A psychosocial approach to understanding pilot and controller acceptance of change in ATM, based on three CDA case studies

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Overview

- Background
- Concepts behind the method
- Some key results
- Broader findings
- Summary & next steps
Background
Provenance

- Research undertaken by:
  Transport Studies Group
  University of Westminster

- With funding and technical expertise from:
  EUROCONTROL Experimental Centre
  Prospective Studies Unit
82 interviews: 20-50 minutes

<table>
<thead>
<tr>
<th>Location</th>
<th>Companies</th>
<th>Dates</th>
<th>Number of Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td>NATS, bmibaby, BA, CitiExpress, Thomas Cook</td>
<td>07-09 MAR 2005</td>
<td>31 interviews (+10)</td>
</tr>
<tr>
<td>Bucharest</td>
<td>ROMATSA, TAROM</td>
<td>21-24 MAR 2006</td>
<td>24 interviews</td>
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<tr>
<td>Stockholm-Arlanda</td>
<td>Luftfartsverket, SAS</td>
<td>15-17 NOV 2006</td>
<td>27 interviews</td>
</tr>
<tr>
<td>Location</td>
<td>Approach Description</td>
<td>Time</td>
<td>CDA Requirement</td>
</tr>
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</tr>
<tr>
<td>Manchester</td>
<td>Vectored</td>
<td>2200 - 0600</td>
<td>CDA assumed as standard</td>
</tr>
<tr>
<td>Bucharest</td>
<td>STAR</td>
<td>All times</td>
<td>CDA by pilot request</td>
</tr>
<tr>
<td>Stockholm-Arlanda</td>
<td>P-RNAV STAR + A-CDA / ‘Green Approaches’</td>
<td>Low traffic</td>
<td>CDA on ATC offer</td>
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</table>
Concepts behind the method
To better understand the process of change in ATM

- Pressures driving change (industrial, societal)
- How change is introduced
- Barriers to successful change
- Factors which promote successful change

**PRACTICAL**

- Human Factors
- User Requirements
- Market Research
- Theory of Planned Behaviour
Tools for mapping acceptance of change

- ‘Halo effect’ (1920) \textit{to colour judgements by general feeling}’
  - field of psychology; appraisal / attribute intercorrelations

- Theory of Reasoned Action (late 1960s)
  - \textit{actual} behavioural control

- Theory of Planned Behaviour (1980s)
  - mostly in health sector
  - predicting deliberated behaviour: context of \textit{perceived} control

- Seven Stages of Change
  - sustainable travel behaviour, urban campaign assessment
  - recently in ATM: key similarities & differences (autonomy)

- Library of generic reference questions
  - mapped onto specific sets for different types of ATM change
Seven Stages of Change model
(Broader EU model)

Awareness of issue
Accepting opportunity
Perception of options
Evaluation of options
Making a choice
Experimental change
Established change
null
Seven Stages: some key variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Example question</th>
<th>Measure of</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_1$</td>
<td>‘Achieving CDAs at [airport] is not my responsibility’</td>
<td>acceptance of responsibility</td>
</tr>
<tr>
<td>$V_2$</td>
<td>‘Achieving CDAs at [airport] is a serious contribution to positive change’</td>
<td>option evaluation (generic measure)</td>
</tr>
<tr>
<td>$V_3$</td>
<td>‘I would recommend the way we do it at [airport], to a similar airport’</td>
<td>net ‘buy-in’ (proxy measure)</td>
</tr>
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Likert (summated) attitudinal scale
A psychosocial context

- Perceived societal and system benefits
  - relationship between two, blurred boundary?
  - trade-offs, e.g. flexibility v. noise abatement?
  - how correlated with behavioural change?

‘Public’ benefit of CDAs demonstrated a larger halo effect and behavioural correlation, with pilots
A principle components approach

- A better description of the perceived benefits and disbenefits?
  - with respect to ‘society’ and ‘system’
    (as described by 9 key variables)

2 components were produced from these 9 variables, pretty cleanly loaded (aggregate, unconstrained)
Some key results
Attitudes to CDAs

<table>
<thead>
<tr>
<th>Question</th>
<th>Pilots</th>
<th>Controllers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Of no strong interest would avoid if free choice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not my responsibility to positive change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Little difference if don't do sometimes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OK as step towards something better</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduces flexibility due more procedural</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommend way we do at Bucharest</td>
<td></td>
<td></td>
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7th USA/Europe ATM R&D Seminar, Barcelona, July 02-05, 2007
Benefits of CDAs

- Benefits people under approach paths
- Benefits TAROM
- Benefits ROMATSA
- Benefits airport
- Increases pilot workload
- Increases controller workload
- Limits capacity
- Less safe than stepped during low vis
- Too time consuming
- Increases pax comfort

For pilots:
- Increases workload
- Less safe

For controllers:
- Increases workload
- More time consuming
Principle components analysis

- Unconstrained, disaggregate; for controllers:
  - solutions produced more components than for pilots
  - correlations weakened by perceived workload
- Components* were logical ‘predictors’ of $V_1 \ldots V_3$
  - suggestive that perceived benefit drives change
  - some components were better ‘predictors’ than $1^\circ$ variables
  - pilot benefit components were best ‘predictors’
  - $b_{C_{P,1}}$ best of all at capturing ‘net perceived benefit’
  - $b_{C_{P,1}}$ even captured concern about noise complaints (!)
- Correlation matrices
  - logical and very clean: suggested some interesting halo effects, differentiated by pilot / controller ...

* as dummy variables
Halo effects

‘Airport’ and ‘public’ benefit correlations

Pilots
(Figure 2)

Controllers
(Figure 4)
Broader findings
Some examples of broader findings

- **Full briefing of participants**
  - avoid tactical / RT ‘discussions’ on what is already agreed
- Move stakeholders forward at same time: buy-in through agreed objectives
  - but don’t set (early) goals too high
- Need good inter-sector comms & to clearly ID traffic in scope
  - CDA & stepped/vectored traffic = difficult mix
- Make sure participants understand limitations (of ATC & aircraft)
  - e.g. pilot complaints when broken-off / dropped by APP, think have priority
- Maintain a continued dialogue, with flight-by-flight correlation potential
  - but outside a blame culture
- Keep everything as simple as possible
  - but try to get the technology right to avoid a poor start, difficult to shake off
Summary & next steps
For ATM change implementers

- Perceived benefit drives behaviour, especially when conforms with existing values
  - see also Bolic & Hansen (2005)

- Look for positive and negative halo effects in target sub-groups:
  - reinforce the dominant benefit(s) perceived
  - off-set the dominant disbenefit(s) perceived

- Study output will be a set of practical guidelines
  - to help understanding & facilitation of change

- How ATM views society - & vice versa!

- Any suggestions for a pilot workload case study?
Thank you