Package 'bidux'

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Title Behavioral Insight Design: A Toolkit for Integrating Behavioral Science in UI/UX Design

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Description Provides a framework and toolkit to guide 'shiny' developers in implementing the Behavioral Insight Design (BID) framework. The package offers functions for documenting each of the five stages (Notice, Interpret, Structure, Anticipate, and Validate), along with a comprehensive concept dictionary.

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Contents

`as_tibble.bid_issues` *Convert bid_issues object to tibble*

Description

Extracts the tidy issues tibble from a bid_issues object for analysis and visualization. This provides a structured view of all telemetry issues with metadata for prioritization and reporting.

Usage

```
## S3 method for class 'bid_issues'
as_tibble(x, ...)
```

Arguments

x	A bid_issues object from bid_ingest_telemetry()
...	Additional arguments (unused)

Value

A tibble with issue metadata including severity, impact, and descriptions

---

as_tibble.bid_stage *Convert bid_stage to tibble*

Description

Convert bid_stage to tibble

Usage

```
## S3 method for class 'bid_stage'
as_tibble(x, ...)
```

Arguments

x	A bid_stage object
...	Additional arguments (unused)

Value

A tibble

bid_address *Create Notice stage from single telemetry issue (sugar)*

Description

Convenience function that combines issue selection and Notice creation in one step. Useful for quick workflows where you want to address a specific issue immediately.

Usage

```
bid_address(issue, previous_stage, ...)
```

Arguments

issue	A single row from bid_telemetry() output
previous_stage	Previous BID stage (typically from bid_interpret)
...	Additional arguments passed to bid_notice_issue()

Value

A bid_stage object in the Notice stage

Examples

```
## Not run:
issues <- bid_telemetry("data.sqlite")
interpret <- bid_interpret("How can we improve user experience?")

# Address the highest impact issue
top_issue <- issues[which.max(issues$impact_rate), ]
notice <- bid_address(top_issue, interpret)

## End(Not run)
```

bid_anticipate *Document User Behavior Anticipation Stage in BID Framework*

Description

This function documents the anticipated user behavior by listing bias mitigation strategies related to anchoring, framing, confirmation bias, etc. It also supports adding interaction hints and visual feedback elements.

Usage

```
bid_anticipate(
  previous_stage,
  bias_mitigations = NULL,
  include_accessibility = TRUE,
  ...
)
```

Arguments

previous_stage	A tibble or list output from an earlier BID stage function.
bias_mitigations	A named list of bias mitigation strategies. If NULL, the function will suggest bias mitigations based on information from previous stages.
include_accessibility	Logical indicating whether to include accessibility mitigations. Default is TRUE.
...	Additional parameters. If 'interaction_principles' is provided, it will be ignored with a warning.

Value

A tibble containing the documented information for the "Anticipate" stage.

Examples

```
interpret_stage <- bid_interpret(
  central_question = "How can we improve selection efficiency?",
  data_story = list(
    hook = "Too many options",
    context = "Excessive choices",
    tension = "User frustration",
    resolution = "Simplify menu"
  )
)

notice_stage <- bid_notice(
  previous_stage = interpret_stage,
  problem = "Issue with dropdown menus",
  evidence = "User testing indicated delays"
)

structure_info <- bid_structure(previous_stage = notice_stage)

# Let the function suggest bias mitigations based on previous stages
bid_anticipate(previous_stage = structure_info)

# with accessibility included (default) and custom bias mitigations
anticipate_result <- bid_anticipate(
  previous_stage = structure_info,
  bias_mitigations = list(
```

```
    anchoring = "Use context-aware references",
    framing = "Toggle between positive and negative framing"
  ),
  include_accessibility = TRUE
)

summary(anticipate_result)
```

`bid_concept` *Get detailed information about a specific concept*

Description

Returns detailed information about a specific BID framework concept, including implementation recommendations based on the concept's stage.

