

CS500125

Maximizing Data and Strategic Partnerships to Drive Prefabrication

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Learning Objectives

- Discover situations where maximizing data can have significant benefits on project quality and efficiency.
- Learn about seeking out and collaborating with like-minded partners to drive change.
- Learn how to evaluate how design data can be utilized in the prefabrication process.
- Learn how to maximize the Revit API to streamline data flow between partners and design/prefabrication phases.

Description

It goes without saying that as an industry, we will use more data, not less, as time goes on. The word “data” gets thrown around a lot, but how do we narrow down the word data into only what is useful for generating real quality and efficiency gains in construction? What software exists to help us do this? Using strategic partnerships focused around solving specific problems, maximizing data goes from an overwhelming topic to a powerful conversation that drives quality and efficiency. This session will talk about the advantages of developing strategic partnerships centered around maximizing data with likeminded organizations within the construction industry. You'll see how custom software development within the Revit API can streamline data flow and solve age-old industry frustrations. And you'll learn how data can be fed from the design phase into prefabrication. We'll review case studies where these tactics were employed and see the savings generated.

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Speaker(s)

Brandon Johnson



Brandon is the Director of Electrical Engineer for KLH Engineers. He focuses on setting the vision and direction for the electrical engineering department along with facilitating ongoing training and education of the electrical engineering staff at KLH. He is also responsible for overseeing the creation of electrical software by KLH's in house software engineering team that defines the electrical engineering process. He also serves as a Business Analyst for the software engineering team, handling the population and prioritization of the software team's backlog plus rollout and training of all newly created software.

Jim Tavernelli



Jim Tavernelli serves as President and Chief Operating Officer of KLH Engineers. He has led the firm's reinvention into an innovation-centric practice executing its "technical strategy" that has fundamentally changed the way KLH completes its work. His leadership provides opportunities for every employee to be visionaries, advance ideas, and develop new technologies and processes each day. This approach has transformed the firm's culture while building an extensive set of software applications and modified workflows being applied in the AEC industry. He is a licensed Professional Engineer with a Bachelor of Science in Electrical Engineering from the University of Dayton and is a member of industry and community associations.

Kevin Eldridge



Kevin is a Lead Mechanical Engineer for KLH Engineers. His primary role is mechanical system design for construction projects that stretches across all market segments including Healthcare, Civic and Commercial to name a few. Kevin is also involved in the DEMAIN consortium, and works closely with Tweet Garot (another member of the consortium) on project collaboration aimed at improving the consulting engineer's understanding of contractor workflow while also increasing his understanding of constructable design.

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Mark Hans



Mark serves as a lead technology designer at KLH and leads the firm's internal Technology Department BIM innovations. He has been instrumental in developing KLH's technical innovations and led the development of many internal software tools.

Spencer Murphy



Spencer Murphy is the Engineering Department Manager for Rex Moore Electrical Contractors where he has spent the last three year. Spencer typically fills the role as the Electrical Engineer of Record and leads his team of designers (Power & Light, Life Safety System, Low Voltage Systems, and Telecommunications System); however, he also assists with pre-construction coordination, estimating, corporate leadership, and mentoring of junior engineers. Spencer has been an engineering project manager for over 20 years and has been a professional engineer for 12 years in multiple states from California to Alaska with a strong background in Commercial power distribution, custom lighting solutions, Oil & Gas, Municipal Projects, Rural Power and Communications, and industrial controls.

Chris Hronek



Chris is the Fabrication Database Manager at Tweet/Garot Mechanical. A sheet metal worker by trade, he focuses on many internal process at Tweet along with translating design requirements to Tweet's field teams.

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Adam Perales



Adam began his career with Construction Innovations in 2012 building lasting relationships with customers. He brings extensive experience in a variety of major electrical markets, including renewable energy, cogeneration, transmission and distribution, SCADA integration, manufacturing, industrial controls and wireless telecommunications.

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Learn about seeking out and collaborating with like-minded partners to drive change.

[KLH Engineers](#) is an MEP consulting engineering firm based out of Ft. Thomas, KY. In 2016, KLH embarked on a journey to reinvent itself. It was clear to KLH what contractors thought of consulting engineers. Arrogant, hands-off, bottlenecks, a necessary evil... these and others were the phrases thrown out when KLH started traveling the country in 2016 seeking feedback from contractors on how KLH could provide better value to the industry. It is these impressions that are driving contractors to increase their inhouse engineering competency, slowly cutting design firms out of the market. As KLH evaluated their role in the industry over the next 10+ years, it was clear that continuing down the same path would not result in continued success. As the construction industry trends toward faster, more cost effective, and more efficient deliverables, a new approach to engineering was needed and KLH's "technical strategy" was born.

