Digital Tools for Engineers

by

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Digital Tools for Engineers
A SunCam online continuing education course

Course Contents:

1. Introduction

This course summarizes common digital tools and software being used today by engineers. Software has grown from an efficient alternative to physical paperwork to essential platforms for engineers, aiding with just about every task throughout the day. Engineers should strive to keep up with the latest software and consider if it could be useful for their projects.

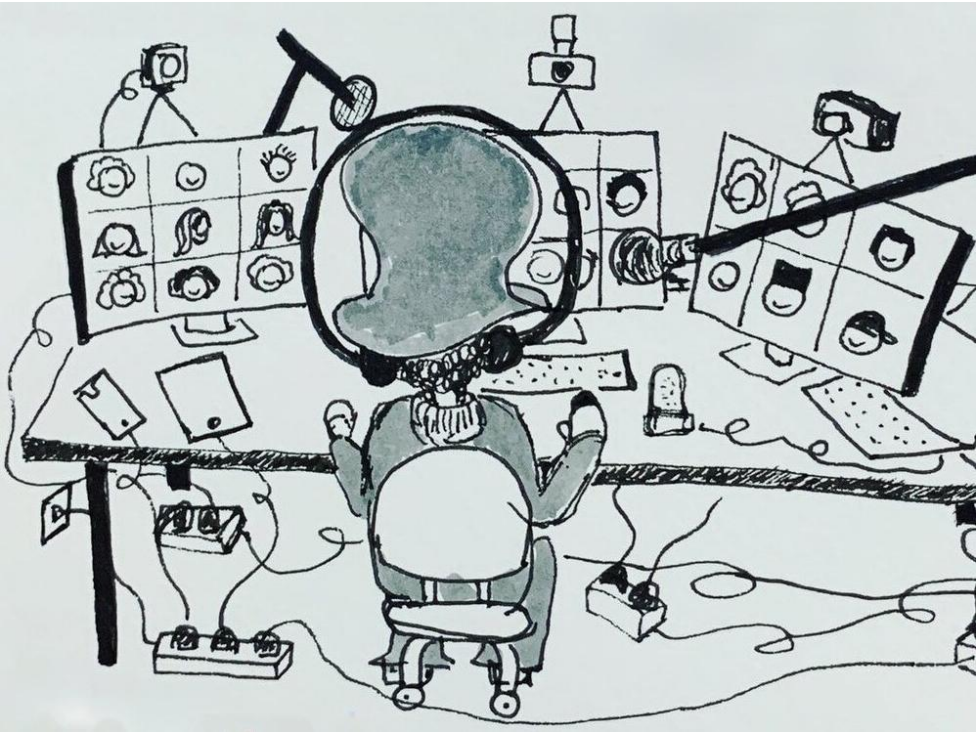

Figure 1: Digital tools are now available for most professional activities.
Source: commons.wikimedia.org/wiki/File:Virtual_Insanity.jpg, p.d.

Most software now has an aspect of artificial intelligence (AI), whether built into the program or an optional add-on feature. AI can provide several benefits to engineering project tasks, including increased efficiency and risk reduction. AI tools are redefining many processes by automating routine tasks, providing assistance through prompts, and generating unique contect.

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This course starts with an overview of Microsoft (MS) software commonly used by all professionals, including engineers. Microsoft continues to dominate in the field of professional software, especially in medium to large corporations and public organizations. The recent introduction of Copilot to MS Office software has kept the software relevant and with the times.

Next, other professional tools are reviewed, with example software listed for each tool.

Specific AI-driven tools are also reviewed. These tools can help create documents, assist with meetings, create schedules, identify potential risks proactively, and ultimately drive better project outcomes.

Finally, specific engineering tools are covered, such as Autodesk suite, Ansys suite, Bentley suite, MATLAB, Specification Software, FEA modeling, and CFD modeling.