Usage

```
bid_concept(concept_name, add_recommendations = TRUE)
```

Arguments

`concept_name`	A character string with the exact or partial concept name
`add_recommendations`	Logical indicating whether to add stage-specific recommendations

Value

A tibble with detailed concept information

`bid_concepts` *Search BID Framework Concepts*

Description

Search for behavioral science and UX concepts used in the BID framework. Returns concepts matching the search term along with their descriptions, categories, and implementation guidance.

Usage

```
bid_concepts(search = NULL, fuzzy_match = TRUE, max_distance = 2)
```

Arguments

search	A character string to search for. If NULL or empty, returns all concepts.
fuzzy_match	Logical indicating whether to use fuzzy string matching (default: TRUE)
max_distance	Maximum string distance for fuzzy matching (default: 2)

Value

A tibble containing matching concepts with their details

---

bid_flags *Extract telemetry flags from bid_issues object*

Description

Extracts global telemetry flags and metadata from a bid_issues object. These flags provide boolean indicators for different types of issues and can be used for conditional logic in downstream BID stages.

Usage

```
bid_flags(x)

## S3 method for class 'bid_issues'
bid_flags(x)

## Default S3 method:
bid_flags(x)
```

Arguments

x	A bid_issues object from bid_ingest_telemetry() or any object with a flags attribute

Value

A named list of boolean flags and metadata

`bid_ingest_telemetry` *Ingest telemetry data and identify UX friction points*

Description

This function ingests telemetry data from shiny.telemetry output (SQLite or JSON) and automatically identifies potential UX issues, translating them into BID framework Notice stages. It returns a hybrid object that is backward-compatible as a list of Notice stages while also providing enhanced functionality with tidy tibble access and flags extraction.

Usage

```
bid_ingest_telemetry(path, format = NULL, thresholds = list())
```

Arguments

`path`	File path to telemetry data (SQLite database or JSON log file)
`format`	Optional format specification ("sqlite" or "json"). If NULL, auto-detected from file extension.
`thresholds`	Optional list of threshold parameters: - unused_input_threshold: percentage of sessions below which input is considered unused (default: 0.05) - delay_threshold_seconds: seconds of delay considered problematic (default: 30) - error_rate_threshold: percentage of sessions with errors considered problematic (default: 0.1) - navigation_threshold: percentage of sessions visiting a page below which it's considered underused (default: 0.2) - rapid_change_window: seconds within which multiple changes indicate confusion (default: 10) - rapid_change_count: number of changes within window to flag as confusion (default: 5)

Value

A hybrid object of class c("bid_issues", "list") containing bid_stage objects for each identified issue in the "Notice" stage. The object includes:

`Legacy list`	Named list of bid_stage objects (e.g., "unused_input_region", "delayed_interaction")
`issues_tbl`	Attached tidy tibble with issue metadata
`flags`	Global telemetry flags as named list
`created_at`	Timestamp when object was created

```
Use as_tibble() to access the tidy issues data, bid_flags() to extract flags,
 and legacy list access for backward compatibility.
```

Examples

```
## Not run:
# Analyze SQLite telemetry database
issues <- bid_ingest_telemetry("telemetry.sqlite")

# Analyze JSON log with custom thresholds
issues <- bid_ingest_telemetry(
  "telemetry.log",
  format = "json",
  thresholds = list(
    unused_input_threshold = 0.1,
    delay_threshold_seconds = 60
  )
)

# Use results in BID workflow
if (length(issues) > 0) {
  # Take first issue and continue with BID process
  interpret_result <- bid_interpret(
    previous_stage = issues[[1]],
    central_question = "How can we improve user engagement?"
  )
}

## End(Not run)
```

---

bid_interpret *Document User Interpretation Stage in BID Framework*

Description

This function documents the interpretation of user needs, capturing the central question and the data storytelling narrative. It represents stage 1 in the BID framework.

