
<td>X</td>
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<td>Francis</td>
<td>Physician Acceptance of Data from Patient Self-Monitoring Devices</td>
<td>2016</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Salinas Segura</td>
<td>Google Glass as a Pervasive Information System (PIS) (*modified)</td>
<td>2015</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>
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• Implications for Flight Training
• Support for a given factor could influence training design:
  ✓ A strong correlation (+ or -)
    = factor may influence *behavioral intention or use behavior*
  ✓ No or minimal correlation
    = factor unlikely to influence behavioral intention and use behavior

• Example:
  ✓ If *facilitating conditions* is supported as a factor:
    - trainers might ensure user support for EFBs is readily available
      (classes, manuals, online tutorials, etc...)
• If age, gender, or experience are supported as moderators:
  ✓ The moderator influences the relationship between a factor and *behavioral intention* or *use behavior*

• Examples:
  ✓ If *age* moderates the relationship of *effort expectancy* on *behavioral intention*:
    - trainers might consider a student’s age as relevant to how instructional material is presented
  ✓ If *experience* moderates the relationship of *effort expectancy* on *behavioral intention*:
    - trainers might seek to increase exposure to tablet technology
References


Questions?

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