Through a series of connections, KLH came into contact with [DPMG](#). DPMG is a business evolution consultant that helps businesses implement lean strategies into their business models. Through DPMG, KLH was introduced to the [Rex Moore Group](#), [Construction Innovations](#), and [Tweet/Garot Mechanical](#). Rex Moore, based out of Sacramento, CA, is a full-service design/build electrical contractor with inhouse engineering, modeling, installation, and maintenance teams. Construction Innovations, also out of Sacramento, is a manufacturer specializing in custom manufacturing of assemblies and kits to fit project requirements. Tweet/Garot, based out of De Pere, WI, is a design/build mechanical contractor with engineering, fabrication, and installation capabilities all in house. All three of these companies had already gone through a lean transformation and were producing innovative deliverables within their respective silos. Rex Moore's workflows were allowing them to secure projects faster and with more accuracy than their competition. Coupled with their engineering and BIM capabilities, they were able to produce faster, better deliverables to their contractors in the field. Construction Innovations were producing UL listed electrical assemblies and kits and were the leading US based manufacturer of utility scale solar assemblies. Tweet/Garot was dramatically reducing their installation time on site with their mechanical manufacturing and prefabrication capabilities. Once all four companies were connected, it was obvious that much could be achieved together, and the [Demain Consortium](#) was formed.

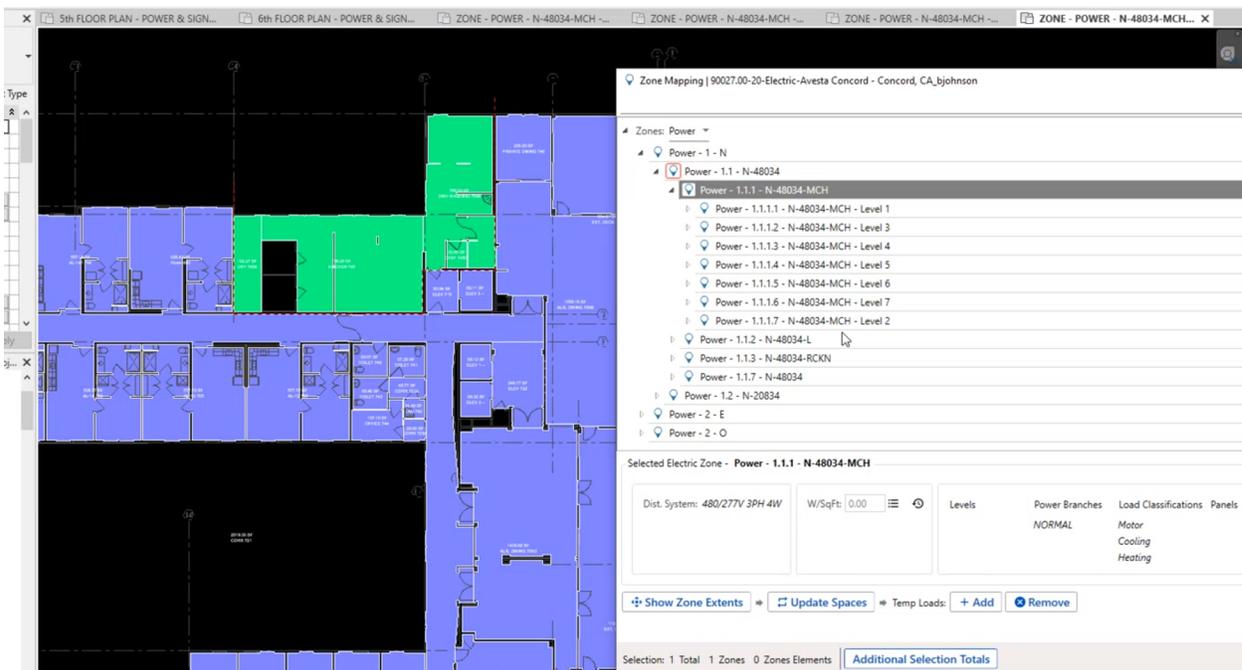
Demain is focused simply on bringing the joy back to construction. Because of the deep trust and accountability that has been established between members, the silos between members have been bridged and new innovations have resulted. Demain focuses on bettering each individual member, while also chasing unique projects where the full strengths of all members can be leveraged across the construction value stream. This handout and presentation will show some of the many advancements and innovations that have resulted from this partnership and how they have increased the pre-fabrication capabilities of all members through the use of data.

Discover situations where maximizing data can have significant benefits on project quality and efficiency.

Custom Software to Drive Design

When KLH and Rex Moore first started collaborating, it became obvious that assimilating an electrical engineering consultant with an electrical contractor's engineering team was no easy task, but over time its advantages became clear. It forced both groups to develop a single process that both could follow. By leveraging data in Revit models and custom software, not only did both teams become aligned but the quality and efficiency of both improved. KLH's design and software experience coupled with Rex Moore's design and installation experience resulted in improved existing software and new software that drove the quality and efficiencies gained.