Usage

```
bid_interpret(
  previous_stage = NULL,
  central_question,
  data_story = NULL,
  user_personas = NULL
)
```

Arguments

previous_stage	Optional tibble or list output from an earlier BID stage function. Since Interpret is the first stage in the BID framework, this is typically NULL but can accept previous stage output in some iteration scenarios.

central_question
: Required. A character string representing the main question to be answered. If NULL, will be suggested based on previous stage information.

data_story
: A list containing elements such as hook, context, tension, resolution, and optionally audience, metrics, and visual_approach. If NULL, elements will be suggested based on previous stage.

user_personas
: Optional list of user personas to consider in the design.

Value

A tibble containing the documented information for the "Interpret" stage.

Examples

```
# Basic usage
interpret_result <- bid_interpret(
  central_question = "What drives the decline in user engagement?",
  data_story = list(
    hook = "Declining trend in engagement",
    context = "Previous high engagement levels",
    tension = "Unexpected drop",
    resolution = "Investigate new UI changes"
  )
)

# With user personas
interpret_personas <- bid_interpret(
  central_question = "How can we improve data discovery?",
  data_story = list(
    hook = "Users are missing key insights",
    context = "Critical data is available but overlooked",
    tension = "Time-sensitive decisions are delayed",
    resolution = "Highlight key metrics more effectively"
  ),
  user_personas = list(
    list(
      name = "Sara, Data Analyst",
      goals = "Needs to quickly find patterns in data",
      pain_points = "Gets overwhelmed by too many visualizations",
      technical_level = "Advanced"
    ),
    list(
      name = "Marcus, Executive",
      goals = "Wants high-level insights at a glance",
      pain_points = "Limited time to analyze detailed reports",
      technical_level = "Basic"
    )
  )
)

summary(interpret_personas)
```

bid_notice *Document User Notice Stage in BID Framework*

Description

This function documents the observation and problem identification stage. It represents stage 2 in the BID framework and now returns a structured bid_stage object with enhanced metadata and external mapping support.

Usage

```
bid_notice(previous_stage, problem, theory = NULL, evidence = NULL, ...)
```

Arguments

previous_stage	A tibble or list output from the previous BID stage function (typically bid_interpret).
problem	A character string describing the observed user problem.
theory	A character string describing the behavioral theory that might explain the problem. If NULL, will be auto-suggested using external theory mappings.
evidence	A character string describing evidence supporting the problem.
...	Additional parameters. Deprecated parameters (e.g., 'target_audience') will generate warnings if provided.

Value

A bid_stage object containing the documented information for the "Notice" stage with enhanced metadata and validation.

Examples

```
interpret_result <- bid_interpret(
  central_question = "How can we improve user task completion?",
  data_story = list(
    hook = "Users are struggling with complex interfaces",
    resolution = "Simplify key interactions"
  )
)

# Auto-suggested theory
bid_notice(
  previous_stage = interpret_result,
  problem = "Users struggling with complex dropdowns and too many options",
  evidence = "User testing shows 65% abandonment rate on filter selection"
)

# With explicit theory
notice_result <- bid_notice(
  previous_stage = interpret_result,
```

```
  problem = "Mobile interface is difficult to navigate",
  theory = "Fitts's Law",
  evidence = "Mobile users report frustration with small touch targets"
)

summary(notice_result)
```

`bid_notices` *Create multiple Notice stages from telemetry issues*

Description

Bridge function that converts multiple telemetry issues into Notice stages. Provides filtering and limiting options for managing large issue sets.

Usage

```
bid_notices(issues, filter = NULL, previous_stage = NULL, max_issues = 5, ...)
```

Arguments

`issues`	A tibble from bid_telemetry() output
`filter`	Optional filter expression for subsetting issues (e.g., severity == "critical")
`previous_stage`	Optional previous BID stage (typically from bid_interpret)
`max_issues`	Maximum number of issues to convert (default: 5)
`...`	Additional arguments passed to bid_notice_issue()

Value

A named list of bid_stage objects in the Notice stage

Examples

```
## Not run:
issues <- bid_telemetry("data.sqlite")
interpret <- bid_interpret("How can we reduce user friction?")

# Convert all critical issues
notices <- bid_notices(issues, filter = severity == "critical", interpret)

# Convert top 3 issues by impact
top_issues <- issues[order(-issues$impact_rate), ][1:3, ]
notices <- bid_notices(top_issues, previous_stage = interpret)

## End(Not run)
```

`bid_notice_issue` *Create Notice stage from individual telemetry issue*

Description

Bridge function that converts a single telemetry issue row into a BID Notice stage. This allows seamless integration between telemetry analysis and the BID framework.

