

IE-DSS

Industrial Engineering Toolkit

Production Study Master — Data Entry

Training Manual: the TWI Study Builder

For Industrial Engineers capturing Job Method Study data

Version 1.0

1. Purpose

This manual explains how to capture a Job Method Study using the TWI Study Builder — the required data-entry tool for every station's element table in IE-DSS. It is written for the Industrial Engineer who will actually sit at the machine and capture the study.

The TWI Study Builder is now the only way to fill a station's element table — direct typing into Production_Study_Master.xlsx is no longer supported and must not be used:

- Open TWI_Study_Builder_GUI.exe and type or paste a running description of what the operator does, and let the tool split it into clean, standardised elements automatically.

TWI_Study_Builder_GUI.exe sits in the same folder as IE-DSS.exe. It requires a valid license.lic, the same as every other tool in the suite, and does not appear inside the main 33-step pipeline.

2. Production Study Master — Station Sheet Schema

Every station sheet (Stn-1, Stn-2, ...) follows the exact same layout. The element table starts at row 7. Knowing this schema matters because it is exactly what the TWI Study Builder reads and writes — nothing more, nothing less.

Cell	Meaning	Who fills it
D1 / D2	Station ID and Activity name (e.g. Stn-1, “Mesh pasting with shell”)	TWI tool / IE
F1	Process Name — also pulled automatically into the Index sheet’s Process Name column	TWI tool asks / IE
O1	Study date	TWI tool (auto) / IE
O2	Station Type: Man / Man Machine / Auto	TWI tool asks / IE
C4 / D4	Proposed / Present manpower count	IE (auto-estimated by TWI, refine later)
A (row 7↓)	S.No — element serial number, 1..N, must stay sequential	TWI tool (auto) — never hand-renumber
B (row 7↓)	Resource — Operator / Operator-1 / machine name	TWI tool (auto, from narration)
C (row 7↓)	Current / Proposed Method Details — the element description	TWI tool (auto) or typed directly
D / E (row 7↓)	Start Time / End Time (s) — one shared clock; 0 marks a new parallel resource lane	IE types the readings
F (row 7↓)	Time in (s) — live formula = End – Start	Formula — never type into this column
I / J / K (row 7↓)	Op C1 / C2 / C3 — three stopwatch cycle readings	IE types the readings
L / M / N (row 7↓)	Avg(s) / Var% / Status — live formulas	Formula — never type into these columns
O (row 7↓)	Idea to Improve — free text	IE, optional

Columns F, L, M and N are live formulas. The TWI Study Builder never writes into them, and neither should you — typing over a formula breaks the Time/Avg/Var%/Status calculation for that row permanently.

3. How the TWI Study Builder Works

The tool takes your running description of what happened at the station and turns it into clean elemental rows in five automatic steps.

Phase 1 — Input

You type or paste the observation as one continuous stream of notes — exactly how you would describe it out loud while watching the operator. Say the word “next” between elements: it is the strongest signal the splitter uses to know where one element ends and the next begins.

```
operator picks up the housing from the left bin next rotates the housing
and inserts it into the fixture next presses it firmly next checks the
seating next walks to the glue station
```

Phase 2 — TWI Splitter

The stream is cut into single-action pieces on every “next”, then again on connecting words (“and then”, “after that”, “and also”) if “next” was forgotten somewhere. If a piece still contains two or more recognised action verbs — meaning two elements were said in one breath — the tool splits it automatically at each verb and flags every resulting row, so it gets a second glance instead of being silently merged.

Phase 3 — Standardizer

Every element’s action verb is mapped to one of 22 standard verbs, so two IEs describing the same motion in different words (“grabs” / “takes” / “picks up”) end up with the same standard word in the study. The full table is in §9 (Quick Reference).

Phase 4 — Classifier

Each element is silently tagged with a work Category and a Therblig motion code in the same pass — this is what lets man_gantt_mtm, mm_chart_analyzer and the Q&A engine consume the study later without re-guessing. You do not need to do anything for this phase; it happens automatically and does not appear on the sheet.

Phase 5 — Writer

Finally the elements are written to the workbook, in one of two modes you choose at the start of the wizard:

- Option 1 — Separate file: a clean standalone workbook (TWI_Study_Output.xlsx) is created. Production_Study_Master.xlsx is never opened. You copy-paste columns B and C from it into the master yourself — the safest option if you want to review before committing.
- Option 2 — Fill the master directly: the tool writes straight into columns B and C of the target station sheet, or creates the station sheet first if it does not exist yet (see §5).

4. Running the TWI Study Builder — Step by Step

Double-click TWI_Study_Builder_GUI.exe (same folder as IE-DSS.exe). It opens straight to the Start Screen, which lists everything you can do:

The Start Screen

- **Study Setup (Customer, Line, Takt, ...)** — edit the study's header details any time.

