
Structuring Engineering Workflows to Eliminate 90% of Drawing Production Time

Lara Sousa, Álvaro Moreira, Jorge Soares

24th May 2026

Ducflair

Abstract

Fielconforto, an HVAC contractor specializing in restaurant construction, reduced schematic production time by approximately 90% through the adoption of a structured vector-based engineering workflow. This case study examines the transition from manual drafting to object-based component systems, the resulting operational improvements, and the broader implications for engineering firms facing similar scalability challenges.

1. Introduction

Fielconforto is an HVAC contractor specialized in restaurant construction projects, typically ranging from €1M to €8M in total construction value. Within this project range, HVAC systems typically represent around 10 to 15 percent of total construction value¹ and play a critical role in technical coordination and execution quality.

Although engineering performance on site was strong, electrical schematics were being produced using a general purpose drawing tool that was not designed for structured engineering workflows. The technical content of the drawings was correct, but the production process behind them lacked scalability and structural efficiency.

2. Problem Analysis

For a company delivering approximately twenty projects per year, the manual drawing approach represented a significant allocation of engineering hours to repetitive work instead of higher-value technical tasks^{2,3}. Fielconforto was positioned in a structural gap common among growing engineering firms: basic tools no longer supported operational maturity, yet enterprise CAD ecosystems would introduce unnecessary complexity⁴.

The main constraints identified were:

- Schematics were created manually using a raster style drawing approach, without object based components or intelligent tools;
- Each new project required a full redraw;
- Revisions were handled through file duplication rather than controlled versioning;
- There was no structured component library;

- Recurrent elements could not be reused systematically.

As a result, every project reintroduced the same production effort. Each schematic required between two and three hours to complete.

For a company delivering approximately twenty projects per year, this represented a significant allocation of engineering hours to repetitive graphical work instead of higher value technical tasks such as coordination, optimization, and analysis.

Fielconforto was positioned in a structural gap common among growing engineering firms. Basic drawing tools no longer supported operational maturity, yet enterprise CAD ecosystems would introduce unnecessary complexity and overhead.

The limitation was not technical knowledge. It was a workflow structure.

3. Architectural Transformation

Rather than implementing a heavy CAD platform, Scopture introduces a structured two dimensional engineering environment designed specifically to remove redraw friction and introduce production logic.

The objective is not cosmetic improvement, but an architectural transformation of the schematic production workflow.

The system is built around three core principles:

- Object based components replacing pixel based drawing;
- Reusable and standardized engineering libraries;
- Integrated version tracking within the workflow.

This approach separates technical content from graphical representation, enables scalable output in PDF and SVG formats, and ensures that revisions do not require reconstruction.

The result is a restructuring of the production process rather than a simple software replacement.

4. Implementation

The new environment was introduced directly within an active project. The first live schematic was completed in approximately one hour, including adaptation to the new structure.

After stabilization, average production time decreased to approximately fifteen minutes per schematic.

An important observation emerged during adoption. Despite moving into a vector based environment, the engineering team reported lower perceived complexity compared to the previous tool. Standardization reduced cognitive load, and repetition was replaced by structured reuse.

5. Measurable Results

The restructuring of the workflow produced clear and quantifiable improvements in both production efficiency and process control. By replacing manual drafting logic with a structured, object based approach, schematic creation time was significantly reduced while improving consistency across revisions.

What previously required between two and three hours per project was reduced to approximately fifteen minutes, with revision time becoming nearly immediate due to integrated version control and editable components.

ESQUEMA DE CABOS

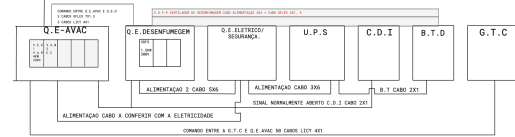
- V.E.X.1 VENTILADOR DE EXTRAÇÃO DA HOTTE CABO 4X2,5
- VAN.2- VENTILADOR DE COMPENSAÇÃO DA HOTTE CABO 4X2,5
- V.D.F VENTILADOR DE DESEMFUMAGEM CABO 4X2,5
- VE.X-2 VENTILADOR DE EXTRAÇÃO GERAL CABOS 3X2,5
- U.E1- UNIDADE DE AR CONDICIONADO CABO 5X4 EXTERIOR
- U.I.1-1-2-1-3-1-4- UNIDADES INTERIORES 4-CABOS 3X2,5
- F.I.1- FILTRO ELECTROSTATICO CABO 3X2,5
- R.C.F- REGISTO CORTA FOGO E DESEMFUMAGEM 2 CABOS 2X1
- V.G- VALVULA DE GAS 3X1
- C.H- COMANDO DA HOTTE CABO 7X1
- U.I-2-1 UNIDADE DE AR CONDICIONADO DA ZONA DE PREPARAÇÃO CABO 3X2,5 INTERIOR
- U.I-2-2 UNIDADE DE AR CONDICIONADO CABO 3X2,5 INTERIOR
- U.E.2 UNIDADE DE AR CONDICIONADO EXTERIOR CABO 3X2,5



