Qualitative and Quantitative Data Collection and Analysis for Information System Design and Evaluation

Understanding human needs and validated instruments for Information Systems design and evaluation

Course: Understanding User Behavior for Decision-Making

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1

Learning Objectives

01

Distinguish Data Types

- Understand behavioral, cognitive, emotional data.
- Inform decision support system design.
- Improve managerial outcomes.

02

Master Data Collection Methods

- Apply techniques: system logs, interviews, eye tracking.
- Understand user behavior.
- Optimize workflows.

03

Integrate Data for Insights

- Combine qualitative and quantitative data.
- Evaluate DSS performance.
- Enhance decision-making and user trust.

04

Leverage Technology for Evaluation

- Utilize advanced analytics & AI tools.
- Automate data collection and analysis.
- Improve evaluation efficiency.

05

Design Evaluation Methodologies

- Build robust evaluation frameworks.
- Ensure transparency and ethics.
- Assess impact on strategy.

2

PART 1

Data Collection and Analysis Methods

Understanding qualitative and quantitative data is crucial for informed managerial decisions and effective decision support systems.

- Inform managerial decisions
- Foster evidence-based practices
- Design and evaluate decision support systems (intelligent automation, predictive analytics)
- Prioritize user understanding
- Enhance system transparency and effectiveness

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3

Quantitative Data

Characteristics

Numerical data for validating decisions. Quantifies patterns and relationships, forming a robust foundation for data-driven systems.

Collection Methods

- Structured questionnaires
- System logs
- A/B testing
- Controlled experiments
- Automated behavioral tracking

Analysis Approaches

- Descriptive statistics
- Inferential tests
- Correlation & Regression
- Advanced analytical models
- Data visualization

Strengths

- Rigorously tests hypotheses
- Generalizes insights
- Enables robust comparison
- Identifies statistical relationships
- Supports evidence-based decisions

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4

Qualitative Data

Characteristics
- Non-numerical, descriptive data.
- Captures user context and richness.
- Uncovers 'why' and 'how' behaviors.
- Supports human-centered decision-making.

Collection Methods
- Interviews, focus groups.
- Observations (e.g., users with AI workflows).
- Think-aloud protocols, open-ended surveys.
- Diary studies, ethnographic research.

Analysis Approaches
- Thematic analysis, coding schemes.
- Grounded theory, content analysis.
- Identifies patterns, themes, meanings in text.
- Informs managerial decisions and system design.
- Supports evidence-based management.

Strengths
- Uncovers unexpected user insights.
- Explores complex phenomena (e.g., user trust).
- Captures context and nuance in decision tools.
- Generates hypotheses for system improvement.
- Explains factors in decision effectiveness.

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5

Key Data Types for Decision Systems

Optimizing decision systems requires diverse data on user behavior and organizational context.

Behavioral Data
Observable user actions and interactions within decision support systems.

Physiological Responses
Biological reactions indicating user stress, trust, or cognitive load during system interaction.

Cognitive Data
Mental processes revealing user comprehension and reasoning in decision systems.

Subjective Data
User perceptions and self-reported experiences on system effectiveness and fairness.

Textual Data
User-generated written content providing direct feedback on system performance.

Video/Multimedia Data
Recorded sessions and visual content capturing human-system interaction.

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6

Behavioral Data

Behavioral data captures explicit user actions and patterns in digital systems. It provides objective evidence of user engagement, revealing real-world usage and system performance.

What it Captures

- **Specific Actions:** Clicks, scrolls, key presses, form submissions...
- **Interaction Sequences:** User step order and flow.
- **Usage Patterns:** Repetitive behaviors, feature adoption.
- **Timing:** Time on pages/tasks, session duration...

Collection Methods

- **Analytics Tools:** Platforms like Google Analytics, Mixpanel, Hotjar for tracking.
- **System Logs & Click Tracking:** Recording events, actions, and navigation paths.
- **Task Completion Metrics:** Tracking success rates for specific tasks.
- **A/B Testing Platforms:** Comparing user behaviors across different versions.

Analysis Techniques

- **Path Analysis:** Visualize user journeys and drop-offs.
- **Funnel Analysis:** Track step progression to find bottlenecks.
- **Cohort Analysis:** Group users to observe behavior changes.
- **Time-Series Analysis:** Examine behavioral trends over time.