For example, a zone mapping tool was developed. This tool creates electrical zones within Revit and allows an electrical engineer to analyze load calculations at a schematic level. They can accurately size electrical services with nothing other than a blank Revit model of the building. Leveraging the data within the Revit model such as square footage, types of spaces, etc. the quality of schematic deliverables and the efficiency of the downstream design process was dramatically improved, since the zones can later be used for automated branch circuiting.



Zone Mapping Tool

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Another tool to highlight is called the Feeder Calculator. This custom tool was built by KLH prior to Demain being formed. However, with Rex Moore's experience added it was improved to be more accurate and cost conscientious. This tool pulls data from the Revit model such as feeder lengths and electrical loads. The engineer then makes some decisions about the types of feeders used and the ratings of equipment, then the tool automatically produces code compliant feeder sizes that are added to the drawings. This tool has saved untold errors from making it on the drawings and has made every engineer at both companies proficient at sizing feeders without mistakes and rework. It also ensures that regardless of where feeder information is shown on the drawings, it is always accurate and in sync.

The screenshot displays the 'R2H Feeder Calculator' software interface. It features a spreadsheet with columns for Equipment, Family Type, Rating (A), Demand (A), UG, Feeder Length (ft), Voltage, Poles, Wires, Existing, 2021 Neutral, Ground Type, Feeder Type, Feeder Area, Feeder ID, Feeder, Conduit Status (Beta), Fault Current, Short Circuit Rating, and Total Voltage Drop (%). The spreadsheet lists various electrical components like switchboards, transformers, and panelboards, along with their specifications and calculated values. At the bottom, there are controls for Auto Type (Copper Only, Aluminum), Max Feeder VD %, and options for ASHRAE, Auto Calculate, and Show Additional Feeder Fields. A 'Calculate' button and 'Update Revit' button are also visible.

Feeder Calculator Tool

Learn how to evaluate how design data can be utilized in the prefabrication process.

Prefabrication of Utility Scale Solar projects

Construction Innovations (CI) is the leading US based manufacturer of utility scale solar assemblies. Prior to the formation of Demain, they were already manufacturing skids of solar equipment and prefabricated components complete with factory inspections and testing then shipping these components, along with installation drawings, to the field. Once Demain was formed, KLH and CI began to identify what areas of an already efficient process could be further improved by the use of data.

The start of a solar project for CI are design drawings received by the design engineer in 2D AutoCAD. Prior to Demain, a manual takeoff of the design drawings was performed to create a bill of material (BOM). CI's proprietary inhouse process were then implemented to translate this BOM into the prefabricated assemblies and installation drawings that left the shop. The manual takeoff process was time consuming, and not immune to errors. KLH and CI worked together to create a new process that leveraged data.

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To start, custom software was created to translate the 2D design drawings into a 3D Revit environment. Next, software was created to perform the takeoff and BOM development with CI's proven manufacturing standards built in. The result was a Revit 3D model of the site that included the necessary data to inform the pre-fabrication process. Design validation components were built into the software to verify accuracy, and the installation drawings were produced from Revit. All in all, the design data can now be effectively translated into Revit allowing for BOM creation, installation drawing creation, and data flow to manufacturing without the need or errors associated with manual takeoff.



Construction Innovation's Manufacturing Facility

Learn how to maximize the Revit API to streamline data flow between partners and design/prefabrication phases.

Mechanical Fabrication Conversion

KLH and Tweet/Garot partnered together on the design and construction of the mechanical systems for an orthopedic surgery center. Early on in the project, the team identified that one of the biggest areas of wasted time in the fabrication process was the conversion of design elements to fabrication elements, including simply knowing when a design element is ready for fabrication. It leads to rework, frustrations, and ultimately takes focus away from the real work that needs to be done. This led to the creation of a custom tool built into Revit using the Revit API called Set Fab Status. In its simplest form, it allows the team to collaborate back/forth on when design elements are ready for conversion and when elements have been converted. This cut down on rework and miscommunication by simply building some basic data into the design model with a custom tool. The project yielded many takeaways for future improvements to the tool and creation of others to further streamline the process. Without KLH's knowledge of design and Tweet/Garot's knowledge of fabrication and installation, these efficiencies would have never been realized.

Fabrication Statuses

Statuses	% of Status Assigned
Design Routing	0
Design Coordination	0
Construction Coordination	0
Signed Off	0
Staged To Spool	0
QC	0
Issued For Fabrication	0
None	0

Parts

- Design Parts
- Fabrication Parts

Set Fab Status Tool