- **New station** — capture a station that doesn't exist yet.
- **Insert a station (before/after)** — add a station between two existing ones; every later station is renumbered automatically.
- **Delete a station** — remove a station; every later station is renumbered automatically.
- **Add elements to an existing station** — append or edit rows without wiping what's already captured.
- **Rewrite an existing station from scratch** — replace the identity and every element, starting from what's currently there.
- **Classify rows already typed directly into Excel** — backfill Category/Therblig for rows someone hand-typed into the sheet.
- **Components / Tools / Notes** — record what a station uses, kept separate from the element table.
- **Start a brand-new study (archives current master)** — for a completely different line or project (§6).
- **Switch Study...** — jump between studies already captured, without losing anything (§6).

Capturing a Station's Elements — the Core Flow

- 1. From the Start Screen, choose New station, Add elements to an existing station, or Rewrite an existing station from scratch.
- 2. For New station / Rewrite: enter the Station ID, then fill in the Station Identity form — Process name, Station type (Man / Man Machine / Auto), Machine name (required for Man Machine / Auto), Qty per cycle, Flow Type, and the rest (C/O Time, No. of C/O/Shift, Space, WIP Qty, Dist to Next Stn, Shift Time, Lunch, Tea, Meeting/5S) — fill in whatever you know now; only Process name and Machine name (where required) are mandatory. Click Continue.
- 3. The element table opens. For each resource (Operator, and any machine), type the Resource name at the top, then type or paste your running observation into the narration box — say “next” between elements, exactly as before. Click “Split into tasks” to turn it into rows.
- 4. Watch the Station Completion Status panel — it shows a checkmark against each expected resource once it has at least one element, and stays INCOMPLETE until every expected resource does.
- 5. Fill in each row's measured data directly in the table: double-click a cell (or press F2, or Tab/Shift-Tab to move between editable cells) to type into it — No. of Units, CT1/CT2/CT3 (three stopwatch readings), Dist (mm), and Idea to Improve. Category and Therblig are filled automatically; End Time is computed automatically from the CT readings, never typed directly.
- 6. Use Insert row above / Delete row to adjust the table, and Teach verb for this row / Teach object for this row on any row that's flagged (highlighted) because its action wasn't recognized.
- 7. Click Export to Excel. If anything's missing — an expected resource has no elements, some rows have no verb assigned, or rows are missing CT1/CT2/CT3/No. of Units — a popup explains exactly what's missing and lets you choose whether to fix it first or export anyway.

Nothing is written to Production_Study_Master.xlsx until you click Export to Excel, and Export refuses to run if the master looks like it's open in Excel — close Excel completely first.

Columns F, L, M and N stay live formulas — the table screen doesn't even offer them as fields you can type into.

5. Creating or Changing a Station

- **New station:** type a Station ID that doesn't already exist (e.g. Stn-7), then follow the Identity form + element table steps in §4. The tool builds the new sheet from the master's own template automatically — correct station

identity, a clean S.No sequence, live formulas already in place — and registers it on the Index sheet, all without you ever touching a sheet tab in Excel.

- **Insert a station:** pick which existing station to insert relative to, and whether before or after it. Every station from that point on is renumbered automatically, and the Index sheet is rebuilt to match.
- **Delete a station:** pick which one — the tool tells you exactly which stations will be renumbered before anything happens.
- **Rewrite an existing station from scratch:** pick the station and you'll go through the same Identity form + element table as New station, except every identity field is pre-filled with what's already there — change only what needs fixing.
- **Add elements to an existing station:** pick the station — its existing elements load straight into the table, so you can insert, delete, or edit any row (old or new) in place before exporting. Identity is never re-asked; the machine resource (if any) is inferred from what's already on the sheet.

Never create a new station by right-click → Move or Copy on a sheet tab in Excel. A copied tab drags the old station's identity, locked cells and formulas along with it — exactly what New station and Insert a station exist to prevent.

6. Study Setup, New Studies, and Switching Between Them

Choose Study Setup (Customer, Line, Takt, ...) from the Start Screen any time to fill in or correct the study's header details — Company/Unit, Location, Product/Model, Customer, Line/Project, Takt Time (s), Industry, Sub-Type. Current values are loaded automatically; change only what needs fixing.

When a study for an entirely different line or project begins, do not clear the existing Stn-1 and type over it — that would destroy the current line's completed study. Instead, choose “Start a brand-new study (archives current master)” from the Start Screen. It will:

- 1. Archive the current master, with every station it holds, into Master_Archive\ — nothing is lost, just moved aside.
- 2. Permanently delete every station sheet except the first, and reset the Index register.
- 3. Walk you straight into Study Setup for the new line — Line/Project and Customer are required; everything else can be filled in now or later.
- 4. Start capturing the new line's first station.

