

Institute of Flight Guidance
Technische Universität Braunschweig



NASA Airline Operations Workshop Aug 4 2016

A large, curved wall in a control room is covered with multiple projection screens. The largest screen on the left shows a 3D map of the United States with green and blue flight paths and aircraft icons. To its right, two smaller screens display data tables and a cockpit view. In the foreground, several operator consoles with multiple monitors are visible, with a person seated at one of them. The room is dimly lit, with the primary light source being the projection screens.

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

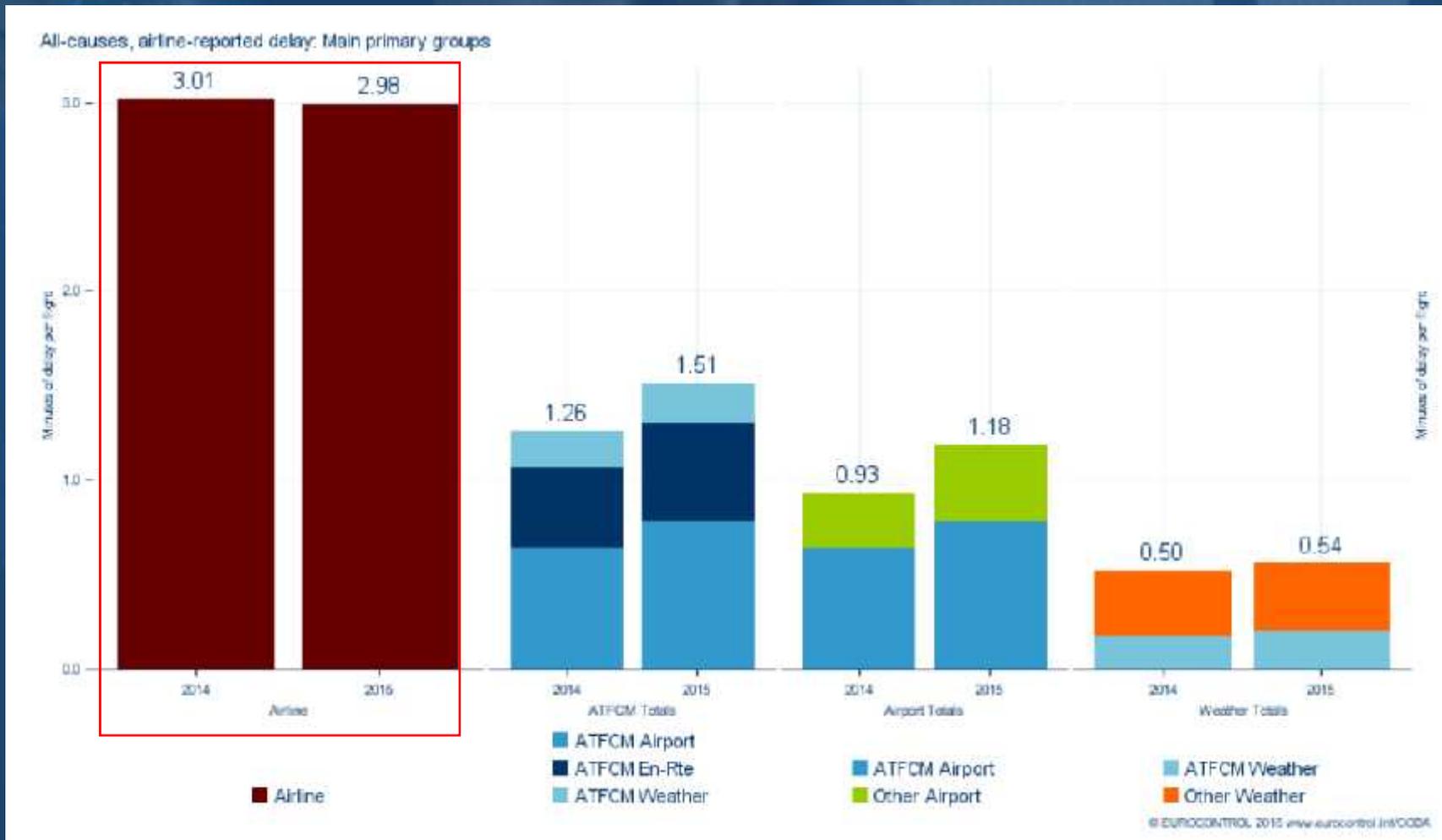
Nico Zimmer | Boeing Digital Aviation Research

How does *Superman Culture* affect OCCs?



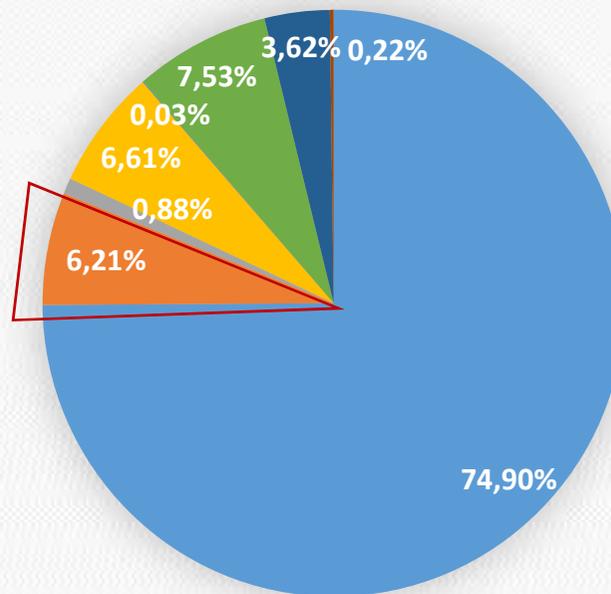
Airline OCC goal: Maintain (together?) the schedule. When not possible, return to plan as fast as possible.