2. Microsoft Tools

Microsoft continues to dominate among workplace software for professionals. Most companies provide employees, including engineers, with Microsoft 365, which is a subscription-based cloud productivity service combining the following:

- Premium Office apps (Word, Excel, PowerPoint, Outlook)
- OneDrive cloud storage (1 TB)
- SharePoint
- Advanced security
- AI-powered tools
- Mobile apps

The biggest change in recent years has been the role-out of Copilot for all the MS 365 software. Copilot has been available since 2023 but took a few years to fully integrate and become commonly used in daily work. Copilot is covered later in the course.

Outlook

- Outlook is a communication hub for email, share attachments, schedule meetings and work times, reserve personal time, manage to do lists, and more.
- Key tools in 2026:
  - Shared calendars for visibility and finding availability for large meetings
  - Integrated Task Tracking: With the Microsoft “To Do” integration, you can set reminders, due dates, and priority levels (High, Normal, Low)
  - Email-to-Task Conversion: Turn actionable emails into tasks or calendar appointments
  - Email organization tools including flagging, priority levels, searching, and automated sorting
  - Time blocking on calendar to accomplish tasks without meetings.
  - Color-code calendar items based on conditions (role, project, personal, etc.)
  - Integration with MS Teams

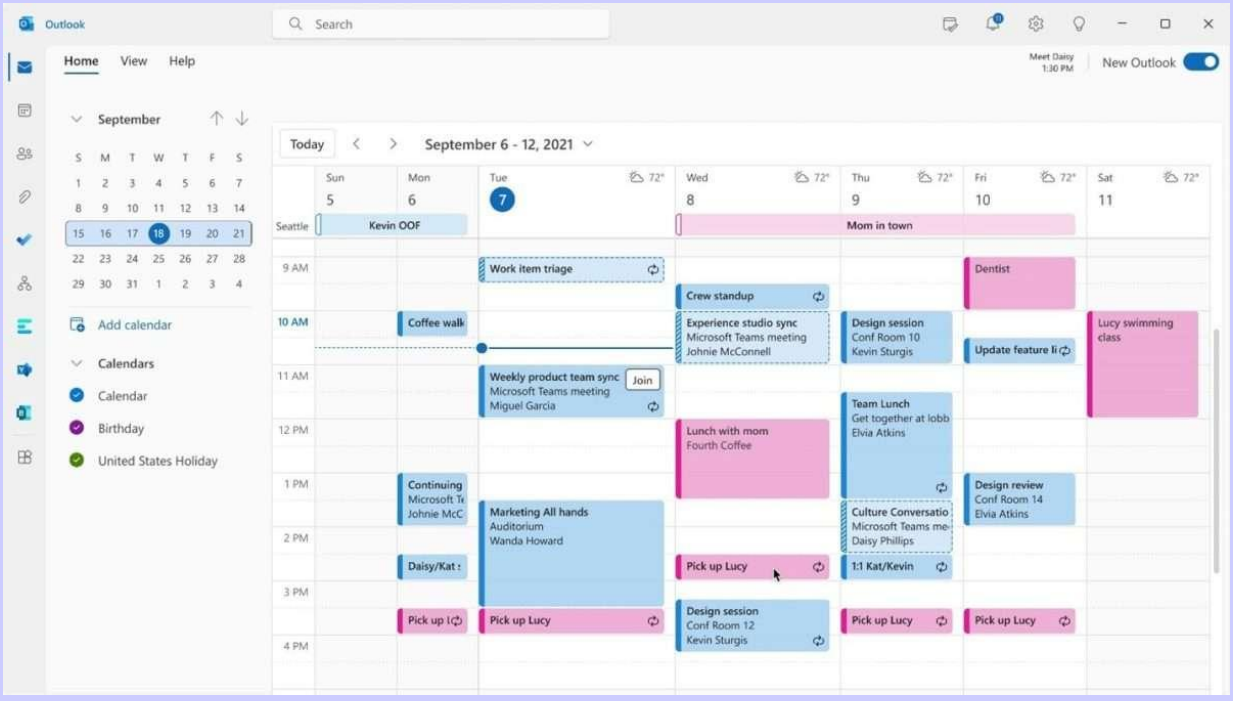

Figure 2: Outlook calendar with personal events in light red and work meetings in blue.
Source: Author

