



AI-Assisted Power BI for Business Analytics

Figure 1: AI-Assisted Power BI for Business Analytics

Business Requirements Document

AIRS-16 AI Readiness Longitudinal Study

Project: AI Readiness Growth Analysis Dashboard **Stakeholder:** Course Instructor & Research Team
Date: March 2026 **Priority:** High

Executive Summary

This analytics project measures student growth in AI readiness across an 8-week course using the AIRS-16 psychometric instrument. Students complete pre-course and post-course assessments, and this dashboard visualizes individual and cohort-level changes to evaluate course effectiveness and identify areas for curriculum improvement.

Business Context

Organizations investing in AI training programs need evidence that their educational interventions produce measurable outcomes. This longitudinal study addresses three critical questions:

1. **Does the course work?** — Do students demonstrate improved AI readiness after completing the curriculum?
2. **Which dimensions improve most?** — Are gains uniform across all UTAUT2 constructs, or do certain areas show stronger improvement?
3. **Who benefits most?** — Do all students improve equally, or are there patterns in who gains the most?

The AIRS-16 instrument measures eight constructs from the UTAUT2 (Unified Theory of Acceptance and Use of Technology 2) framework, adapted for AI adoption contexts:

Construct	Code	What It Measures
Performance Expectancy	PE	Belief that AI will improve job performance
Effort Expectancy	EE	Perceived ease of using AI tools
Social Influence	SI	Peer and organizational support for AI adoption
Facilitating Conditions	FC	Access to resources and infrastructure
Hedonic Motivation	HM	Enjoyment and intrinsic motivation to use AI
Price Value	PV	Perceived cost-benefit balance of AI tools (strongest predictor, =.505)
Habit	HB	Automaticity and routine use of AI
Trust in AI	TR	Confidence in AI reliability and output quality

Outcome Variable: Behavioral Intention (BI) — 4-item measure of intent to adopt AI tools.

Scoring: AIRS Score = sum of 8 construct means (range 8-40). Typology thresholds: 20 = Skeptic, 21-30 = Moderate, >30 = Enthusiast.

Validation: Correa (2025), N=523, CFI=.975, RMSEA=.065, R²=.852

Key Business Questions

The following questions must be answered by the analytics solution:

Overall Course Effectiveness

1. **Did overall AI readiness improve?** Compare composite scores (average of all 8 constructs) pre vs. post.
2. **Are the improvements statistically significant?** Use paired t-tests with $p < .05$ threshold.
3. **Are the improvements practically meaningful?** Calculate Cohen's d effect sizes (Small < 0.5 , Medium 0.5-0.8, Large > 0.8).

Construct-Level Analysis

4. **Which construct showed the largest improvement?** Rank constructs by mean change score.
5. **Which construct showed the smallest improvement?** Identify curriculum gaps for future iterations.
6. **Did any construct decline?** Flag potential negative course impacts.
7. **Are all effect sizes "Large" ($d > 0.8$)?** Evaluate practical significance across dimensions.

Individual Student Growth

8. **What is the distribution of growth categories?** Classify students as High Growth, Moderate Growth, Stable, or Declined.
9. **What percentage of students showed meaningful improvement?** Count students with total change > 1 point.
10. **Are there any students who declined?** Investigate outliers for intervention insights.

Correlation with Outcomes

11. **Is AI readiness growth correlated with behavioral intention growth?** Scatter plot with Pearson correlation — students who improved on AIRS-16 should show stronger intention to adopt AI.
12. **Did students shift typology categories?** Count students who moved from Skeptic \rightarrow Moderate or Moderate \rightarrow Enthusiast.
13. **Do students who started lower show more growth?** Test for ceiling effects.

Success Criteria

The analytics solution will be considered successful when:

Criterion	Measurement
Statistical Significance	All 8 constructs show $p < .05$ improvement
Practical Significance	Average Cohen's d across constructs > 0.8 (Large)
Positive Growth Rate	85% of students show positive overall change
Visualization Clarity	Dashboard answers all 13 business questions
Research Contribution	Findings inform course design improvements

Stakeholder Requirements

Primary Users

User	Role	Usage
Course Instructor	Decision Maker	Evaluate curriculum effectiveness, identify weak areas
Students	Analysts	Complete analysis as capstone exercise
Department Leadership	Executive Sponsor	Review aggregate outcomes for program evaluation
Research Team	Investigators	Prepare findings for academic publication

Access Requirements

- Dashboard accessible via Power BI Service (VT tenant)
- Students receive anonymized cohort data only
- Individual-level data visible only to instructor
- Export capability for executive summary slides

Update Frequency

- Pre-course data: Collected Week 1
- Post-course data: Collected Week 8
- Analysis: Performed once at course completion
- Historical comparison: Available for future cohorts

Data Requirements

Source Data

Dataset	Description	Format
AIRS_VT_Cohort_Anonymized.csv	Raw pre/post scores for all students	CSV
AIRS_Analysis_Results.csv	Pre-computed statistical results	CSV