Microsoft Paint – raster workflow

ESQUEMA DE CABOS

U.E.1- UNIDADE DE AR CONDICIONADO CABO 5X4 EXTERIOR	U.E.1- UNIDADE DE AR CONDICIONADO CABO 5X4 EXTERIOR
U.I.1-1-2-1-3-1-4- UNIDADES INTERIORES 4-CABOS 3X2,5	U.I.1-1-2-1-3-1-4- UNIDADES INTERIORES 4-CABOS 3X2,5
F.I.1- FILTRO ELECTROSTATICO CABO 3X2,5	F.I.1- FILTRO ELECTROSTATICO CABO 3X2,5
R.C.F- REGISTO CORTA FOGO E DESEMFUMAGEM 2 CABOS 2X1	R.C.F- REGISTO CORTA FOGO E DESEMFUMAGEM 2 CABOS 2X1
V.G- VALVULA DE GAS 3X1	V.G- VALVULA DE GAS 3X1
C.H- COMANDO DA HOTTE CABO 7X1	C.H- COMANDO DA HOTTE CABO 7X1
U.I-2-1 UNIDADE DE AR CONDICIONADO DA ZONA DE PREPARAÇÃO CABO 3X2,5 INTERIOR	U.I-2-1 UNIDADE DE AR CONDICIONADO DA ZONA DE PREPARAÇÃO CABO 3X2,5 INTERIOR
U.I-2-2 UNIDADE DE AR CONDICIONADO CABO 3X2,5 INTERIOR	U.I-2-2 UNIDADE DE AR CONDICIONADO CABO 3X2,5 INTERIOR
U.E.2 UNIDADE DE AR CONDICIONADO EXTERIOR CABO 3X2,5	U.E.2 UNIDADE DE AR CONDICIONADO EXTERIOR CABO 3X2,5



Scapture – vector workflow

Figure 1: Direct comparison of the same cable schematic produced with the previous raster tool (left) and the new structured vector environment (right).

Metric	Before	After
Schematic Creation	120 to 180 minutes	Approximately 15 minutes
Revision Time	30 plus minutes	Near instant
Drawing Architecture	Raster	Vector
Reusability	None	Structured
Versioning	Manual	Integrated
Output	Image based	Professional PDF and SVG

Table 1: Comparison of operational metrics before and after implementation.

The table below summarizes the operational differences observed before and after implementation.

Considering the average production time before and after implementation, schematic creation decreased from approximately 120 to 180 minutes to around 15 minutes per project. In practical terms, this corresponds to a reduction of close to 90 percent in drawing production time.

Beyond time savings, these results indicate a shift from reactive drafting to a controlled and reusable engineering workflow, increasing both speed and reliability across projects.

6. Operational Impact

Schematics were transformed into true coordination assets, easily shared and understood across all site teams. Documentation quality was raised to the level of professional CAD deliv-

erables, which significantly reduced ambiguity during execution and helped prevent errors on site.

Internal drawings evolved from informal sketches into structured engineering documentation that is clear, consistent and ready for reuse in future projects.

The improvement was systemic rather than incremental, by entrusting repetitive drafting Fielconforto was able to reallocate engineering time from manual drawing to higher value technical work such as coordination, design optimization and detailed engineering analysis.

7. Discussion

The dynamics in this project are not isolated. Industry data shows that HVAC and MEP contractors are being asked to deliver more complex, energy efficient buildings under rising cost pressure and persistent labour shortages^{1,3,4,5,7,8,9}. At the same time, digitalisation is recognised as a key lever to close the construction productivity gap, but many firms struggle to convert that ambition into practical day-to-day workflows^{2,6}. This case illustrates what that translation can look like in practice. By turning informal internal drawings into structured engineering documentation and making schematics usable as coordination assets, the contractor reduced execution risk while freeing up scarce engineering time. The same hours were redeployed from repetitive drafting to coordination, optimisation and analysis, activities that directly influence quality, schedule and margin. In an environment where teams are lean and specialized skills are hard to scale, this kind of workflow redesign creates operational leverage, not just convenience. Basic tools no longer scale, yet large enterprise systems often add operational weight instead of removing it.

Meaningful transformation requires structured workflows designed around how engineers actually work.

8. References

1. Rennell Capital Group. Commercial Guide: Estimate HVAC Cost. 2025.
2. McKinsey & Company. (2023). Reinventing construction through a productivity revolution.
3. Associated General Contractors of America (AGC). (2024). Construction Workforce Shortage Survey.
4. Deloitte. (2025). Engineering and Construction Industry Outlook.
5. International Energy Agency (IEA). (2024). Energy Efficiency 2024: Trends and Net Zero Pathways.
6. European Commission. (2024). Digitalisation in the construction sector.
7. Eurostat. (2025). Construction Cost Index (CCI) Trends.
8. Cedefop. (2024). Skills for the Green Transition.
9. NAHB. Residential Statistics: Cost of Constructing a Home.