MS Teams

Description	Other Meeting Software
• Create Team channels and chats to share information, tasks, and decisions in real time • See staff contact information, org charts, and availability status • Integrates with Outlook for calendar scheduling • Integrates with OneDrive to save shared files • Integrates with SharePoint to save files in Team channels • AI driven meeting administrative tasks, include agenda, written transcription with speaker names, live translation, meeting notes and summary, action item list • Search across chats, meetings, notes, and channels	• Zoom • Webex • Google Meet • Apple FaceTime • Skype • WhatsApp

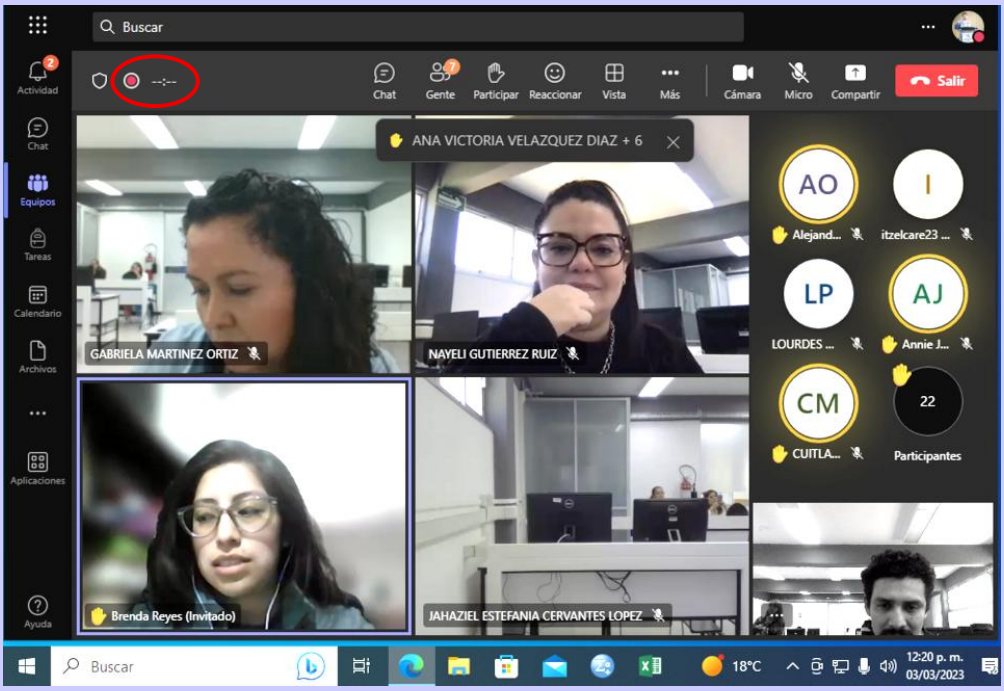

Figure 3: MS Teams call; the red dot indicates it is being recorded (along with an initial notification). A transcription is available in the chat history after the meeting ends, alongside the recording.

Source: commons.wikimedia.org/wiki/User:Luisalvaz, Luis Alvaz, CC-BY-SA-4

Word

- MS Word is the industry-standard word processor used at most business and schools.
- Integration with the Microsoft Office suite.
- Go-to tool for everything from simple letters to complex reports
- Instant spelling and grammar checking
- Track changes and review comments for quality review documentation
- Multi-user simultaneous editing on OneDrive, SharePoint, and MS Teams
- Ready-made templates for resumes, reports, brochures, letters, etc.
- Drawing and image editing
- Lock for limited editing such as protecting terms and conditions in agreements
- Print or export to pdf
- Import a pdf file and convert to text and tables