Data Dictionary: Raw Cohort Data

Column	Data Type	Description	Range
participant_id	String	Anonymous identifier	P001-P999
PE_pre	Decimal	Performance Expectancy baseline	1.0-5.0
PE_post	Decimal	Performance Expectancy endline	1.0-5.0
EE_pre	Decimal	Effort Expectancy baseline	1.0-5.0
EE_post	Decimal	Effort Expectancy endline	1.0-5.0
SI_pre	Decimal	Social Influence baseline	1.0-5.0
SI_post	Decimal	Social Influence endline	1.0-5.0
FC_pre	Decimal	Facilitating Conditions baseline	1.0-5.0
FC_post	Decimal	Facilitating Conditions endline	1.0-5.0
HM_pre	Decimal	Hedonic Motivation baseline	1.0-5.0
HM_post	Decimal	Hedonic Motivation endline	1.0-5.0
PV_pre	Decimal	Price Value baseline	1.0-5.0
PV_post	Decimal	Price Value endline	1.0-5.0
HB_pre	Decimal	Habit baseline	1.0-5.0
HB_post	Decimal	Habit endline	1.0-5.0

Column	Data Type	Description	Range
TR_pre	Decimal	Trust in AI baseline	1.0-5.0
TR_post	Decimal	Trust in AI endline	1.0-5.0
BI_pre	Decimal	Behavioral Intention baseline (mean of 4 items)	1.0-5.0
BI_post	Decimal	Behavioral Intention endline (mean of 4 items)	1.0-5.0
AIRS_pre	Decimal	AIRS Score baseline (sum of 8 construct means)	8.0-40.0
AIRS_post	Decimal	AIRS Score endline (sum of 8 construct means)	8.0-40.0
Typology_pre	String	Classification at baseline	Skeptic/Moderate/Enthusiast
Typology_post	String	Classification at endline	Skeptic/Moderate/Enthusiast

Data Dictionary: Pre-Computed Statistics

Column	Data Type	Description
Construct	String	Construct code (PE, EE, SI, FC, HM, PV, HB, TR)
Pre Mean	Decimal	Average pre-course score
Post Mean	Decimal	Average post-course score
Change	Decimal	Mean difference (Post - Pre)
Cohen's d	Decimal	Standardized effect size
Effect	String	Interpretation (Small, Medium, Large)
Significant	String	Statistical significance stars (, ,)

Derived Calculations

Students must create the following calculated columns:

```
// Construct change scores
PE_change = PE_post - PE_pre
EE_change = EE_post - EE_pre
SI_change = SI_post - SI_pre
FC_change = FC_post - FC_pre
HM_change = HM_post - HM_pre
PV_change = PV_post - PV_pre
HB_change = HB_post - HB_pre
TR_change = TR_post - TR_pre

// AIRS Score (sum of 8 construct means, range 8-40)
AIRS_pre = PE_pre + EE_pre + SI_pre + FC_pre + HM_pre + PV_pre + HB_pre + TR_pre
AIRS_post = PE_post + EE_post + SI_post + FC_post + HM_post + PV_post + HB_post + TR_post
AIRS_change = AIRS_post - AIRS_pre

// Behavioral Intention change
BI_change = BI_post - BI_pre
```

Typology Classification (94.5% validated accuracy)

```
IF AIRS_Score <= 20 THEN "AI Skeptic"
ELSE IF AIRS_Score <= 30 THEN "Moderate User"
ELSE "AI Enthusiast"
```

Growth Classification Logic

```
IF AIRS_change >= 6 THEN "High Growth"
ELSE IF AIRS_change >= 2 THEN "Moderate Growth"
ELSE IF AIRS_change >= -2 THEN "Stable"
ELSE "Declined"
```

Visualization Requirements

Required Visuals

Visual	Purpose	Data Source
Radar Chart	Compare pre/post profiles across all 8 constructs	Raw cohort data
Clustered Bar Chart	Side-by-side pre vs. post means	Raw cohort data
Effect Size Bar Chart	Cohen's d values with threshold lines	Pre-computed stats
Box Plots	Distribution of change scores by construct	Raw cohort data
Pie/Donut Chart	Growth category distribution	Calculated field
Scatter Plot	Correlation between AIRS change and BI change	Raw cohort data
Typology Sankey	Student flow between typology categories pre → post	Calculated field
Summary Table	Statistical results with conditional formatting	Pre-computed stats

Expected Output

The visualization below represents benchmark results for a successful analysis:

Panel	What It Shows	Expected Insight
Top-Left (Radar)	Pre/post scores across all 8 UTAUT2 constructs	Orange polygon (post) expands beyond maroon polygon (pre)
Top-Right (Effect Sizes)	Cohen's d values with threshold lines	All bars exceed $d = 0.8$ (Large effect) threshold
Bottom-Left (Box Plots)	Distribution of change scores per construct	All medians positive; consistent growth across students
Bottom-Right (Scatter)	AIRS change vs. Behavioral Intention change	Positive correlation expected — students who improved on AIRS should show stronger adoption intention