Usage

```
bid_notice_issue(issue, previous_stage = NULL, override = list())
```

Arguments

`issue`	A single row from bid_telemetry() output or issues tibble
`previous_stage`	Optional previous BID stage (typically from bid_interpret)
`override`	List of values to override from the issue (problem, evidence, theory)

Value

A bid_stage object in the Notice stage

Examples

```
## Not run:
issues <- bid_telemetry("data.sqlite")
interpret <- bid_interpret("How can we reduce user friction?")

# Convert first issue to Notice stage
notice <- bid_notice_issue(issues[1, ], previous_stage = interpret)

# Override problem description
notice <- bid_notice_issue(
  issues[1, ],
  previous_stage = interpret,
  override = list(problem = "Custom problem description")
)

## End(Not run)
```

bid_pipeline *Create pipeline of Notice stages from top telemetry issues (sugar)*

Description

Convenience function that creates a pipeline of Notice stages from the highest priority telemetry issues. Useful for systematic issue resolution workflows.

Usage

```
bid_pipeline(issues, previous_stage, max = 3, ...)
```

Arguments

issues	A tibble from bid_telemetry() output
previous_stage	Previous BID stage (typically from bid_interpret)
max	Maximum number of issues to include in pipeline (default: 3)
...	Additional arguments passed to bid_notices()

Value

A named list of bid_stage objects in the Notice stage

Examples

```
## Not run:
issues <- bid_telemetry("data.sqlite")
interpret <- bid_interpret("How can we systematically improve UX?")

# Create pipeline for top 3 issues
notice_pipeline <- bid_pipeline(issues, interpret, max = 3)

# Continue with first issue in pipeline
anticipate <- bid_anticipate(previous_stage = notice_pipeline[[1]])

## End(Not run)
```

bid_report *Generate BID Framework Report*

Description

Creates a comprehensive report from a completed BID framework process. This report summarizes all stages and provides recommendations for implementation.

Usage

```
bid_report(
  validate_stage,
  format = c("text", "html", "markdown"),
  include_diagrams = TRUE
)
```

Arguments

validate_stage	A tibble output from bid_validate().
format	Output format: "text", "html", or "markdown"
include_diagrams	Logical, whether to include ASCII diagrams in the report (default: TRUE)

Value

A formatted report summarizing the entire BID process

Examples

```
if (interactive()) {
  # After completing all 5 stages
  validation_result <- bid_validate(...)

  # Generate a text report
  bid_report(validation_result)

  # Generate an HTML report
  bid_report(validation_result, format = "html")

  # Generate a markdown report without diagrams
  bid_report(
    validation_result,
    format = "markdown",
    include_diagrams = FALSE
  )
}
```

---

bid_result *Constructor for BID result collection objects*

Description

Constructor for BID result collection objects

Usage

```
bid_result(stages)
```

Arguments

stages	List of bid_stage objects

Value

Object of class 'bid_result'

---

bid_stage *Constructor for BID stage objects*

Description

Constructor for BID stage objects

Usage

```
bid_stage(stage, data, metadata = list())
```

Arguments

stage	Character string indicating the stage name
data	Tibble containing the stage data
metadata	List containing additional metadata

Value

Object of class 'bid_stage'

---

bid_structure *Document Dashboard Structure Stage in BID Framework*

Description

This function documents the structure of the dashboard with automatic layout selection and generates ranked, concept-grouped actionable UI/UX suggestions. Layout is intelligently chosen based on content analysis of previous stages using deterministic heuristics. Returns structured recommendations with specific component pointers and implementation rationales.