Key Metrics

- **Task Completion Rate:** % of users completing a task.
- **Time-on-Task:** Average time for an action/task.
- **Error Rate:** Frequency of user or system errors.
- **Feature Adoption:** Proportion of users engaging with features.

Behavioral Data Example

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Evaluation

Strengths

- **Objective:** Factual evidence, free from self-reporting bias.
- **Scalable:** Collected from many users over time.
- **Non-Intrusive:** Passive collection without interrupting user experience.
- **Actual Behavior:** Reveals what users *do*, not what they *say*.

Limitations

- **No "Why":** Captures *what*, not motivations or reasons.
- **Lacks Context:** Limited insight into external factors.
- **Needs Interpretation:** Raw data requires careful analysis.
- **Ethical Concerns:** Privacy issues with user tracking.

Physiological Data

Physiological data captures unconscious bodily responses, offering unbiased insights into cognitive and emotional states by measuring biological signals.

What it Captures

- Unconscious bodily responses.
- Reflects cognitive processes (e.g., attention, load).
- Indicates emotional states (e.g., stress, engagement).

Collection Methods

- **Wearable Sensors:** Smartwatches, rings, patches (heart rate, skin temp).
- **Heart Rate Monitors:** Measures cardiac activity (e.g., ECG).
- **EEG (Electroencephalography):** Measures brain electrical activity.
- **Skin Conductance Sensors:** Detects changes in skin conductivity related to arousal.
- **Eye Tracking Devices:** Records gaze, pupil dilation, blink rate.

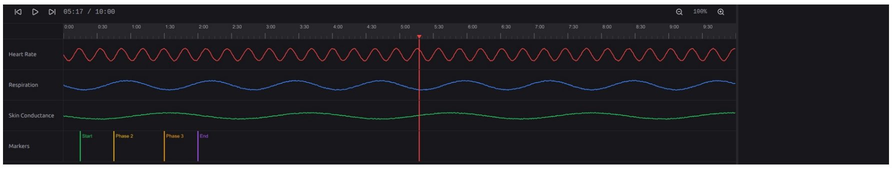
Analysis Techniques

- **Signal Processing:** Filtering, artifact removal.
- **Baseline Comparison:** Compare to resting state.
- **Event-Related Analysis:** Examine responses time-locked to events.
- **Multivariate Analysis:** Integrate multiple physiological signals.

Key Metrics

- **Heart Rate Variability (HRV):** Fluctuations indicating stress/relaxation.
- **Skin Conductance Response (SCR):** Skin conductivity changes, linked to arousal.
- **Pupil Dilation:** Pupil size changes reflect cognitive effort, emotional response.

Physiological Data



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11

Evaluation

Strengths

- **Objective:** Factual evidence, free from self-reporting bias.
- **Unconscious:** Reveals reactions users can't consciously control.
- **High Temporal Resolution:** Captures rapid state changes (milliseconds).

Limitations

- **Costly Equipment:** High cost for specialized sensors and software.
- **Expertise Needed:** Complex signal interpretation requires specialists.
- **Variability:** Individual responses differ; requires calibration.
- **Lab-Dependent:** Often needs controlled environments, limiting real-world use.

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12

Cognitive Data

What it Captures

- Mental processes: How users think and process information
- Reasoning: Logic and decision-making pathways users follow
- Comprehension: Understanding of system functions and information
- Memory & retention: What users remember and recall from interactions

Collection Methods

- Think-aloud protocols
- Mental model interviews: Exploring users' internal representations and assumptions about how the system works
- Comprehension tests
- Memory recall tasks

Analysis Techniques

- Protocol analysis (coding transcripts)
- Content analysis (qualitative data categorization)
- Concept mapping
- Performance metrics

Key Metrics

- Task completion accuracy
- Recall accuracy
- Cognitive load scores
- Decision time
- Error patterns

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13

Evaluation

Strengths

- Reveals reasoning & mental processes
- Identifies misunderstandings & clarifies behaviors
- Provides rich, nuanced insights

Limitations

- Verbalization may alter processes
- Time-intensive data collection/analysis
- Requires specialized expertise
- Limited sample sizes

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14

Subjective Data: User Perceptions

Captures (not exhaustive)

- Perceptions
- Attitudes
- Preferences
- Satisfaction
- Trust

Metrics - Examples:

