

AS125655

Document DNA: Relevant 2D Documents in a 3D World

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Learning Objectives

- Understand digital best practices and the pitfalls of not having them
- Learn how to identify, diagnose, and remedy problematic digital files
- Learn how to augment QC processes by incorporating steps for digital review
- Learn how to create files that do more than just produce pretty output

Description

In today's world of 3D, Building Information Modeling (BIM), and rapid prototyping, are 2D drawings still relevant? Even while some industries push toward bypassing traditional 2D output completely, by going straight from digital to production, drawings for many of us still serve as a primary and essential means for communicating design intent. Yet behind every 2D document lurks the possibility of a file that's a digital disaster. You know the type; they look fine when plotted but are a nightmare to actually work with. These documents might pass a visual-based quality-control review, but a plot can hide a multitude of sins. This session will explore the hidden DNA of documents that can affect productivity, profit, and even employee morale. We'll brainstorm together on digital best practices to ensure your plotted documents (whether paper or digital) are more than just pretty drawings. We'll also dive into the tools and techniques to help identify, prevent, and remedy digital dilemmas in your company.

Speaker(s)

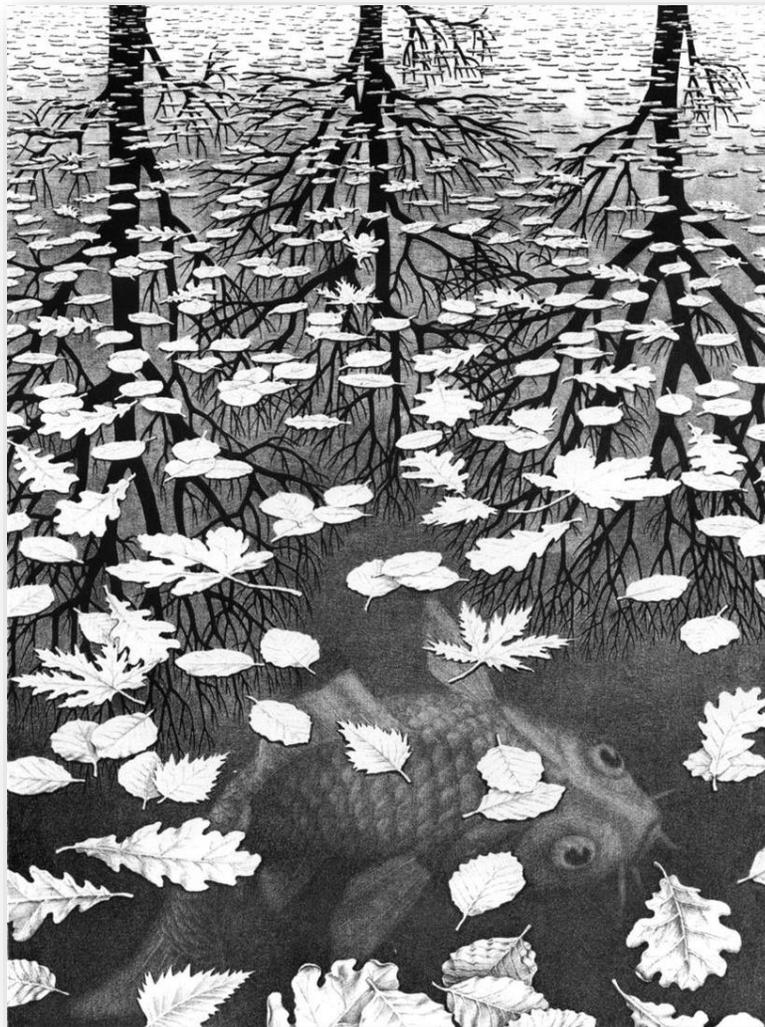
Chris is admittedly an "old school" AutoCAD user (having used it pretty much daily since graduating from Oklahoma State University in 1985) and a fledgling Revit user (some habits die hard!). He's worked primarily in architecture, structural steel, and post-frame buildings, and has been a drafter, IT manager, trainer, programmer, and Autodesk consultant for notable companies such as Kroger, L Brands, and Huntington Bank, and was a member of Autodesk's AutoCAD Mentor team. He is currently serving his third term on the AUGI Board of Directors in the role of Treasurer. He is the CAD Manager for Shremshock: Architects & Engineers in central Ohio where he lives with Sonia, his wife of 30+ years. He is the parent of two adult children and spends his free time reading, camping, gardening, doing art, and tinkering in the garage on the vintage 1966 International Scout he's had since high school.