EU aircraft delay by irregular operational causes



US aircraft delay by irregular operational causes

2015 % of Total Operations



- On Time
- Air Carrier Delay
- Weather Delay
- National Aviation System Delay
- Security Delay
- Aircraft Arriving Late
- Cancelled
- Diverted

The devil is in the detail



A. Internal Issues

B. External Issues

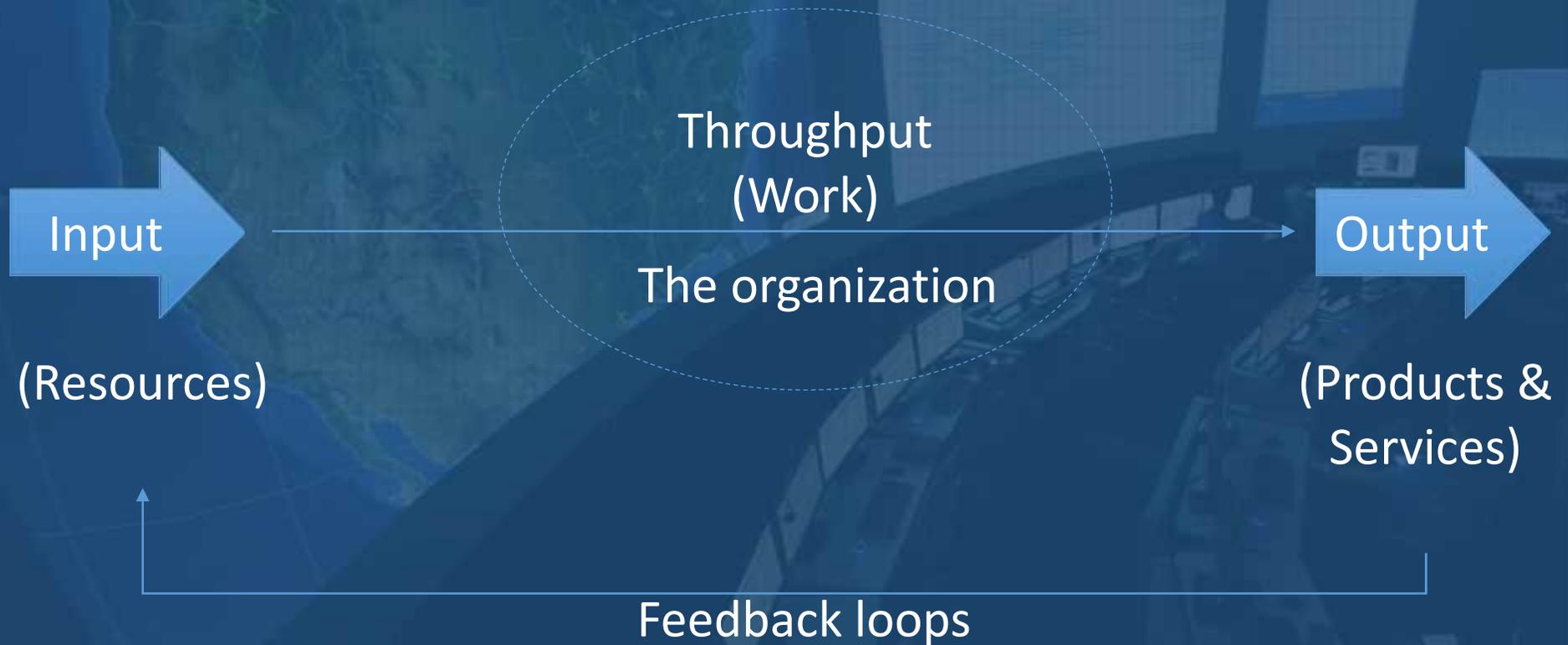
1. Systems & Functions
2. Management / People / Knowledge / Culture
 - I. **Fast Decision Making issues**
 - II. **Knowledge and people**
 - III. **Cross-functional / interdepartmental communication**
 - IV. **Airline Culture**
3. Third Party damage & safety

Approach

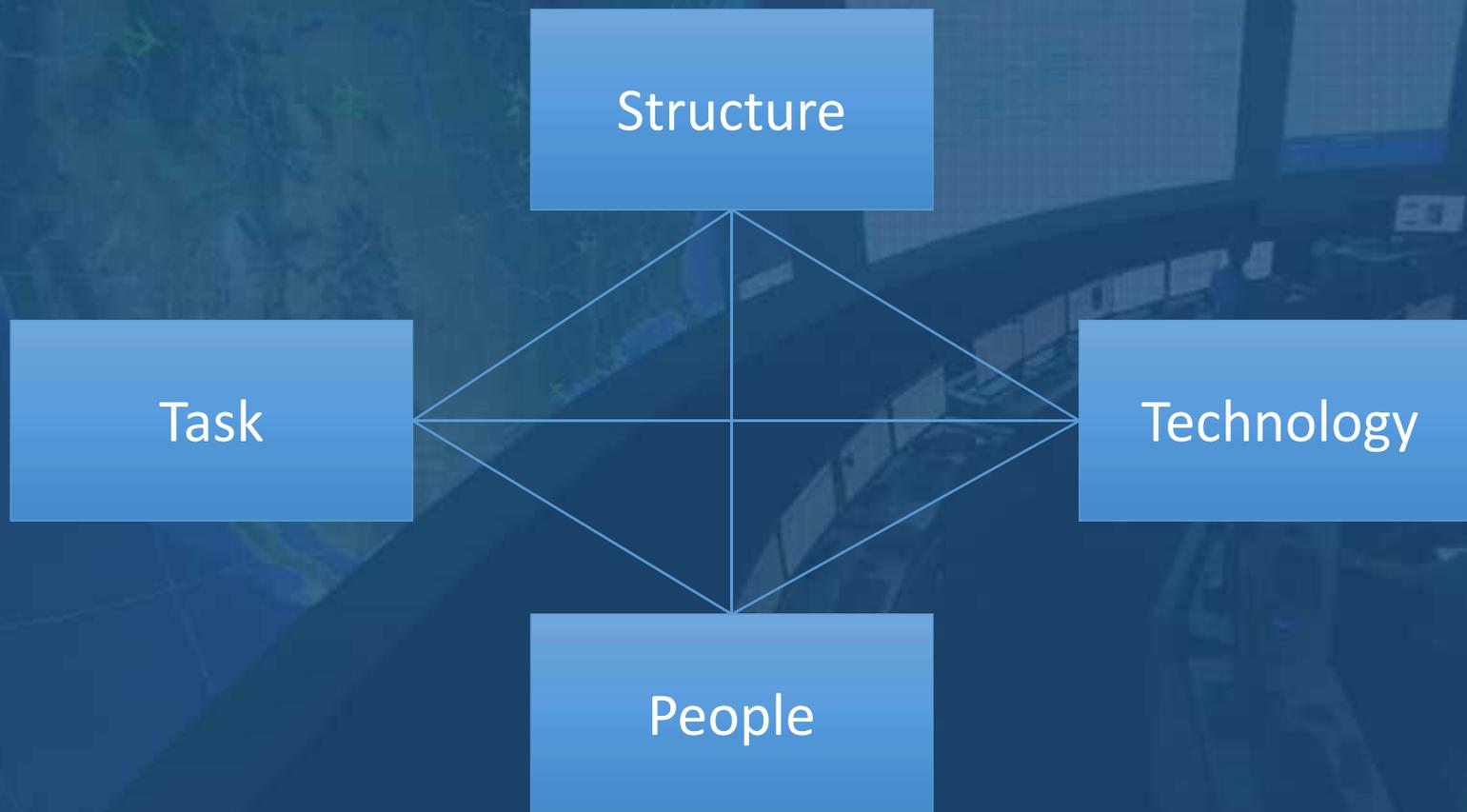
“In general, management needs to understand that success of a company is correlated to how the socio-technical system works – it’s not just a technical system with individuals you can replace and who needs to adapt ”