- Satisfaction Scores (e.g., SUS)
- Usability Ratings
- Trust Levels
- Perceived Usefulness/Ease of Use
- Emotional Responses

Analysis (not exhaustive)

- Sentiment analysis: Identifying positive, negative, or neutral attitudes from responses
- Scoring (Likert scales): e.g. quantifying user satisfaction levels (SUS scores,)
- Trust assessment: Measuring confidence and reliability perceptions in the system
- Preference ranking: Understanding user choices and priorities

Collection Methods

- Surveys and questionnaires: Standardized instruments measuring usability and workload
- Interviews and focus groups: Direct conversations exploring user opinions and experiences
- User feedback forms: Open-ended and structured feedback collection
- Preference studies: Comparative evaluations of design alternatives

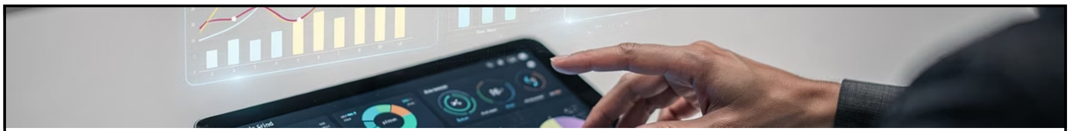
Evaluation

Strengths

- **User Perspective:** Captures thoughts, feelings, attitudes.
- **Motivations:** Explains user behavior.
- **Pain Points:** Identifies frustrations and satisfaction.
- **Complements Data:** Provides context for objective patterns.

Limitations

- **Bias:** Subject to social desirability and recall bias.
- **Accuracy:** Self-reports may lack accuracy.
- **Context:** Responses vary by timing and framing.
- **Design:** Requires careful question wording.



Video/Multimedia Data: Visual Records

What it captures

User interactions, emotions, behaviors, contexts

Collection methods

- Screen recordings
- Session replays
- Video observations
- Webcam recordings
- Eye tracking videos
- Contextual observation
- Interaction recordings

Analysis techniques

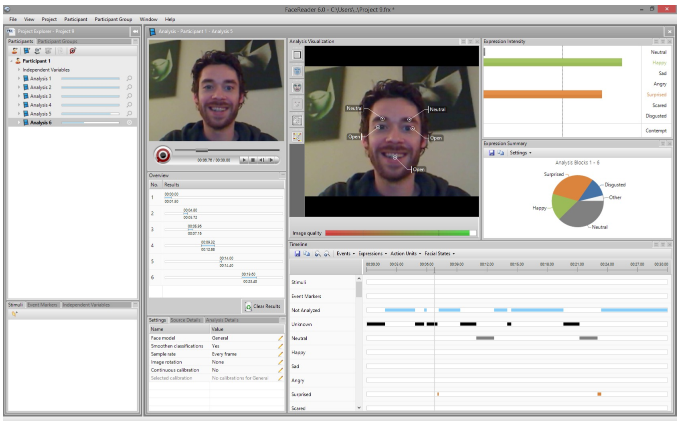
- Qualitative: Interaction analysis, ethnographic coding
- Quantitative: Computer vision, facial expression, gaze patterns
- Tools: Morae, Hotjar, OpenCV, facial coding software

Key metrics

- Interaction sequences
- Facial expressions
- Gaze patterns
- Gesture analysis
- Time-stamped behaviors

17

User Emotion Analysis: example of FaceReader



https://www.vicarvision.nl/products/facereader/

18

Evaluation

Strengths

- **Rich Contextual Data:** Environment, body language, situation.
- **Non-Verbal Cues:** Facial expressions, gestures, tone.
- **Detailed Review:** Rewatchable for analysis.
- **Training Support:** Illustrates user behavior.

Limitations

- **Time-Intensive Analysis:** Slow, labor-intensive.
- **Privacy Concerns:** Ethical/legal recording issues.
- **Large File Sizes:** Significant storage/processing.
- **Observer Effect:** Behavior changes when recorded.