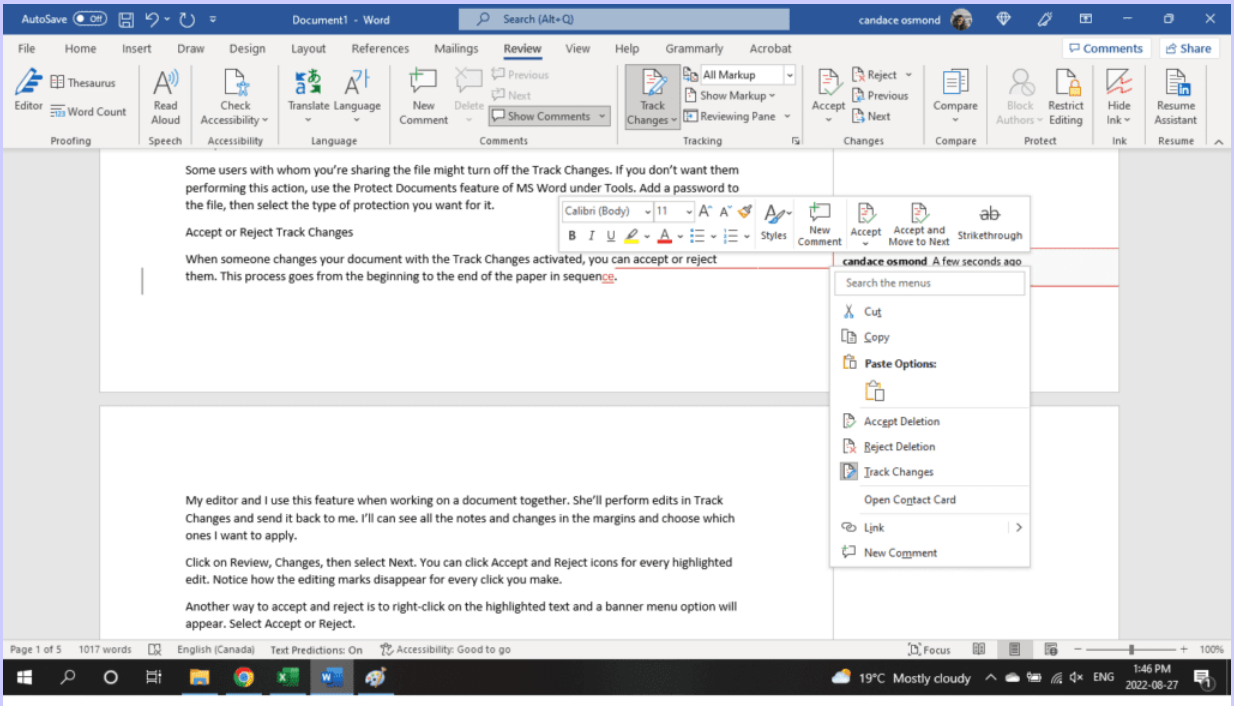

Figure 4: Track changes options when editing a word document.
Source: Author

Excel

- Excel is flexible to a variety of task and much more than creating tables.
- Excel is a versatile tool used by Engineers for various purposes, including:
  - Engineering Calculations: Performing repetitive calculations using built-in formulas for structural loads, fluid flow, or electrical circuits.
  - Data Analysis & Visualization: Cleaning raw sensor data or test results and creating pivot tables and charts to identify trends.
  - Automation with VBA/Macros: Writing scripts to automate tedious workflows, generate reports, or interface with other software.
  - Unit Conversions: Using lookup tables and custom functions to ensure consistency across different measurement systems.
  - What-If Analysis: Using the Goal Seek and Solver tools to find optimal design parameters (e.g., minimum weight for a required strength).
  - Equipment Lists and Material Take-offs: Quantifying materials and parts from technical drawings for design collaboration and cost estimating.
  - Project Management: Creating Gantt charts, tracking project budgets, and managing resource allocation.