More Than Face Value

As a teen, I was given a book of M. C. Escher art for Christmas. Not only was the art spectacular and the illusions engaging, but his works caused me to stop and study the image and challenged me to look at the world around me with fresh eyes and from different perspectives. You may recognize some of his work.



His 1955 lithograph, named “Three Worlds” (below), was always a favorite.



As Escher's lithograph implies, not everything is what it appears on the surface. Or, in another way of putting it, not everything can be taken at face value. And with my 30+ years of producing drawings in various industries, I've come to understand that documents, too, can have surprises lurking "under the surface".

The ways in which we create documents has drastically changed over the past few decades. We all see it in our respective industries, in our companies, and it's made even more evident when attending events like Autodesk University. The purpose that documents serve, and the form they take, has changed as well. But our reliance on documents is still strong as they continue to be the fundamental conduit for communicating design intent and sharing information.

Defining Quality

Not all documents, though, are truly effective at carrying out this purpose. A document's quality can have a direct impact on how effectively and efficiently this communication is delivered and executed.

So, how do you define a "good" drawing?

- Are there certain things you look for?
- Are there red flags that, if present, make you question the rest of the drawing?
- Is it one of those things that is hard to describe, but "you know it when you see it"?

I pulled the following quote from an article entitled "What Makes a Good Working Drawing?" ([source](#)):

"If the layout looks good, the plan is usually successful. The appearance of a drawing is usually a good indication of its accuracy. The layout of the drawing will determine if people can understand and work with the content. A clearly, thoughtfully laid-out drawing is conducive to a thorough and proper review before it hits the field."

A blog post named "Working Drawings: Leading by Example" ([source](#)) gets more specific:

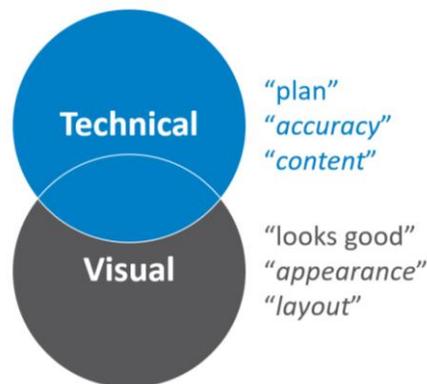
"...poor working drawings often exhibit fundamental problems: incomplete details, missing drawings, component-sizing errors, poor workmanship, excessive information and nonstandard symbols."

Notice any themes here?

Fundamental Elements

The items listed in the previous quotes can be grouped into two distinct elements which I call **technical** and **visual**. The Technical element is marked by the words “accuracy”, “content”, “incomplete”, “missing”, and “errors”. The Visual element is marked by the words “looks good”, “appearance”, “layout”, and “poor workmanship”.

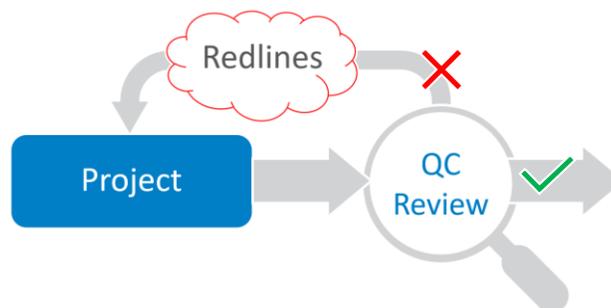
According to these writers, a quality drawing would be one that achieves a level of excellence in at least these two areas.



And, interestingly, when drawings are reviewed or audited, these elements are the focus.

Quality Control circa 1817

Most drawings undergo some type of quality control review or document audit before they are submitted (issued, published, delivered, etc.), as diagrammed simply below.



Both the Technical and Visual elements of a drawing are an important part of the review/audit phase of a project. Arguably, the Technical element is the primary focus of a review, but the Visual element plays an important part, as it can help or hinder the effectiveness of the drawing. A drawing that is technically correct, yet visually confusing, may not be much better than a drawing that is technically wrong yet visually clear. The best drawings are those that have the correct blend of both elements.

