Predicting human factors influence on effectiveness of operational decision-making in Airline Operation Control Centers

Nico Zimmer | Boeing Digital Aviation Research
Airline OCC goal: Maintain (together?) the schedule. When not possible, return to plan as fast as possible.

How does Superman Culture affect OCCs?
EU aircraft delay by irregular operational causes

Source: CODA DIGEST - All-Causes Delay and Cancellations to Air Transport in Europe – 2015
US aircraft delay by irregular operational causes

2015 % of Total Operations

- On Time: 74.90%
- Air Carrier Delay: 0.22%
- Weather Delay: 3.62%
- National Aviation System Delay: 7.53%
- Security Delay: 6.16%
- Aircraft Arriving Late: 0.03%
- Cancelled: 6.21%
- Diverted: 0.88%

Source: http://www.transtats.bts.gov/OT_Delay/OT_DelayCause1.asp
The devil is in the detail

Hidden Causes

- A. Internal Issues
  - 1. Systems & Functions
  - 2. Management / People / Knowledge / Culture
    - I. Fast Decision Making issues
    - II. Knowledge and people
    - III. Cross-functional / interdepartmental communication
    - IV. Airline Culture
  - 3. Third Party damage & safety

- B. External Issues
  - 1.…100 IATA CODES
  - Types: Airline, Airport, EnRoute, ATC, Weather....

Disruption Costs

Source:
Adapted after Beyond Airline Disruptions
Jasenka Rapajic 2009
Approach

“In general, management needs to understand that success of a company is correlated to how the socio-technical system works – it’s not just a technical system with individuals you can replace and who needs to adapt”

Emery, Thorsrud, Trist (1964)
Open System Theory

Input (Resources) → The organization → Output (Products & Services)

Throughput (Work)

Feedback loops

Source: 1950 Ludwig von Bertalanffy
Organizational Systems Model

Source: 1964
H. Leavitt
Socio-Technical System

“Socio-technical design is an approach that aims to give equal weight to social and technical issues when new work systems are being designed.”

Enid Mumford (2000)
OCC as Socio-Technical System

Airline OCC as Throughput / Transformation

Technical System

OCC Workflows/Process

Technology as Airline Maturity

OCC Organizational Model

Social System

OCC People

Source: Adapted after
1977 Nadler-Tushman
1978 Katz & Kahn
1985 Sydow
Workflow Model

Dispatcher Interviews (internal)

Airline Operation Manager Interviews (internal)

OCC Visits & Interviews

Internal OCC Analysis Documents

Source: Zimmer, Jekaterina Balashova 2014
OCC as Socio-Technical System

Airline OCC as Throughput / Transformation

- OCC Workflows/Process
- Technology as Airline Maturity
- OCC Organizational Model
- OCC People

Social System

Input

Output

Source: Adapted after
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1978 Katz & Kahn
1985 Sydow
Personality & Behavior

Personality traits can predict occupational behavior and job effectiveness criteria

- **Conscientiousness (C)** is a valid predictor for job and training proficiency (Barrick & Mount, 1991)

- **C** has the highest validity for overall job effectiveness (Hurtz & Donovan, 2000)

- **Neuroticism (N)** is negatively correlated with individual proficiency (Neal et al., 2012)

- **N and C** are valid predictors for job effectiveness across occupations (Salgado, 1997)
OCC People Model
Five Factor Model of Personality after McCrae & Costa

Q1: Differences in occupational groups?
Q2: Differences in any other trait?
Q3: Differences in different types of airlines?

Hypothesis 1: OCC people Higher C score than Norm?
Hypothesis 2: OCC people Lower N score than Norm?
Hypothesis 1: OCC employees showed significantly higher C score mean than Norm sample.

Hypothesis 2: Not significant. Need to be rejected.

Question 2: OCC employees showed significantly lower A score mean than Norm sample.

Question 3: Network Legacy Carrier employees showed a significantly higher C-score mean than Low-Cost Carrier employees in this sample.

Source: Till Peters 2015
Airline Workflow Simulator

- **Simulation Input**
  - Airline profile
    - Flight schedule
    - Fleet
    - Agents
  - Environment
    - Time estimates
    - Constants

- **Simulation Output**
  - Agent view
  - Flight view
  - Fleet type view

- **AWS**

**User**
- prepares
- runs
- adjusts
- analyzes

Source: Jekaterina Balashova 2014
## Summary – First Simulation Results

<table>
<thead>
<tr>
<th>Norm Five Factor Profile</th>
<th>OCC Five Factor Model (FFM) Profile</th>
<th>OCC High Agreeableness Level</th>
<th>OCC High Conscientious Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario with NEO-FFI 3 Norm Data based on generated sample data</td>
<td>OCC Baseline Scenario based on Neo-FFI 3 OCC Survey data</td>
<td>OCC Staff Scenario with Neo-FFI 3 OCC Survey Data with High A-Factor</td>
<td>OCC Staff Scenario with Neo-FFI 3 OCC Survey Data with High C-Factor</td>
</tr>
<tr>
<td>Agreeableness: 69% of Norm have tendency to be agreeable</td>
<td>Agreeableness 7% lower than Norm</td>
<td>Agreeableness mean level 90%</td>
<td>Agreeableness same as OCC FFM Profile</td>
</tr>
<tr>
<td>Conscientiousness level 67% (100% is the highest level)</td>
<td>Conscientiousness 8% higher</td>
<td>Conscientiousness same as of OCC Profile</td>
<td>Conscientiousness mean level 90%</td>
</tr>
<tr>
<td>All workflow performance increased by 5.5% compared to Scenario with norm Data</td>
<td>All workflow performance increased by ~ 0.2%</td>
<td>All workflow performance increased by 6.3%</td>
<td></td>
</tr>
</tbody>
</table>
Conscientious people tend to be purposeful, strong-willed, determined, and will to achieve!!

Be conscientious, but work together!
Don’t be heroes!

Conclusion
Outlook – More Research needed

People & Teamwork Simulation

Airline OCC as Throughput / Transformation

OCC Workflows/ Process

OCC People

OCC Organizational Model

Technical System

Technology as Airline Maturity

Social System

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1985 Sydow
Outlook – Control Center Study

State of the art socio-technical assessment in command and control

Supply Chain Control Center - DHL
Energy Supply Control Center - Mainova
Signaling Control Center - DB
Air Traffic Control Center – DFS
THANK YOU

Feedback | Ideas ?
nico.zimmer@jeppesen.com

Nico Zimmer | Boeing Digital Aviation Research