Textual Data: User-Generated Content

What it captures

- Written feedback
- Communications
- Documentation

Collection methods

- Support tickets and chat logs
- Forum posts and reviews
- Open-ended survey responses
- Social media comments
- Documentation analysis

Analysis techniques

- Qualitative: Thematic, grounded theory
- Quantitative: Text mining, sentiment analysis, NLP, topic modeling
- Tools: NVivo, ATLAS.ti, Python, R

Key metrics

- Sentiment scores
- Topic frequencies
- Keywords
- Complaint categories

Evaluation

Strengths

- Captures detailed user experiences
- Authentic user voice
- Scalable with NLP tools (Natural Language Processing)
- Captures genuine reactions

Limitations

- Unstructured; hard to organize
- Ambiguous meaning; context-dependent
- Potential for user bias
- High language variability

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Qualitative vs. Quantitative Data

Dimension	Qualitative	Quantitative
Goal	Explore needs, context, mental models; understand human challenges.	Measure performance, engagement, outcomes; identify biases.
Sample Size	Smaller, purposive; in-depth studies.	Larger, representative; statistical evaluation.
Data Format	Interviews, observations; open-ended feedback.	Metrics, conversion rates; A/B tests, system logs.
Analysis Style	Thematic analysis, journey mapping; identify pain points.	Statistical validation, regression; anomaly detection.
Validity Focus	Credibility of insights, pattern transferability; inform ethical design.	Internal/external validity (A/B, generalization); assess fairness, effectiveness.
Best For	New features, adoption barriers; inform human-centered design.	Dashboard impact, efficiency; algorithmic fairness, data integrity.

Note: This comparison highlights key distinctions but is not exhaustive in each category.

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PART 2

Data-Driven Decision Making

Integrating insights from managerial decision-making systems and technology-driven support fosters user-centered decision-making and evidence-based management.

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23

Four Types of Data Analysis

For Managerial Decision-Making

Descriptive Analysis

Goal: Summarize current user behavior and operational state.

Collection: Behavioral logs, usage metrics, demographic surveys.

Example: Dashboards showing new feature adoption and user interaction paths.

Diagnostic Analysis

Goal: Understand WHY something happened.

Collection: Incident reports, user feedback, error logs, causal surveys, qualitative interviews.

Example: Pinpointing exact user interaction steps that led to a significant drop-off in a conversion funnel.

Predictive Analysis

Goal: Forecast future outcomes and potential user risks.

Collection: Historical data, consistent metrics, future trend signals.

Example: Forecast customer attrition to identify at-risk users and design interventions.

Prescriptive Analysis

Goal: Recommend optimal actions and strategies for decision-making.

Collection: Experimental data (A/B tests), outcome measures, operational constraints.

Example: Determine optimal resource allocation and evaluate human-system synergy.

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24

Descriptive Analysis: Understanding What Happened

Case: E-commerce Recommendation System Audit

1 **Context**

An online retailer noticed declining user engagement with their product recommendation engine despite high technical performance metrics.

2 **Data Collection & Methods**

- Behavioral data: Click-through rates, time spent on recommendations, purchase conversion rates (analytics tools)
- Video recordings: User sessions showing interaction patterns with recommendations
- System logs: Recommendation algorithm outputs and user responses

3 **Analysis Approach**

Summarized and visualized user interaction patterns to understand current system performance. Created dashboards showing:

- Which recommendation types users clicked most/least
- Time of day patterns for engagement
- Product category preferences by user segment

4 **Key Findings**

- Users ignored 70% of recommendations
- High engagement only with "recently viewed" items
- Recommendations appeared at wrong moments in shopping journey

5 **Outcome**

Clear picture of current system performance revealed timing and relevance issues, setting foundation for diagnostic analysis.

25

Diagnostic Analysis: Understanding Why It Happened

Context:

A hospital implemented an AI-powered diagnostic support system. After initial deployment, issues arose with adoption and effectiveness, prompting a need to understand **why** these discrepancies occurred across different medical specialties.

Data Collection & Methods:

- Behavioral data: Pilot usage patterns from 50 physicians over 3 months
- Physiological data: Cognitive load measurements (EEG) during system use
- Subjective data: Trust and satisfaction surveys (NASA-TLX, custom trust scales)
- Performance metrics: Diagnostic accuracy, time to decision, system override rates

Analysis Approach:

- Conducted diagnostic analysis to understand adoption and impact challenges:
- Identified usage patterns that **caused** differences in diagnostic accuracy
- Analyzed **which** physician characteristics **explained** system trust
- Modeled relationship between cognitive load and decision quality to **understand performance gaps**
- Investigated **why** certain specialties showed lower adoption or benefit from the system

Key Findings:

- High cognitive load **was a root cause of** system abandonment
- Physicians with 5-10 years experience **demonstrated why** they had the highest adoption potential
- Emergency medicine **showed why it benefited most**; radiology **revealed challenges**
- Transparency features **were found to be crucial for** long-term trust and usage

Outcome:

Based on diagnostic insights, an informed phased rollout strategy was developed, targeted training programs were implemented, and interface simplifications were made for high-cognitive-load scenarios, **addressing identified issues**.