Emery, Thorsrud, Trist (1964)

Open System Theory



Organizational Systems Model

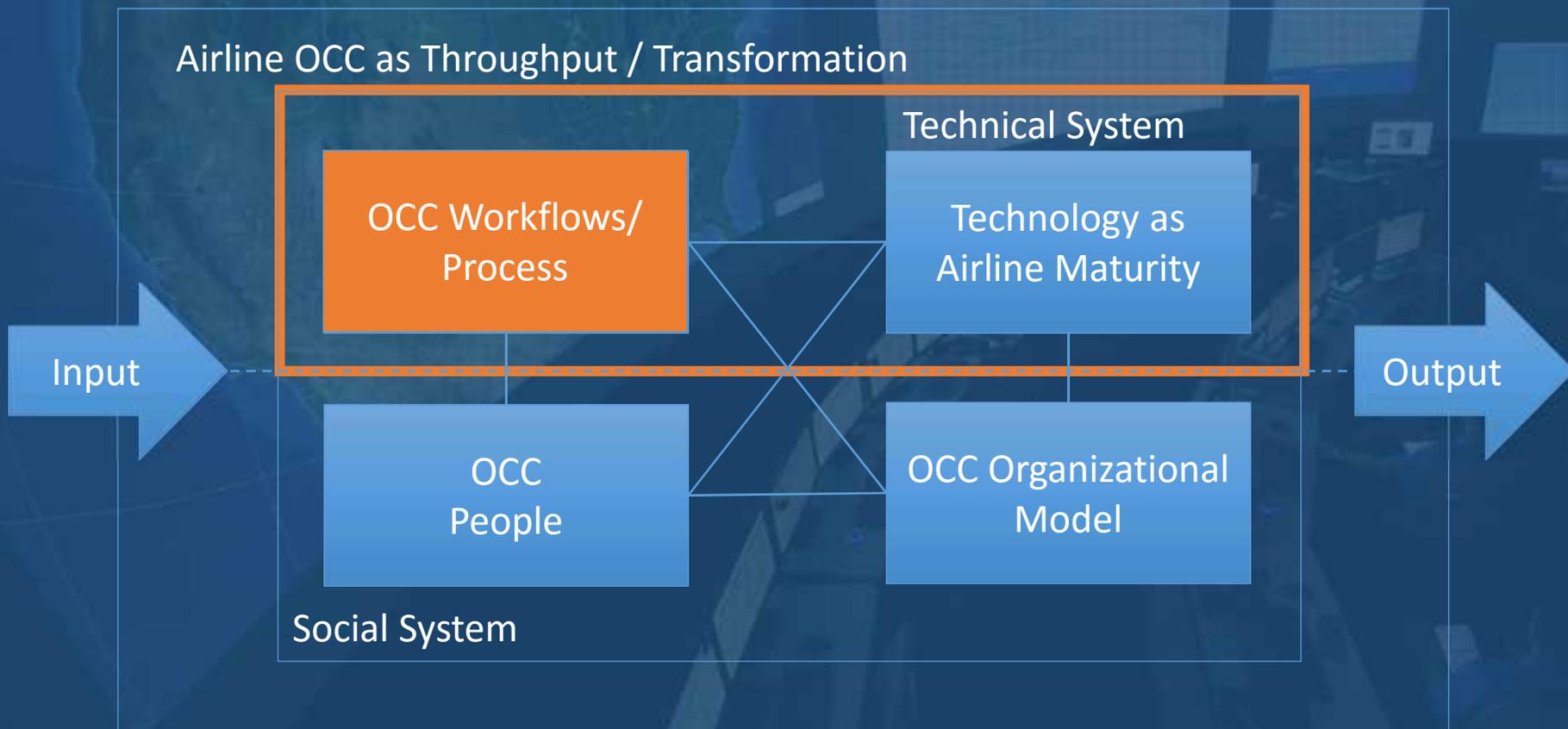


Socio-Technical System

“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