You're shown exactly what will be archived and deleted before you confirm — nothing happens until you say yes.

Once more than one study has been captured this way, choose “Switch Study...” to jump between them. Whatever's currently open is saved to its own Outputs\ folder automatically before switching — nothing is lost by moving between studies, and you can always switch back later.

7. Do's and Don'ts

Do

- Say or type “next” between every element in your narration — it's still the single most reliable signal the tool uses to split your notes into separate rows.
- Watch the Station Completion Status panel — it tells you exactly which resource still needs elements before Export will let you finish cleanly.

- Close Production_Study_Master.xlsx in Excel before running the tool, and before every Export — it can't save into a file Excel has open.
- Fill in CT1/CT2/CT3, No. of Units, Dist (mm) and Idea to Improve directly in the table as you go — don't leave them for later; the Export warning exists precisely to catch rows where this was skipped.
- Use Insert a station / Delete a station from the Start Screen for structural changes — never a sheet-tab right-click in Excel.

Don't

- Don't copy a station sheet tab in Excel to make a new station — use New station or Insert a station instead (§5).
- Don't type into columns F, L, M or N — they're live formulas; the tool's own table doesn't offer them as editable fields for exactly this reason.
- Don't dismiss the “incomplete cycle-time data” warning on Export without a reason — a row with no CT1/CT2/CT3 or No. of Units has no real measurement behind it, however complete it looks otherwise.
- Don't keep more than one copy of Production_Study_Master.xlsx around — there is exactly one master, sitting next to IE-DSS.exe and TWI_Study_Builder_GUI.exe, and the tool finds it automatically.

8. Troubleshooting

- **“Master is open” when you click Export or Save** — Production_Study_Master.xlsx is still open in Excel. Close Excel completely (not just minimize) and try again.
- **“Station incomplete — No elements yet for: ...”** — the named resource hasn't got a single row yet. Type its narration and “Split into tasks” before exporting.
- **“Incomplete cycle-time data”** — at least one row is missing CT1, CT2, CT3 or No. of Units. Fill them in, or confirm you want to export anyway.
- **“Unclassified rows”** — at least one row's action verb wasn't recognized. Use “Teach verb for this row” to map it (remembered permanently), or export anyway — it will show flagged in Excel too.
- **A row highlighted in yellow in the table** — it's flagged: either its verb wasn't recognized, or it was auto-split from one sentence containing two or more actions and deserves a second look. Use “Teach verb for this row” or “Teach object for this row” depending on which is wrong.
- **“Stn-X' already exists”** — you tried New station with a Station ID already in use. Use “Rewrite an existing station from scratch” or “Add elements to an existing station” instead.

9. Quick Reference — Standard Verb Library

Any of the phrases in the right-hand column, spoken or typed, is automatically converted to the standard verb on the left. Longer, more specific phrases are always matched before shorter ones (e.g. “picks up” wins over “picks”).

Standard verb	Recognised phrases
Pick	picks up, pick up, picking up, picks, pick, grabs, grab, takes out, take out, takes, take, lifts, lift, collects, collect, gets, get, picking
Place	places, place, keeps, keep, puts down, puts, put, drops, drop, loads, load, keeping, placing
Insert	inserts, insert, stuffs, stuff, pushes in, push in, feeds, feed
Remove	removes, remove, unloads, unload, pulls out, pull out, ejects, eject
Rotate	rotates, rotate, turns, turn, flips, flip, swaps, swap, reverses, reverse
Align	aligns, align, adjusts, adjust, orients, orient, positions, position

Press	presses firmly, presses, press, pushes, push, presses down
Verify	verifies, verify, checks, check, inspects, inspect, sees, confirms, confirm, ensures, ensure, looks at
Measure	measures, measure, gauges, gauge
Tighten	tightens, tighten, screws down, screws into, screws the, screws it, torques, torque
Lock	locks, lock, clamps, clamp, fastens, fasten
Unlock	unlocks, unlock, unclamps, unclamp, releases the clamp
Hold	holds, hold, supports, support, stabilises, stabilizes
Apply	applies, apply, pastes, paste, sticks, stick, smears, smear, spreads, spread
Clean	cleans, clean, wipes, wipe, deburrs, deburr, deflashes, deflash, blows, blow
Trim	trims, trim, cuts, cut
Start	starts the machine, starts machine, switches on, switch on, starts, start, presses the switch, presses start
Walk	walks to, walk to, walks back, walks, walk, goes to, go to, moves to, move to, comes back, come back, returns, return
Wait	waits for, waits, wait, is idle, idles, stands idle
Assemble	assembles, assemble, fixes, fix, mounts, mount, fits, fit, joins, join
Release	releases, release, leaves, leave
Pack	packs, pack, wraps, wrap