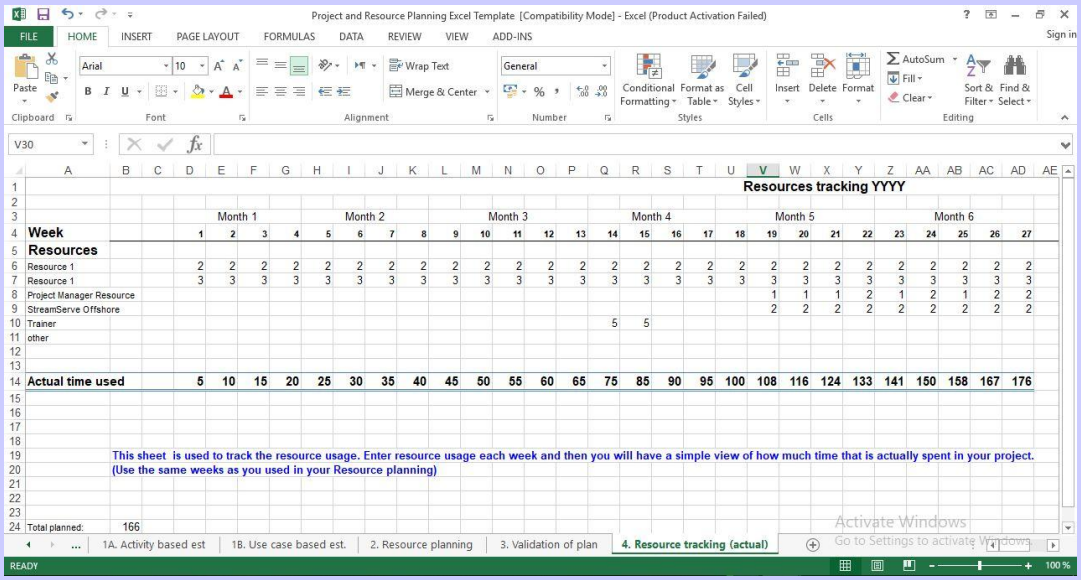

Figure 5: Example resource planning template with staff names in rows and projected hours per week in columns.

Source: www.engineeringmanagement.info/2018/08/project-and-resource-planning-excel.html

PowerPoint

- PowerPoint is the primary tool for presentations, especially for meetings with clients, stakeholders, large teams, departments, company-wide, marketing events, conferences, and webinars.
- While Excel handles the "how," PowerPoint explains the "what" and "why."
- Best practices:
  - The 7-7-7 Rule: Limiting slides to 7 lines of text, with 7 words per line, to prevent "death by PowerPoint" and keep the audience focused on the speaker.
  - Slide Master Consistency: Using templates to ensure professional branding and a uniform look across different project streams.
  - Non-Linear Navigation: Learn to jump between specific slides during Q&A to answer stakeholder questions without scrolling through the entire deck.
  - The "One Message" Rule: Limit each slide to one single key takeaway.
  - Practice and time the entire presentation from beginning to end.
  - Use Visual Hierarchy: Place the most important information in the top-left corner, as audiences naturally read in an "F" pattern.

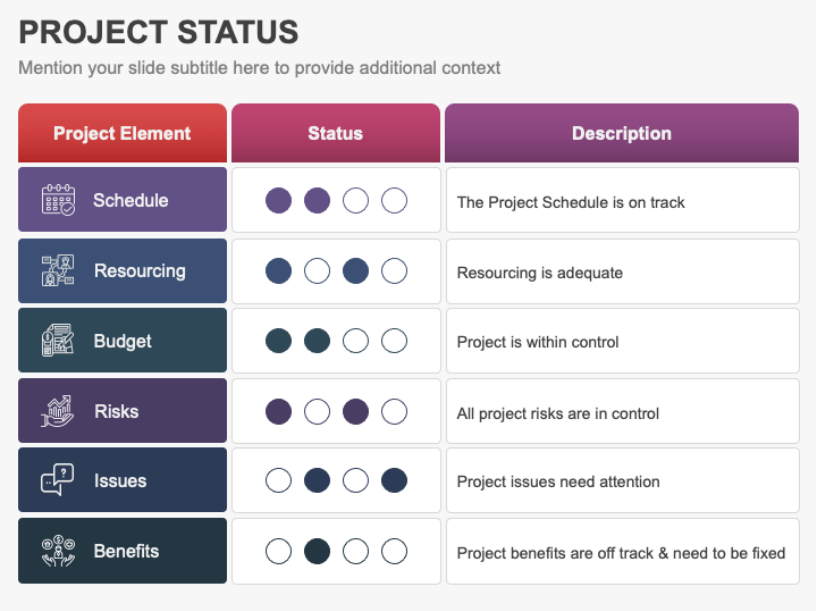

Figure 6: Example project status slide in PowerPoint.
Source: www.sketchbubble.com/en/powerpoint-project-status.html