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

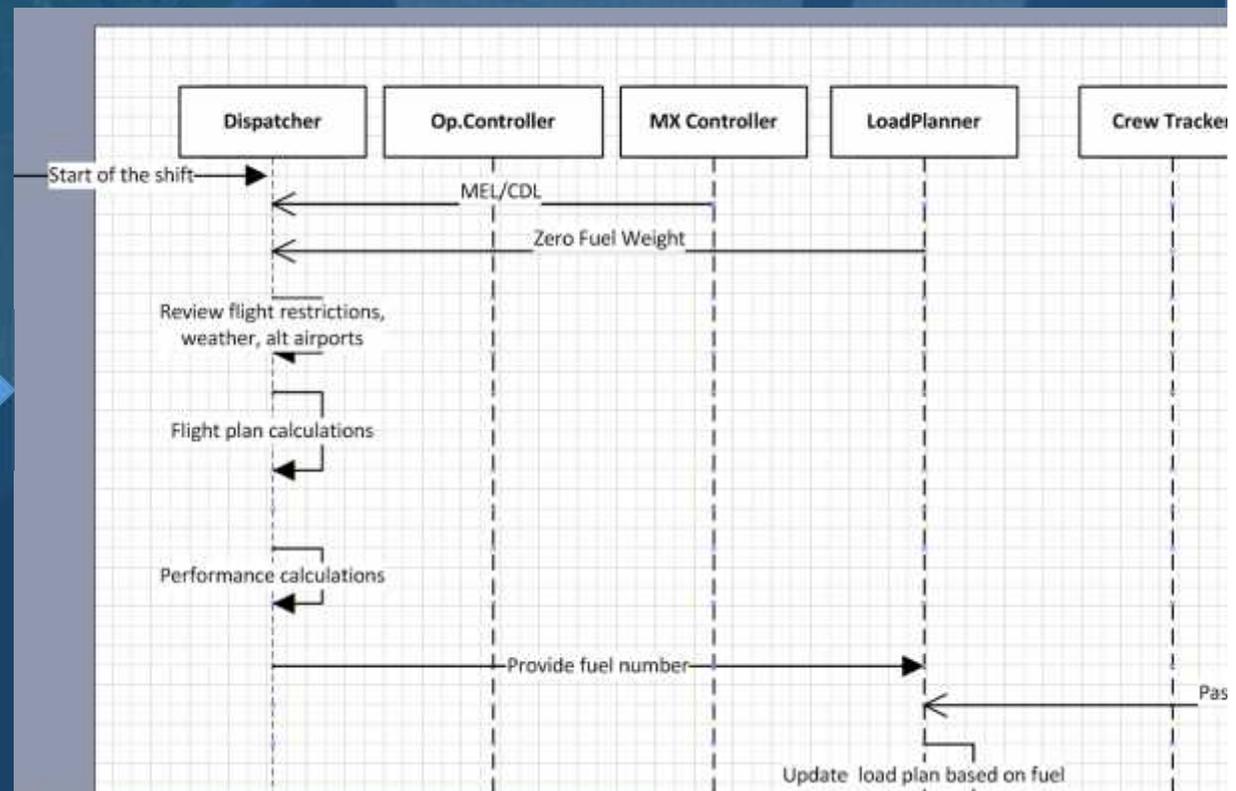
Workflow Model

Dispatcher
Interviews (internal)

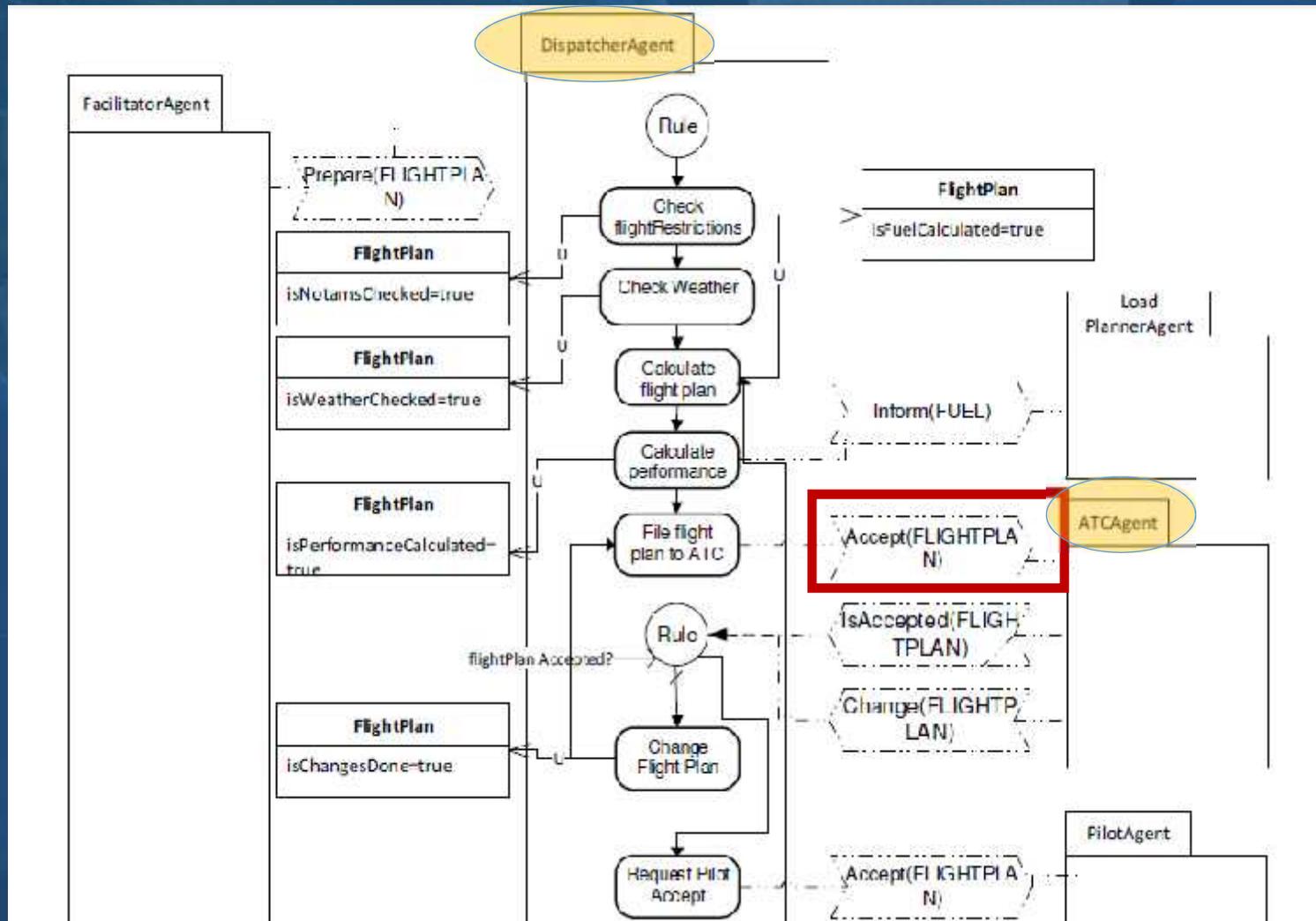
Airline Operation
Manager Interviews
(internal)