As stated earlier, the way we generate documents has changed, but the QC review process for most companies has changed very little. In an [article](#) written on LinkedIn, Kelly Cone summed it up this way:

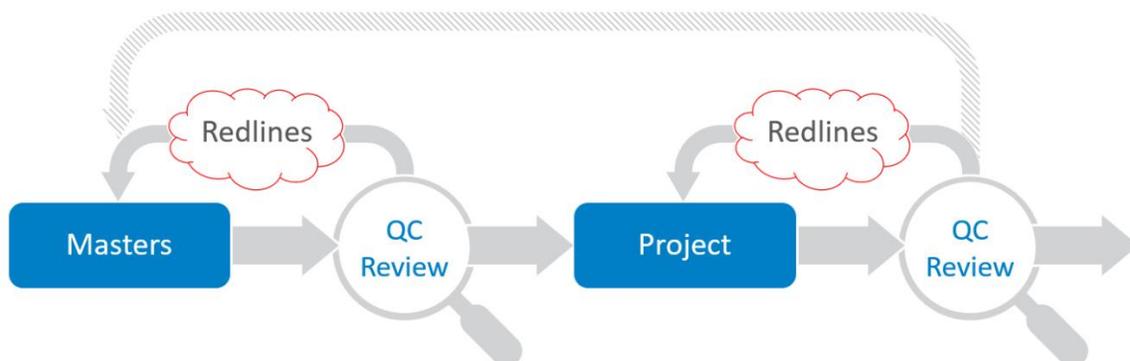
[The construction industry is] *“cursed with more or less the same quality control processes today as those available 200 or even 500 years ago...”*

Think about it. For the most part, QC still consists of an experienced person visually inspecting the drawing in search of, as quote earlier, *“incomplete details, missing drawings, component-sizing errors, poor workmanship, excessive information and nonstandard symbols”*. Whether the document is a PDF, DWF, or plotted to paper, the process is pretty much the same.

Review Before the Review

One sector of the architectural industry that our firm specializes in is multi-site rollout and prototype architecture. These clients have certain brand and design requirements that are consistent in each project. The nature of this work tends to be repetitive, with short duration and low budgets, so efficiency is an important factor.

Many of these projects utilize masters (i.e. prototypes or templates) to streamline the project lifecycle. And, for a number of our clients, we are their “masters architect”, meaning we’re responsible for the creation and ongoing maintenance of their masters. Not only do we use these masters for the client’s projects, but the client provides them to their other consultants to use as well. These masters must be accurate, well organized, flexible, and efficient. In addition to the QC review that occurs for each project, the masters have their own review cycle, as represented below.



The Missing Element

Our drawings were obviously being reviewed. Multiple times, in fact; as masters documents and as project documents. But something was slipping by our reviewers undetected. It was apparently something unnoticeable when looking at a PDF, DWF or plotted paper. Even with our current expanded review process, the drawings were still lacking something. It was obvious from the feedback I was hearing from those working with the drawings:

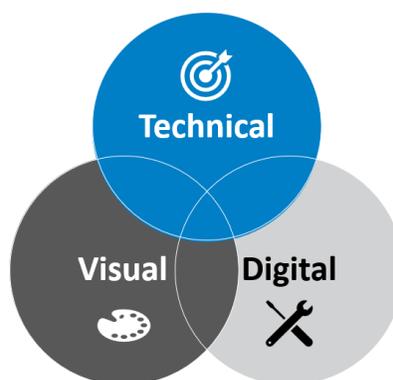
- “These drawings take so long to open (or plot or save).”
- “Why isn’t the schedule created as a table?”
- “Why do my dimensions disappear in this viewport?”
- “This dynamic block isn’t working right.”
- “Why did they use Text instead of MText?!”
- “When I plotted this, all the lineweights are the same.”

Guess what? None of these comments were related to either the Technical or Visual elements of the document! It had nothing to do with whether the drawing was accurate or how it looked; it dealt with how the drawing was created. These were things that were under the surface, invisible to even the most experienced reviewer’s trained eye.

It became apparent that in order to be a truly “good” drawing, it needed more than just Technical and Visual elements. I’ve labeled this missing element as **Digital**.

Document DNA

I refer to these three elements as our “Document DNA”. Let’s take a closer look at each of them.



Technical Element

The Technical element focuses on the “content” of the documents; their precision, completeness, constructability, compliance with jurisdictional or industry regulations, etc.

Some of the key questions related to this element are:

- Is it complete, accurate, buildable?
- Does it capture the client’s design requests?
- Does it comply with relevant code, regulations, and/or standards?
- Does it protect the firm and the client against litigation?



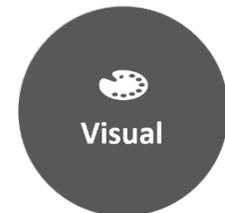
The ultimate goal of the Technical element is _____.

Visual Element

The Visual element focuses on the “look” of the documents; how they are presented, how they are organized, etc.

