User Request Evaluation Tool (URET)
Adoption and Adaptation,

Three Center Case Study

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Problem Statement and Goal

- The objective of this paper is to present findings of exploratory interviews regarding the air traffic controllers’ adoption and adaptation of User Request Evaluation Tool (URET). The importance of this investigation lies in better understanding of changes brought about by the use of Decision Support Tools by sector controller teams and what can be done to avoid some of the unintended consequences.

- The goal of this research is to draw lessons from the experience with URET that can inform technology deployments in the future.
Introduction

- Human operator limitations - improvements in form of Decision Support Tools (DSTs)
- Incremental development, of Air Traffic Control (ATC) system in USA
- “Early and continuous testing of human factors issues is essential for a successful DST design” (Cardosi)
- AAS, STARS - CTAS
- Good design not always enough
- System integration
- Need to know more about adoption of automation in ATC – to facilitate easier and faster transitions from one system to another
Aircraft List and Plan display – electronic flight strips

Graphic Plan display

Wind Grid display
URET Description

- Usage variation:
  - Different teams use it in a different way
  - Usage differs from the intended usage
  - Usage differs across centers
**URET Diffusion**

- **Diffusion of innovation**: “is the process by which an innovation is communicated through certain channels over time among the members of a social system “

- 4 elements:
  - Innovation - URET
  - Communication channels – inter personal and inter facility FAA networks
  - Time – length of URET usage
  - Social system – individual en-route facilities
URET Diffusion

- Social system norms

- Innovation characteristics:
  - Relative advantage
  - Compatibility
  - Complexity
  - Trialability
  - Observability

- Adaptation: “the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation“
URET Usage

- URET in operation in 10 centers

- Three “waves” of deployment:
  - Indianapolis, Memphis
  - Kansas City, Chicago, Cleveland, Washington
  - Jacksonville, Denver, Minneapolis, Forth Worth

- Exploratory interviews in one center of each group
# Center 1

<table>
<thead>
<tr>
<th>Airspace</th>
<th>Traffic</th>
<th>Staffing</th>
<th>Culture</th>
<th>Time</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="#">Airplane</a></td>
<td>Fairly busy</td>
<td>Enough for having teams</td>
<td>Team oriented</td>
<td>9 years</td>
<td>70 hours Mostly HCI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strip Replacement</th>
<th>Route Amendment</th>
<th>Trial Plan</th>
<th>Conflict Probe</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="Smiley" /> <img src="#" alt="Heart" /></td>
<td><img src="#" alt="Smiley" /> <img src="#" alt="Heart" /></td>
<td><img src="#" alt="Smiley" /></td>
<td><img src="#" alt="Sad" /></td>
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</tbody>
</table>
## Center 2

<table>
<thead>
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<th>Airspace</th>
<th>Traffic</th>
<th>Staffing</th>
<th>Culture</th>
<th>Time</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate</td>
<td>Enough for having teams</td>
<td>Individually</td>
<td>1.5 years</td>
<td>36 hours some examples</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strip Replacement</th>
<th>Route Amendment</th>
<th>Trial Plan</th>
<th>Conflict Probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>😄❤️</td>
<td>😄❤️</td>
<td>😄❤️</td>
<td>😞</td>
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</table>
## Center 3

<table>
<thead>
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<th>Airspace</th>
<th>Traffic</th>
<th>Staffing</th>
<th>Culture</th>
<th>Time</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very busy</td>
<td>Not enough for having teams</td>
<td>Individuation (tracker)</td>
<td>2 years</td>
<td>36 hours some examples</td>
</tr>
</tbody>
</table>

### Additional Table

<table>
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<tr>
<th>Strip Replacement</th>
<th>Route Amendment</th>
<th>Trial Plan</th>
<th>Conflict Probe</th>
</tr>
</thead>
<tbody>
<tr>
<td>😊❤️😊</td>
<td>😊</td>
<td>😞😊</td>
<td>😞</td>
</tr>
</tbody>
</table>
Conclusions

- Qualitative evidence that each center can be considered as a separate social system
- Social system norms or “Center Culture” can greatly explain center-wide variations
- Team differences and unintended usage of URET results from automation characteristics and re-invention
- Future work - Survey development and administration
Conclusions

- **Fast adoption** of functionalities for which advantage of use is perceived – electronic flight strip replacement

- **Slow adoption** when adopters need to change their set of values in order to use the innovation – full use of URET functionality implies “strategic” control contrasted to current “tactical”
Conclusions

- **Re-invention** causes:
  - Loose-bundling which allows for separate function use
  - Lack of full knowledge – insufficient training and/or insufficient length of use
  - Lack of situations for which the tool is designed (strategic support for the D-side controller)
Recommendations

- With the separate development of different DSTs and their pending integration into one system, it is important to know how each of them is being used, to be able to formulate a successful program for the effective integration.

- Studies of automation adoption and adaptation of different DSTs should be a prerogative.

- Future work:
  - A survey designed to assess URET adoption
  - It will help us identify the most promising strategies for increasing automation adoption rate and for encouraging “positive” adaptation.