OCC Visits &
Interviews

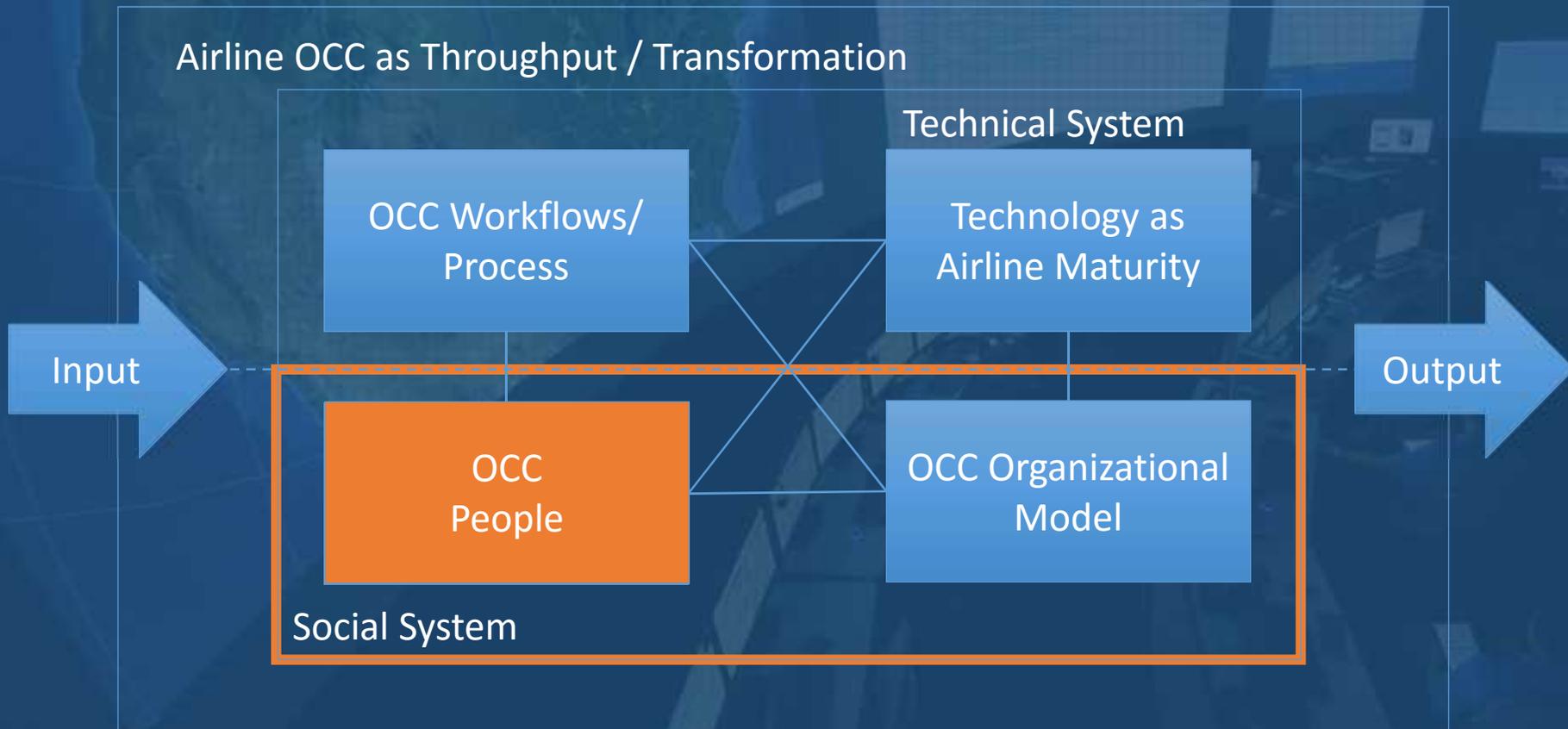
Internal OCC
Analysis Documents



Workflow Behavior Model



OCC as Socio-Technical System



Source: Adapted after
1977 Nadler-Tushman
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)**