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26

Prescriptive Analysis: Recommending Actions

Case: Financial Trading Platform Optimization

Context: A trading platform wanted to optimize their decision support tools to reduce trader stress and improve decision quality during volatile markets.

1

Data Collection & Methods

- Physiological data: Heart rate variability, skin conductance during trading sessions
- Behavioral data: Trading patterns, response times, error rates
- Cognitive data: Decision-making protocols, mental model interviews
- Subjective data: Stress assessments, interface satisfaction surveys
- Video data: Trading session recordings showing context and behavior

2

Analysis Approach

- Correlated physiological stress markers with trading errors
- Identified interface elements causing cognitive overload
- Tested alternative alert systems through A/B testing
- Simulated impact of different interface configurations

3

Prescriptive Recommendations

1. Implement adaptive interface: Simplify display when stress levels rise (based on physiological data)
2. Redesign alert system: Multimodal notifications for critical events (from attention analysis)
3. Add decision pause feature: Mandatory 10-second delay for high-risk trades during high-stress periods
4. Personalize information density: Allow traders to customize based on experience level

Outcome: Implemented recommendations led to measurably reduced stress-related errors, improved trader satisfaction, and better decision quality during volatile periods. System now adapts in real-time to trader state.

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27

User-Centered Decision Framework

Gathering User Insights

- Gather diverse data (interactions, system logs).
- Document data provenance for transparency.
- Synchronize timestamps for behavior correlation.
- Link user studies to system usage.

Analyzing Data

- Apply advanced analytics to human-system interaction.
- Identify interaction patterns and biases.
- Uncover themes across user studies & system metrics.
- Investigate system behavior discrepancies.

Integrating Findings

- Synthesize user study and system log findings.
- Detail DSS impact on outcomes.
- Resolve data conflicts to refine design.
- Generate actionable insights for business value.

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28

Practical Implementation

Bridge theory to practice: apply data collection methods in real-world DSS evaluation.

Method Selection Framework

- **Match methods to research questions:** Use qualitative for "why/how", quantitative for "how much/many".
- **Consider resource constraints:** Align methods with budget, team size, and timeline.
- **Balance depth vs. breadth:** Choose depth for rich insights (small sample), breadth for general patterns (large sample).

Combining Methods Strategically

- **Triangulate for validation:** Confirm findings using multiple data sources or methods.
- **Sequential approach: Qual. explore → Quant. validate:** Explore with qualitative, then validate with quantitative.
- **Parallel collection: Metrics + feedback:** Collect different data types simultaneously for a comprehensive view.

Common Implementation Scenarios

- **Limited budget: Automated data + surveys:** Leverage system logs/analytics and cost-effective online surveys.
- **New DSS: Interviews + think-aloud → A/B test:** Start with exploratory qualitative, then A/B test design iterations.
- **Existing system: Eye tracking + analytics + feedback:** Use advanced methods for granular insights and targeted feedback.

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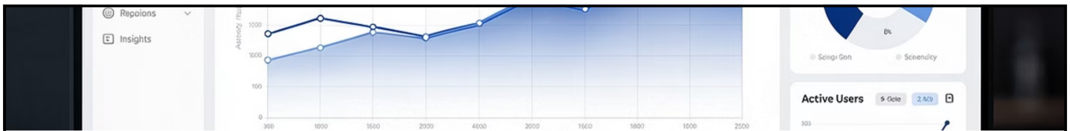
29



Case Study: Dashboard Redesign Using Mixed Methods

Example of applying user insights to improve decision-making

1

The Challenge: Quantitative Decline

Our dashboard redesign project began with concerning quantitative data points:

- 40% decrease in adoption.
- SUS score dropped (72 to 58).
- Reduced ease of use.

2

Qualitative Methods & User Insights

To understand the 'why' behind the quantitative decline, we employed qualitative research:

- Interviews revealed user confusion.
- Rationale unclear in think-alouds.
- Affects trust and integration.