Analytical Considerations

Statistical Notes

- **Paired samples t-test:** Appropriate because same students measured twice
- **Cohen's d effect size:** More meaningful than p-value for practical significance
- **Ceiling effects:** Students who start high have less room to improve
- **Self-report bias:** Scores reflect perceived (not actual) AI competence

AIRS-16 AI Readiness Scale: Longitudinal Analysis Results

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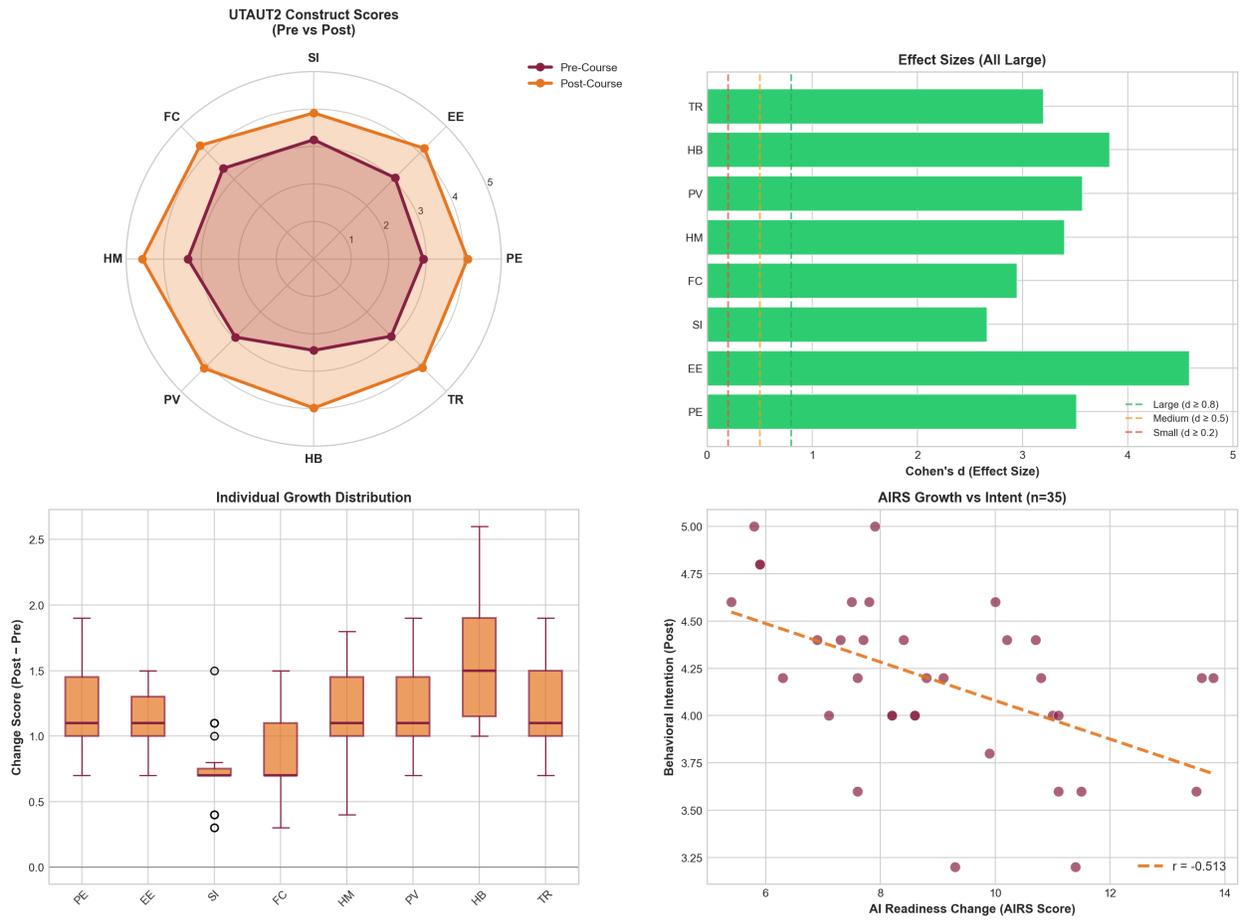


Figure 2: AIRS-16 Longitudinal Analysis Results

Limitations

Limitation	Mitigation
No control group Self-report data	Compare to published UTAUT2 benchmarks Triangulate with behavioral intention (validated outcome variable)
Small sample size	Report confidence intervals alongside point estimates
Single institution	Note generalizability limits in conclusions

Deliverables

Student Deliverable: Executive Summary (1 page)

Students must produce a one-page executive summary containing:

1. **Headline Finding:** Most impactful result in one sentence
2. **Pre-Post Comparison:** Visualization showing improvement
3. **Effect Sizes:** Table with Cohen's d values and interpretations
4. **Key Insight:** What this tells us about AI education effectiveness
5. **Limitations:** Acknowledgment of study constraints

Research Ethics

This study operates under Virginia Tech IRB approval. Student participation requirements:

- Completion of informed consent (Week 1)
- Use of @vt.edu email for tracking
- Right to withdraw without grade penalty
- Data anonymization before any publication

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum.
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science. *Frontiers in Psychology*, 4, 863.
- Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157-178.

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