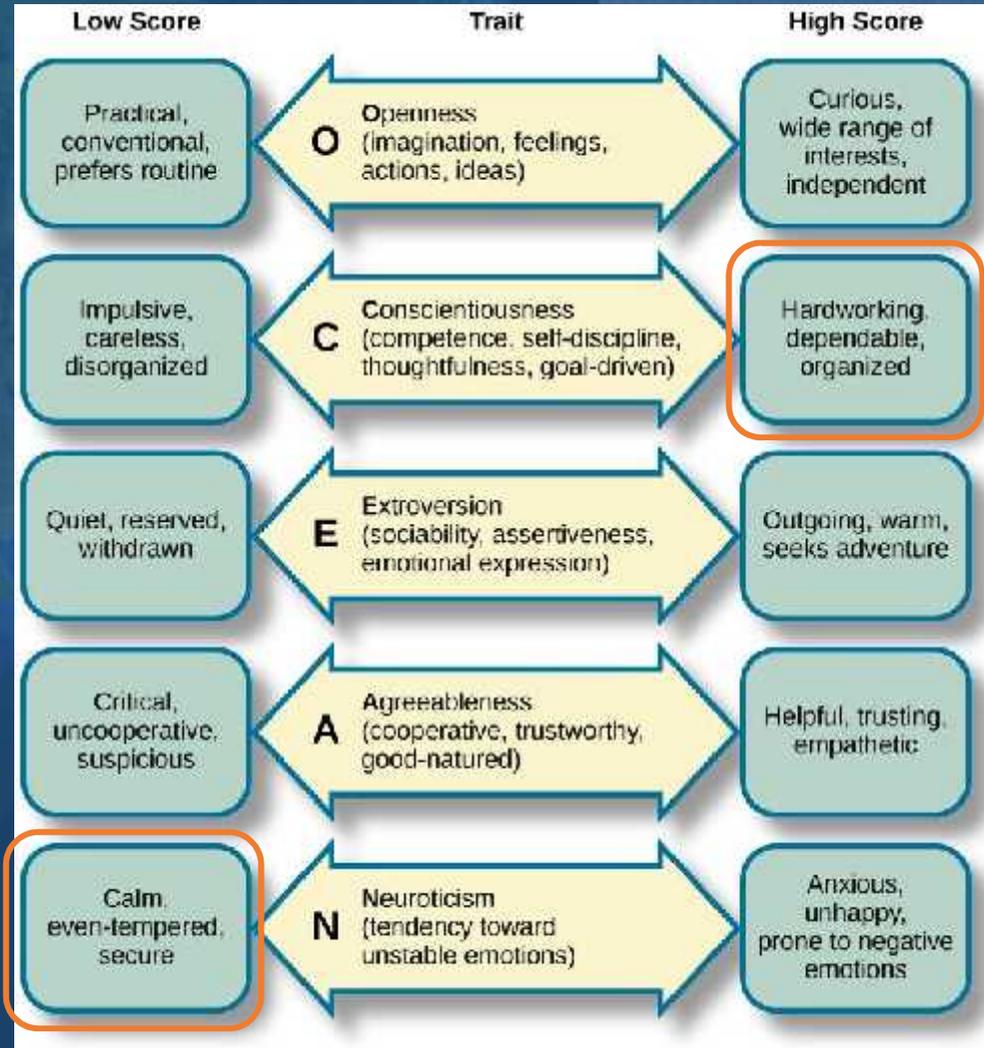
OCC People Model

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?

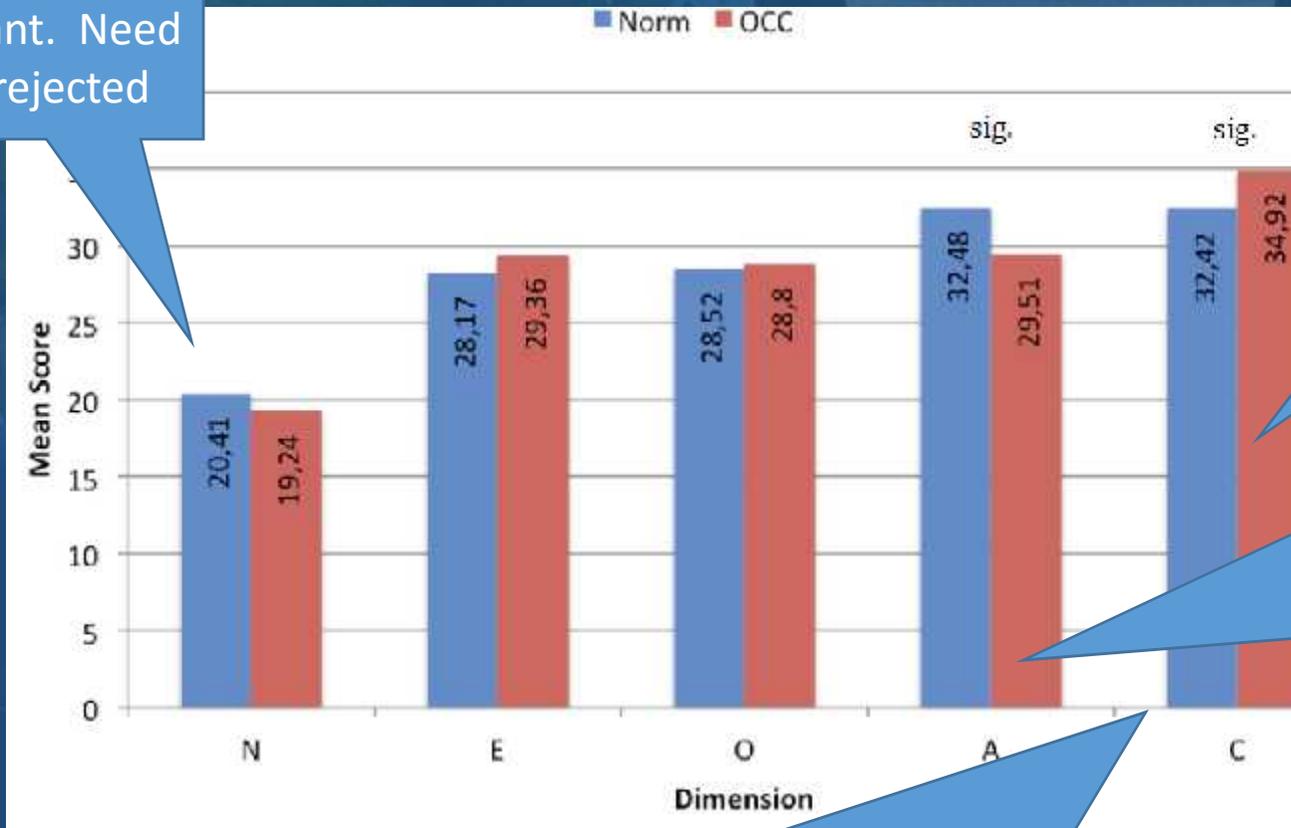


Hypothesis1:
OCC people Higher **C** score than Norm ?

Hypothesis2:
OCC people Lower **N** score than Norm ?