Usage

```
bid_structure(previous_stage, concepts = NULL, telemetry_flags = NULL, ...)
```

Arguments

previous_stage	A tibble or list output from an earlier BID stage function.
concepts	A character vector of additional BID concepts to include. Concepts can be provided in natural language (e.g., "Principle of Proximity") or with underscores (e.g., "principle_of_proximity"). The function uses fuzzy matching to identify the concepts. If NULL, will detect relevant concepts from previous stages automatically.
telemetry_flags	Optional named list of telemetry flags from bid_flags(). Used to adjust layout choice and suggestion scoring based on observed user behavior patterns.
...	Additional parameters. If layout is provided via ..., the function will abort with a helpful error message.

Details

Layout Auto-Selection: For backwards compatibility with versions < 0.3.0; to be removed in 0.4.0. Uses deterministic heuristics to analyze content from previous stages and select the most appropriate layout:

- **breathable**: For information overload/confusion patterns
- **dual_process**: For overview vs detail needs
- **grid**: For grouping/comparison requirements
- **card**: For modular/chunked content
- **tabs**: For categorical organization (unless telemetry shows issues)

Suggestion Engine: Generates ranked, actionable recommendations grouped by UX concepts. Each suggestion includes specific Shiny/bslib components, implementation details, and rationale. Suggestions are scored based on relevance, layout appropriateness, and contextual factors.

Value

A bid_stage object containing:

stage	"Structure"
layout	Auto-selected layout type
suggestions	List of concept groups with ranked suggestions
concepts	Comma-separated string of all concepts used

Examples

```
notice_result <- bid_interpret(
  central_question = "How can we simplify data presentation?",
  data_story = list(
    hook = "Data is too complex",
    context = "Overloaded with charts",
    tension = "Confusing layout",
    resolution = "Introduce clear grouping"
```

```
  )
) |>
  bid_notice(
    problem = "Users struggle with information overload",
    evidence = "Survey results indicate delays"
  )

# Auto-selected layout with concept-grouped suggestions
structure_result <- bid_structure(previous_stage = notice_result)
print(structure_result$layout)  # Auto-selected layout
print(structure_result$suggestions)  # Ranked suggestions by concept

summary(structure_result)
```

`bid_suggest_components` *Suggest UI Components Based on BID Framework Analysis*

Description

This function analyzes the results from BID framework stages and suggests appropriate UI components from popular R packages like shiny, bslib, DT, etc. The suggestions are based on the design principles and user needs identified in the BID process.

Usage

```
bid_suggest_components(bid_stage, package = NULL)
```

Arguments

`bid_stage`	A tibble output from any BID framework stage function
`package`	Optional character string specifying which package to focus suggestions on. Options include "shiny", "bslib", "DT", "plotly", "reactable", "htmlwidgets". If NULL, suggestions from all packages are provided.

Value

A tibble containing component suggestions with relevance scores

Examples

```
if (interactive()) {
  # After completing BID stages
  notice_result <- bid_notice(
    problem = "Users struggle with complex data",
    theory = "Cognitive Load Theory"
  )
```

```
  # Get all component suggestions
  bid_suggest_components(notice_result)

  # Get only bslib suggestions
  bid_suggest_components(notice_result, package = "bslib")

  # Get shiny-specific suggestions
  bid_suggest_components(notice_result, package = "shiny")
}
```

`bid_telemetry` *Concise telemetry analysis with tidy output*

Description

Preferred modern interface for telemetry analysis. Returns a clean tibble of identified issues without the legacy list structure. Use this function for new workflows that don't need backward compatibility.