3

Physiological Methods & Deeper Insights

Further mixed methods, including physiological data collection, revealed a more granular understanding:

- Eye-tracking: increased cognitive load, erratic navigation.
- EEG data: elevated stress, user frustration.
- Hindering effective decisions.

4

Outcome: User-Centered Redesign Mandate

The combined mixed methods insights led to a clear path forward:

- Evidence: transparency and interface gaps.
- New tool disrupted processes.
- Requires user-centered design & iteration.

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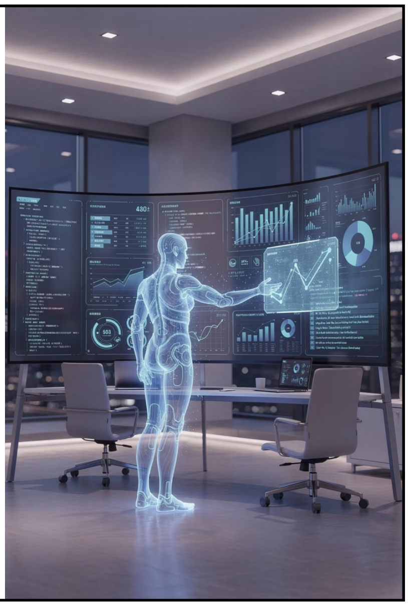
30

PART 3

Part 3: Practical Tools & Automation

Practical AI-powered tools to automate data collection, transcription, analysis, and decision-making processes.



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31

AI-Powered Transcription Tools

Automated transcription fuels user-centered, evidence-based management. It efficiently captures qualitative data from user studies and strategic discussions, providing crucial insights for informed, AI-driven decisions.

Otter.ai

Real-time transcription, speaker identification, automated summaries, integration with Zoom/Teams (F)

Rev.ai

High accuracy API, multi-language support, timestamps, custom vocabulary (C)

Descript

Transcription + editing, remove filler words, multi-speaker detection (F)

Fireflies.ai

Meeting transcription, action items extraction, CRM integration (F)

Whisper (OpenAI)

Open-source, 99 languages, local deployment option (OS)

Pricing: [OS] Open Source (Free) | [F] Freemium (Free tier + paid plans) | [C] Commercial (Paid only)

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32

Automated Qualitative Analysis Tools

AI-Powered Coding & Analysis

- **Dovetail:** AI-powered theme detection, automated tagging, sentiment analysis. (C)
- **Notably:** Pattern recognition, collaborative analysis, AI summaries. (C)
- **Marvin:** Automated repository, AI insights, user research at scale. (C)
- **MonkeyLearn:** Text classification, sentiment analysis, custom ML models. (F)

Traditional Tools Enhanced with AI

- **NVivo:** Auto-coding, sentiment analysis, visualization. (C)
- **ATLAS.ti:** AI-assisted coding, network analysis. (C)
- **MAXQDA:** AI text analysis, mixed methods integration. (C)
- **Dedoose:** Cloud-based, real-time collaboration, automated coding. (C)

These tools accelerate insights from user studies. Human validation and analytical rigor remain critical for effective, transparent decision-making.

Pricing: [OS] Open Source | [F] Freemium | [C] Commercial

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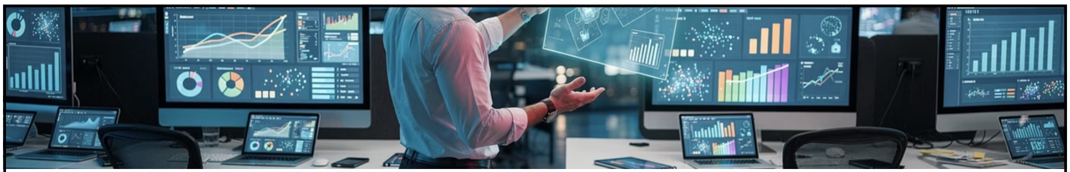
33



Automated Data Collection Platforms

- **Qualtrics:** Advanced surveys, automated distribution, real-time analytics, AI-powered insights (C)
- **Typeform:** Conversational surveys, logic jumps, automated follow-ups (F)
- **SurveyMonkey:** Templates, automated reminders, sentiment analysis (F)
- **Google Forms + Zapier:** Free automation, integration with 5000+ apps (F)
- **Airtable:** Database + forms, automated workflows, API integration (F)
- **UserTesting:** Automated user testing, video recording, AI insights (C)