Significant Results

Hypothesis2: Not significant. Need to be rejected

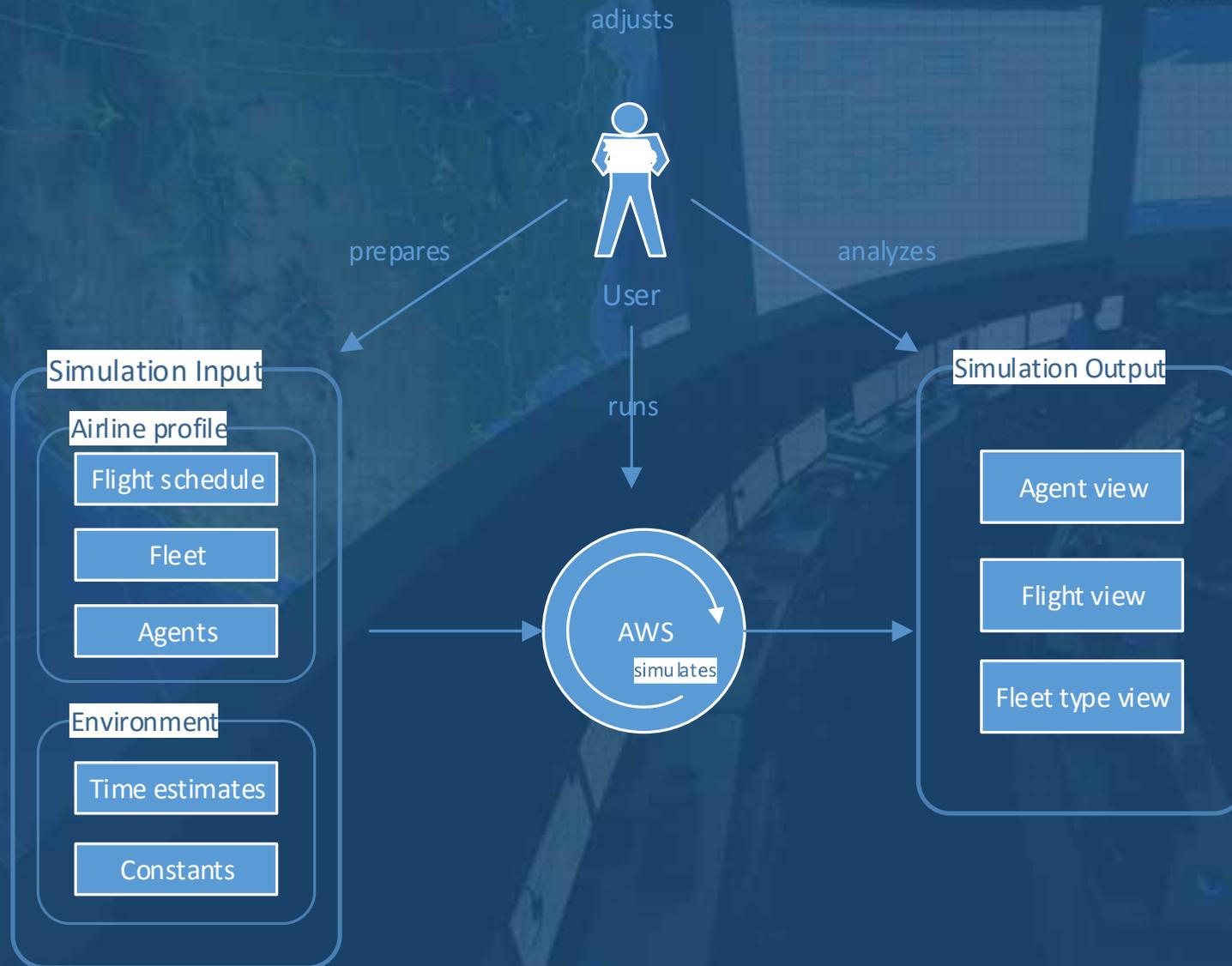


Hypothesis1: OCC employees showed significantly higher **C** score mean than Norm sample

Question2: OCC employees showed significantly lower **A** score mean than Norm sample

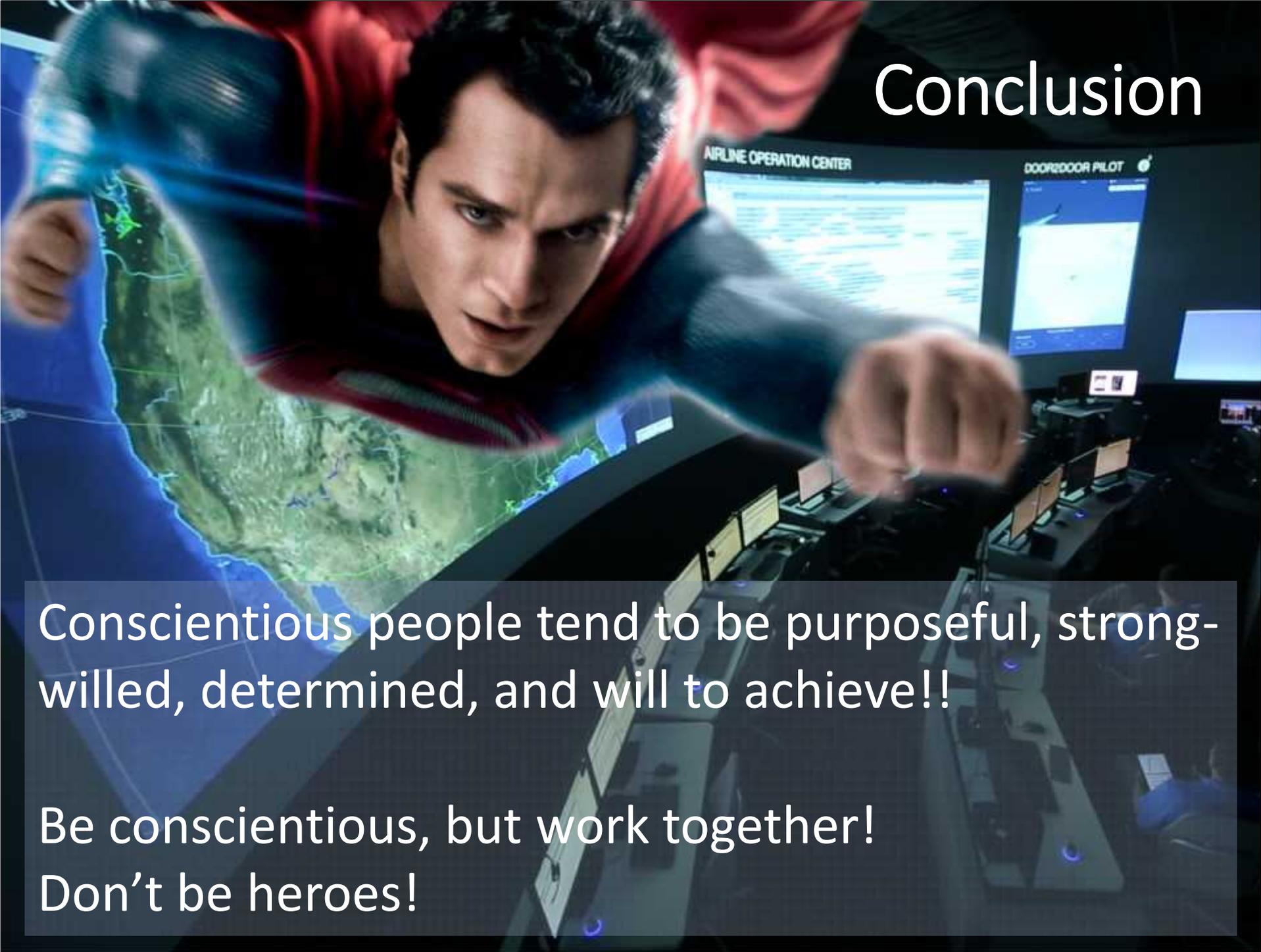
Question 3: Network Legacy Carrier employees showed a significantly higher C-score mean than Low-Cost Carrier employees in this sample