Usage

```
bid_telemetry(path, format = NULL, thresholds = list())
```

Arguments

`path`	File path to telemetry data (SQLite database or JSON log file)
`format`	Optional format specification ("sqlite" or "json"). If NULL, auto-detected from file extension.
`thresholds`	Optional list of threshold parameters: - unused_input_threshold: percentage of sessions below which input is considered unused (default: 0.05) - delay_threshold_seconds: seconds of delay considered problematic (default: 30) - error_rate_threshold: percentage of sessions with errors considered problematic (default: 0.1) - navigation_threshold: percentage of sessions visiting a page below which it's considered underused (default: 0.2) - rapid_change_window: seconds within which multiple changes indicate confusion (default: 10) - rapid_change_count: number of changes within window to flag as confusion (default: 5)

Value

A tibble of class "bid_issues_tbl" with structured issue metadata

Examples

```
## Not run:
# Modern workflow
issues <- bid_telemetry("telemetry.sqlite")
high_priority <- issues[issues$severity %in% c("critical", "high"), ]
```

```
# Use with bridges for BID workflow
top_issue <- issues[1, ]
notice <- bid_notice_issue(top_issue, previous_stage = interpret_stage)

## End(Not run)
```

`bid_validate` *Document User Validation Stage in BID Framework*

Description

This function documents the validation stage, where the user tests and refines the dashboard. It represents stage 5 in the BID framework.

Usage

```
bid_validate(
  previous_stage,
  summary_panel = NULL,
  collaboration = NULL,
  next_steps = NULL,
  include_exp_design = TRUE,
  include_telemetry = TRUE,
  telemetry_refs = NULL,
  include_empower_tools = TRUE
)
```

Arguments

`previous_stage`	A tibble or list output from an earlier BID stage function.
`summary_panel`	A character string describing the final summary panel or key insight presentation.
`collaboration`	A character string describing how the dashboard enables collaboration and sharing.
`next_steps`	A character vector or string describing recommended next steps for implementation and iteration.
`include_exp_design`	Logical indicating whether to include experiment design suggestions. Default is TRUE.
`include_telemetry`	Logical indicating whether to include telemetry tracking and monitoring suggestions. Default is TRUE.
`telemetry_refs`	Optional character vector or named list specifying specific telemetry reference points to include in validation steps. If provided, these will be integrated into the telemetry tracking recommendations with provenance information.

include_empower_tools
: Logical indicating whether to include context-aware empowerment tool suggestions. Default is TRUE.

Value

A tibble containing the documented information for the "Validate" stage.

Examples

```
validate_result <- bid_interpret(
    central_question = "How can we improve delivery efficiency?",
    data_story = list(
      hook = "Too many delays",
      context = "Excessive shipments",
      tension = "User frustration",
      resolution = "Increase delivery channels"
    )
  ) |>
  bid_notice(
    problem  = "Issue with dropdown menus",
    evidence = "User testing indicated delays"
  ) |>
  bid_anticipate(
    bias_mitigations = list(
      anchoring = "Provide reference points",
      framing = "Use gain-framed messaging"
    )
  ) |>
  bid_structure() |>
  bid_validate(
   include_exp_design = FALSE,
   include_telemetry = TRUE,
   include_empower_tools = TRUE
  )

summary(validate_result)
```

---

extract_stage *Extract specific stage from bid_result*

Description

Extract specific stage from bid_result

Usage

```
extract_stage(workflow, stage)
```

Arguments

workflow	A bid_result object
stage	Character string with stage name

Value

A bid_stage object or NULL if not found

---

get_accessibility_recommendations

Get accessibility recommendations for a given context

Description

Get accessibility recommendations for a given context

Usage

```
get_accessibility_recommendations(context = "", guidelines = NULL)
```

Arguments

context	Character string describing the interface context
guidelines	Optional custom accessibility guidelines

Value

Character vector of relevant accessibility recommendations

---

get_concept_bias_mappings

Get bias mitigation strategies for concepts

Description

Get bias mitigation strategies for concepts

Usage

```
get_concept_bias_mappings(concepts, mappings = NULL)
```

Arguments

concepts	Character vector of concept names
mappings	Optional custom concept-bias mappings