Pricing: [OS] Open Source | [F] Freemium | [C] Commercial

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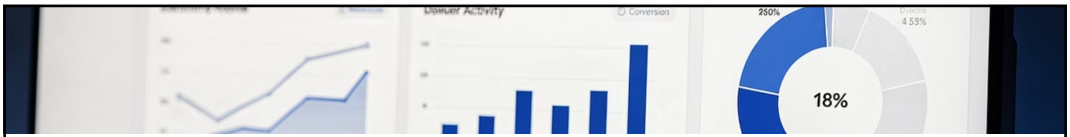
34



Automated Behavioral Analytics Tools

Real-time Behavioral Tracking

Hotjar
- Heatmaps, session recordings, automated feedback collection (F)

FullStory
- Session replay, automatic event capture, AI-powered insights (C)

Mixpanel
- Product analytics, automated cohort analysis, predictive analytics (F)

Amplitude
- User journey tracking, automated anomaly detection (F)

Specialized Analytics

Heap
- Auto-capture all events, retroactive analysis, no coding required (F)

Pendo
- In-app analytics, automated user segmentation, guided tours (C)

LogRocket
- Frontend monitoring, automated error detection, session replay (F)

Pricing: [OS] Open Source | [F] Freemium | [C] Commercial

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35

Video & Multimedia Analysis Automation

AI Video Analysis

- **Realeyes:** Automated emotion detection, attention tracking, facial coding (C)
- **iMotions:** Multi-sensor integration, automated physiological analysis (C)
- **Affectiva:** Emotion AI, facial expression analysis, real-time processing (C)
- **Tobii Pro:** Eye-tracking automation, gaze analysis, heatmap generation (C)

Video Processing Tools

- **Veed.io:** Automated subtitles, transcription, video editing (F)
- **Descript:** Video editing through text, automated filler word removal (F)
- **Loom:** Automated recording, transcription, viewer analytics (F)
- **Clarifai:** AI video tagging, object detection, content moderation (F)

Pricing: [OS] Open Source | [F] Freemium | [C] Commercial

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36

AI-Powered Quantitative Analysis Tools

Statistical Analysis Automation

- **SPSS with Python:** Automated statistical tests, batch processing, custom scripts (C)
- **R + RStudio:** Automated reporting with R Markdown, machine learning packages (OS)
- **Jamovi:** User-friendly interface, automated visualizations, open-source (OS)

Advanced Analytics Platforms

- **Tableau:** Automated dashboards, AI-powered insights (Ask Data), real-time updates (C)
- **Power BI:** Automated data refresh, AI visuals, natural language queries (F)
- **Looker:** Automated reports, embedded analytics, version control (C)

Machine Learning Automation

- **DataRobot:** Automated ML model building, feature engineering, deployment (C)
- **H2O.ai:** AutoML, model interpretation, scalable processing (OS)
- **RapidMiner:** Visual workflow, automated model selection, no-code ML (F)

Pricing: [OS] Open Source | [F] Freemium | [C] Commercial

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Ethical Decision Systems

Data Privacy & Consent:

- Obtain explicit consent for user data.
- Implement robust privacy techniques.
- Prioritize user trust and ethical data handling.

Accuracy & Bias:

- Systems can amplify biases.
- Leads to skewed insights.
- Ensure rigorous validation and human oversight.
- Mitigate bias for fairness.

Transparency & Explainability:

- Advocate for transparent insight generation.
- Disclose methodologies and data sources.
- Ensure rationale behind system suggestions is clear.
- Enables human oversight and trust.

Regulatory Compliance:

- Secure necessary approvals.
- Assess compliance with data protection laws.
- Ensure responsible deployment.

Data Security:

- Understand all data security protocols.
- Prioritize secure solutions for sensitive data.
- Protect against breaches and ensure integrity.

Crucial Managerial Oversight

IS managers must prioritize privacy, consent, and data governance for all decision support systems. These principles are paramount.