Airline Workflow Simulator



Summary – First Simulation Results

Norm Five Factor Profile	OCC Five Factor Model (FFM) Profile	OCC High Agreeableness Level	OCC High Conscientious Level
Scenario with NEO-FFI 3 Norm Data based on generated sample data	OCC Baseline Scenario based on Neo-FFI 3 OCC Survey data	OCC Staff Scenario with Neo-FFI 3 OCC Survey Data with High A- Factor	OCC Staff Scenario with Neo-FFI 3 OCC Survey Data with High C –Factor
Agreeableness: 69% of Norm have tendency to be agreeable	Agreeableness 7% lower than Norm	Agreeableness mean level 90%	Agreeableness same as OCC FFM Profile
Conscientiousness level 67% (100% is the highest level)	Conscientiousness 8% higher	Conscientiousness same as of OCC Profile	Conscientiousness mean level 90%
	All workflow performance increased by 5.5% compared to Scenario with norm Data	All workflow performance increased by ~ 0,2%	All workflow performance increased by 6,3%

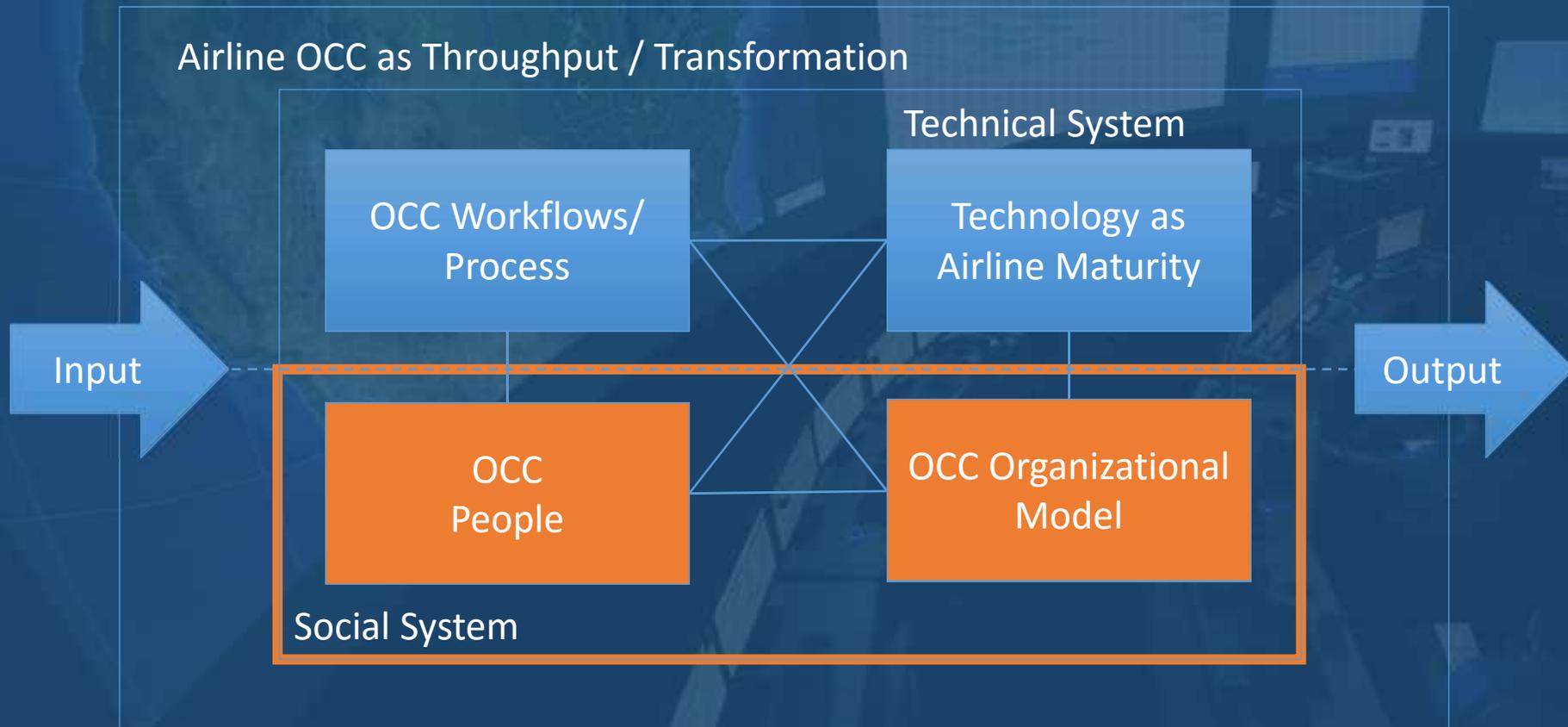
A composite image featuring Superman in his iconic blue suit and red cape, flying over a modern Airline Operation Center. The background shows a large curved wall of computer monitors displaying flight data, with labels like 'AIRLINE OPERATION CENTER' and 'DOOR2DOOR PILOT'. Superman is in the foreground, looking down with a determined expression, his right hand reaching towards the viewer. The overall scene is lit with cool blue and green tones from the screens and the superhero's suit.

Conclusion

Conscientious people tend to be purposeful, strong-willed, determined, and will to achieve!!

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

Outlook – More Research needed People & Teamwork Simulation



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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



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THANK YOU

Feedback | Ideas ?
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