Value

Data frame with relevant bias mappings

---

get_layout_concepts *Get concepts recommended for a layout*

Description

Get concepts recommended for a layout

Usage

```
get_layout_concepts(layout, mappings = NULL)
```

Arguments

layout	Character string indicating layout type
mappings	Optional custom layout mappings

Value

Character vector of recommended concepts

---

get_metadata *Get metadata from bid_stage object*

Description

Get metadata from bid_stage object

Usage

```
get_metadata(x)
```

Arguments

x	A bid_stage object

Value

List with metadata

get_stage *Get stage name from bid_stage object*

Description

Get stage name from bid_stage object

Usage

```
get_stage(x)
```

Arguments

x	A bid_stage object

Value

Character string with stage name

is_bid_stage *Check if object is a bid_stage*

Description

Check if object is a bid_stage

Usage

```
is_bid_stage(x)
```

Arguments

x	Object to test

Value

Logical indicating if object is bid_stage

is_complete *Check if workflow is complete (has all 5 stages)*

Description

Check if workflow is complete (has all 5 stages)

Usage

```
is_complete(x)
```

Arguments

x	A bid_result object

Value

Logical indicating if workflow is complete

print.bid_issues *Print method for bid_issues objects*

Description

Displays a triage view of telemetry issues with severity-based prioritization and provides a reminder about legacy list access for backward compatibility.

Usage

```
## S3 method for class 'bid_issues'
print(x, ...)
```

Arguments

x	A bid_issues object from bid_ingest_telemetry()
...	Additional arguments (unused)

Value

Invisible x (for chaining)

print.bid_result *Print method for BID result objects*

Description

Print method for BID result objects

Usage

```
## S3 method for class 'bid_result'
print(x, ...)
```

Arguments

x	A bid_result object
...	Additional arguments

Value

Returns the input `bid_result` object invisibly (class: `c("bid_result", "list")`). The method is called for its side effects: printing a workflow overview to the console showing completion status, stage progression, and key information from each completed BID stage. The invisible return supports method chaining while emphasizing the console summary output.

print.bid_stage *Print method for BID stage objects*

Description

Print method for BID stage objects

Usage

```
## S3 method for class 'bid_stage'
print(x, ...)
```

Arguments

x	A bid_stage object
...	Additional arguments

Value

Returns the input `bid_stage` object invisibly (class: `c("bid_stage", "tbl_df", "tbl", "data.frame")`). The method is called for its side effects: printing a formatted summary of the BID stage to the console, including stage progress, key stage-specific information, and usage suggestions. The invisible return allows for method chaining while maintaining the primary purpose of console output.

suggest_theory_from_mappings *Suggest theory based on problem and evidence using mappings*

Description

Suggest theory based on problem and evidence using mappings

Usage

```
suggest_theory_from_mappings(problem, evidence = NULL, mappings = NULL)
```

Arguments

problem	Character string describing the problem
evidence	Optional character string with supporting evidence
mappings	Optional custom theory mappings

Value

Character string with suggested theory

summary.bid_result *Summary method for BID result objects*

Description

Summary method for BID result objects

Usage

```
## S3 method for class 'bid_result'
summary(object, ...)
```

Arguments

object	A bid_result object
...	Additional arguments

Value

Returns the input bid_result object invisibly (class: c("bid_result", "list")). The method is called for its side effects: printing a detailed workflow analysis to the console including completion statistics, duration metrics, and comprehensive stage-by-stage breakdowns with key data from each BID framework stage. The invisible return facilitates method chaining while focusing on comprehensive console reporting.

`summary.bid_stage` *Summary method for BID stage objects*

Description

Summary method for BID stage objects

Usage

```
## S3 method for class 'bid_stage'
summary(object, ...)
```

Arguments

`object`	A bid_stage object
`...`	Additional arguments

Value

Returns the input `bid_stage` object invisibly (class: `c("bid_stage", "tbl_df", "tbl", "data.frame")`). The method is called for its side effects: printing a comprehensive summary to the console including stage metadata, all non-empty data columns, and timestamp information. The invisible return enables method chaining while prioritizing the detailed console output display.

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