Some of the key questions related to this element are:

- Is the drawing thoughtfully laid out with sufficient white space to avoid clutter?
- Is everything legible?
- Are industry standard symbols used?
- Do the lineweights aid legibility, show depth, and convey importance?



The ultimate goal of the Visual element is _____.

Digital Element

The Digital element focuses on the “how” the documents were created; the methods and standards used to create them, how intelligent they are, if they enable collaboration, etc.

Some of the key questions related to this element are:

- Are drawings as clean and as small as possible?
- Can the drawing easily and efficiently be edited?
- Are intelligent objects used where possible?
- Does the drawing’s setup enable collaboration?



The ultimate goal of the Digital element is _____.

I chose the tools icon for the Digital element because it could also be broadened to include any tool used for efficient drawing creation. Back in the day, tools such as lettering guides, symbol templates, sticky-backs, although not digital, served a similar purpose in that they were tools leveraged to increase efficiency and consistency.

(But, the term “digital” just had a better ring to it!)

Three Scenarios

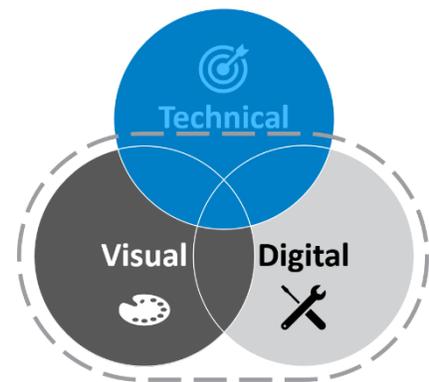
How do we juggle and balance all three elements? Are they all equally importance? Is it ever okay to marginalize one for the sake of the others? Are there certain combinations that are more effective than others? It's not uncommon to encounter documents that contain two out of three. Is that good enough? Is it unrealistic to aim for excellence in all three simultaneously, or is two-out-of-three okay?

If we approach this with the mindset that “two out of three ain't bad”, then we must take a hard look the implications of that missing third element. Each scenario has some interesting and identifiable characteristics as well as consequences.

Scenario 1 – Visual and Digital Emphasis

What are the characteristics or liabilities of documents that emphasize the Visual and Digital over the Technical? I think I heard a few of you gasp at the thought of this unthinkable scenario! What's the point of a drawing if it is wrong?! But we've seen it; drawings that look great, and are a pleasure to work on, but are loaded with errors. What's more, they can be quite convincing because the “look right”.

Worst-case outcome of this scenario: _____.



However, before we write this scenario off as completely useless, consider these situations:

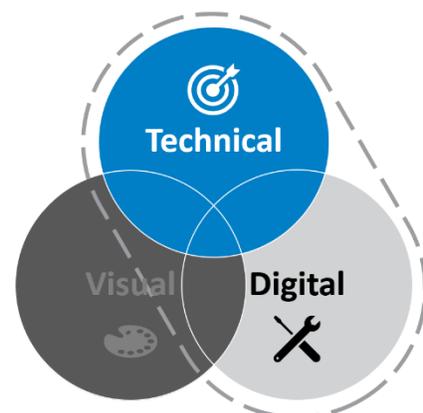
- Have you ever created a napkin sketch? It was far from accurate, but it was an efficient tool at the time (albeit not digital) and visually concise.
- When drawing a foundation section does “dirt” really look like the EARTH hatch pattern?
- Have you ever exaggerated part of a drawing (i.e. sacrificing Technical accuracy) for the purpose of Visual clarity?

In each of these, it was acceptable to forego the technical accuracy to achieve clarity and efficiency.

Scenario 2 – Technical and Digital Emphasis

What are the characteristics or liabilities of documents that emphasize the Technical and Digital over the Visual? You're probably seen documents like this; they're correct, and the person who created them was a skilled CAD person, but they look terrible.

Worst-case outcome of this scenario: _____.



“Even completely accurate, fully detailed drawings can be problematic if unprofessionally executed, sometimes leading to subtle but significant impacts, most notably misinterpretation.” [\(source\)](#)

While we’re talking about accuracy, is it possible for a drawing be “too” accurate? A common problem with both CAD & BIM is balancing the ability to detail “to the nth degree” versus the overhead associated with over-detailing. Too much detail, while technically correct, is counter-productive. Geometry gets cluttered, documents are not clear (we’re missing “Visual” here, whose goal is “Clarity”), system resources are consumed, production is hampered.