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Automated Decision Workflow in Practice

Automated Data Collection
Qualtrics surveys + Hotjar tracking + Fireflies meeting transcription

Automated Processing
Otter.ai transcription + MonkeyLearn text analysis + automated data pipelines (Airbyte)

Automated Analysis
Dovetail theme detection + Tableau dashboards + DataRobot ML models

AI-Powered Insights
ThoughtSpot natural language queries + ChatGPT synthesis + automated alerts

Automated Reporting
Power BI dashboards + automated email reports + Slack notifications

Continuous Monitoring
Real-time dashboards + automated anomaly detection + feedback loops

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39

PART 4

Practical Workshop: Data Budget Challenge

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40

Data Budget Challenge: Evaluating a Decision Support System

Your Goal

Design a realistic and ethical evaluation strategy for a Decision Support System (DSS) under resource constraints. You must decide which data to collect and which methods to use, knowing that every method has a cost.

The Scenario

Case: AI-Based Human Ressources Decision Support System

A company deployed an AI-powered Decision Support System to help managers:

- Prioritize job candidates
- Predict employee turnover
- Improve team performance

After 6 months:

- Adoption is low
- Trust in system recommendations is weak
- Performance varies across departments

Your Task

Design an evaluation plan that explains what is happening, why it is happening, and how the system should be improved — within a limited data budget.

Budget Rules

- Each group receives **10 points total**
- You may **not exceed the budget**
- You may **combine qualitative and quantitative methods**
- You must **justify every choice**
- **Trade-offs matter:** richer data is more expensive

⏱️ Activity Flow (1 hour – Groups of 4 students)

01

Budget Allocation (20 minutes)

In your group:

- Select your data collection methods
- Make sure your total does not exceed 10 points
- Write down:
  - Selected methods
  - Total cost
  - What each method helps you understand (what / why / how)

02

Analysis Mapping (15 minutes)

For each type of analysis, identify which of your chosen data sources supports it:

- Descriptive analysis – What is happening?
- Diagnostic analysis – Why is it happening?
- Predictive analysis – What is likely to happen next?
- Prescriptive analysis – What should the system or organization do?

👉 You must work only with the data you paid for.

03

Ethics & Feasibility Check (5 minutes)

Answer briefly:

- What is the main ethical risk of your chosen methods?
- How would you mitigate it (consent, anonymization, transparency, governance)?

04

Group Debrief (20 minutes)

Each group presents in 4 minutes using the provided template (1 slide):

- Budget allocation and data analysis objective
- One trade-off they had to make
- One insight they could not get because of budget limits

📝 Your Evaluation Plan Template

Selected Methods & Budget

Method 1: __________ (Cost: ___ points)
→ What it helps us understand:
____

Method 2: __________ (Cost: ___ points)
→ What it helps us understand:
____

Method 3: __________ (Cost: ___ points)
→ What it helps us understand:
____

Total Budget Used: ___ / 10 points

Analysis Mapping

Which data sources support each analysis type?

Descriptive (What is happening?):
• Data source: ___________

Diagnostic (Why is it happening?):
• Data source: ___________

Predictive (What might happen next?):
• Data source: ___________

Prescriptive (What should we do?):
• Data source: ___________

Ethics & Feasibility

Main ethical risk: ___________

Mitigation strategy: ___________

Key Trade-Off We Made:

____

One Insight We Cannot Get (due to budget):

____

Data Collection Menu (with Costs)

Behavioral Data

- System logs / click tracking: 1
- Task completion & time-on-task metrics: 1
- A/B testing: 2
- Session replay (e.g., Hotjar): 2

Subjective Data (Perceptions & Trust)

- Short standardized survey (SUS, Likert): 1
- Semi-structured interviews: 2
- Focus groups: 3

Cognitive Data

- Think-aloud protocol: 2
- Cognitive walkthrough: 2
- Comprehension or recall test: 1

Physiological Data

- Eye-tracking: 4
- Heart-rate variability (HRV): 3
- EEG: 5

Textual / Video Data

- Open-ended survey responses: 1
- Screen recording: 2
- Video observation: 3
- Automated sentiment analysis (NLP): 2

Informed Decision-Making: Key Takeaways

User-Centered Design

Diverse data is key:

- Behavioral, physiological, cognitive, subjective data
- Enhances user interaction & system design
- Leads to better managerial outcomes

Evidence-Based Triangulation

Strengthens findings:

- Converge multiple data sources & methods
- Builds confidence in results
- Validates predictive insights

Technology for Insight

Leverage advanced tools:

- AI accelerates design & evaluation
- Automates data analysis
- Requires human oversight for ethical deployment

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