Scenario 3 – Technical and Visual Emphasis

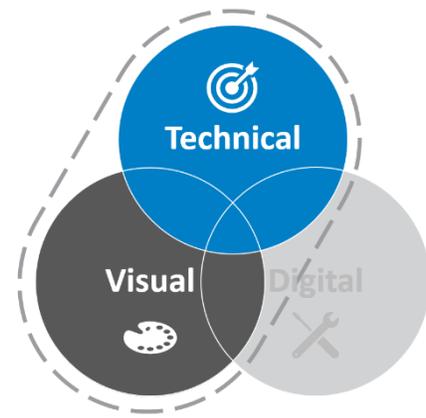
What are the characteristics or liabilities of documents that emphasize the Technical and Visual over the Digital? These drawings generally pass the QC review with flying colors, but when you work with them, you want to pull your hair out!

Worst-case outcome of this scenario: _____.

Of the three scenarios, I believe this is the most common, and the most commonly accepted.

Consider the following statements:

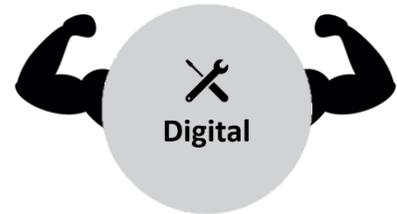
- “Just explode it and move on.”
- “Don’t worry about changing the drawing; just edit the dimension.”
- “We don’t have time to ‘do it right’. Let’s just get it done.”



Have you heard, or perhaps even said, one of these statements before? In essence, these all imply that the drawing’s Digital makeup is secondary in importance. Is it acceptable to take digital shortcuts to achieve a deadline? Is Digital the “throw away” element? Is it the only element that gets set aside when it’s crunch-time? Is this a short-sighted “fix”? What happens when those drawings, that were rushed to completion, come back in need of revisions? Chances are, you will curse the “get it done” mentality that decided to kick the long-term benefits of efficiency to the curb in favor of the short-term shortcuts.

The Omnipotent Element

Is it possible that one element, if used properly, could actually incorporate the other elements? I contend that the Digital element has that potential. Think about a well-crafted dynamic block, wall type, detail, or template drawing. When done correctly as digital elements, they can include the technically accurate and visually appropriate information as well! It is a truly powerful element. None of the other elements have this flexibility.



Digital Tools

The right tools make all the difference in the world. When used properly by trained individuals, they make tasks simpler, safer, and more efficient. And, if you remember, the goal of the Digital element is efficiency. So, having a set of Digital tools is essential to creating and supporting well-rounded documents and empowering users to work with them efficiently.

We need Digital tools to:

- Assist with standards cleanup, enforcement
- Reduce a drawing's digital footprint
- Make it easier to do things right than it is to do it wrong.
- Make standards management and maintenance easy
- Provide document audits and reports

Here's a small list of some essential Digital tools:

- Libraries
 - Blocks and families
 - Styles and types
 - Details
 - Tool palettes
- Drawings
 - Page setups
 - Sheet Sets
 - Template (DWT) files
 - Standards (DWS) files
- Cleanup
 - MergeTextStyles ([link](#))
 - StripMText ([link](#))
 - LayTrans (Layer translator)
 - eTransmit
 - DWGConvert
 - DupRemove
 - OverKill
- Audits and Reporting
 - Standards Checker
 - Reference Manager

DNA Beyond Documents

I've found that this DNA concept can be applied to many things. Even this handout has the combination of all three elements. How might the DNA concept also be applied to:

- Staffing – What is the correct “DNA blend” for various positions in your company? Do different positions in your company require more emphasis on certain elements than others? Does this concept affect your hiring process? Which elements can be taught, and how?
- Projects – Do these elements take on different importance over the course of a project lifecycle? Does (or should) their significance change as deadlines approach?

DNA Beyond AU

As Escher's “Three Worlds” illustrates, a document is more than what you see on the surface. The Document DNA concept enables you to think holistically and, in my opinion, accurately about what constitutes effective and efficient documents.

Realistically, Document DNA even extends beyond drawings. It can be applied to documents of all types; spreadsheets, presentations, etc. It even applies beyond typical documents to dashboards, web sites, user interfaces, and more.

Be wary of the temptation to take shortcuts and quick fixes in your document creation process. You just might be the one who is on the receiving end of them! Endeavor to find the balance between all three elements. Be willing to “invest” in the right tools, whether digital or not, to achieve that balance.

Equipped with this Document DNA concept and the wealth of other information you've acquired at Autodesk University, the documents you create will not only reflect the care and thought you put into them, and have added value “below the surface”, but also be ones that you, and others, will enjoy working with.