SharePoint

- Microsoft SharePoint is a web-based, cloud-powered collaborative platform within Microsoft 365 used for file storage, team collaboration, document management, and building internal websites (intranets).
- Engineers and other professionals often use it in the following ways:
  - Project Sites: Create dedicated sites to serve as a team's internal homepage for news, updates, files, and links.
  - Unified Access: SharePoint consolidates disparate information like project plan, agreements, meeting notes, and schedules into a single "source of truth".
  - Co-authoring: Teams can collaborate on a single project document simultaneously in real-time, eliminating the need to merge separate files.
  - Milestone Monitoring: Built-in calendars and Gantt-style views help visualize project timelines and significant milestones.
  - Teams Integration: Link SharePoint sites to Microsoft Teams to combine formal documentation with informal chat and video conferencing.
  - Granular Permissions: Control sensitive data (like project costs) by setting specific access levels for internal team members and external stakeholders.

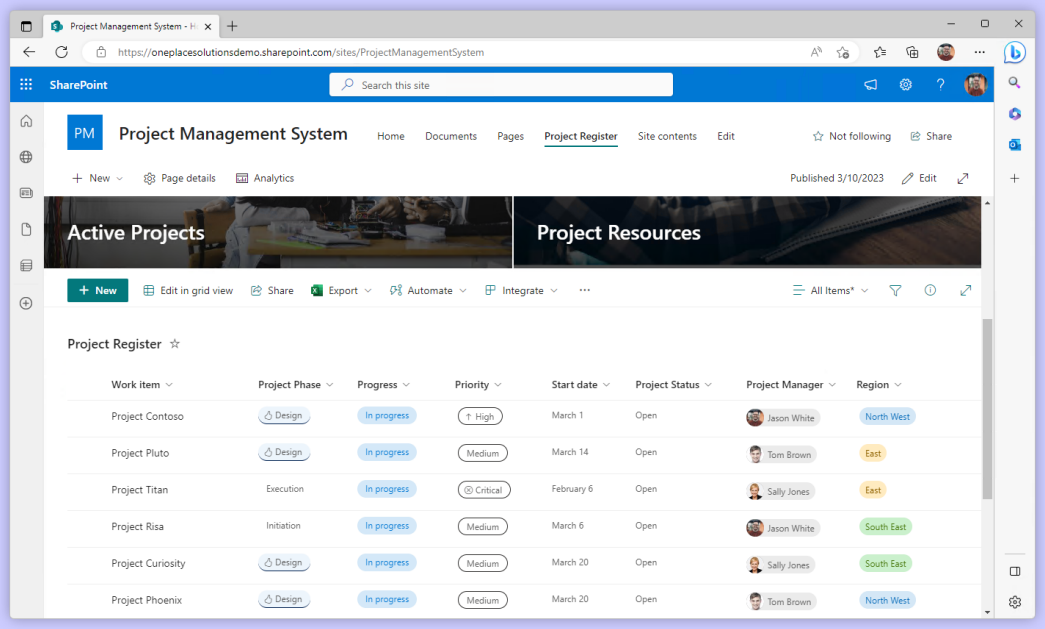

Figure 7: Example SharePoint window in Edge.
Source: , MarioCneo-9872, CC-BY-SA-4.0

OneDrive

- Microsoft OneDrive is a cloud-based file hosting and synchronization service that allows individual users to store, share, and sync files across devices.
- OneDrive has a folder structure within Windows Explorer which makes it convenient to manage documents alongside your personal folders and corporate network folders.
- OneDrive also has a website option to access folders from any device with an internet connection.
- While SharePoint is the "team library," OneDrive serves as a personal digital workspace for drafting, private preparation, one-on-one sharing, large file sharing, and a co-authoring alternative to SharePoint.
- Use the OneDrive Mobile App to quickly scan physical receipts, whiteboards, or signed contracts directly into the cloud.
- Sync specific project folders to the laptop using Files On-Demand to review documents during travel or in areas without Wi-Fi.
- Automatic Backup of folders to prevent data loss if a device fails.

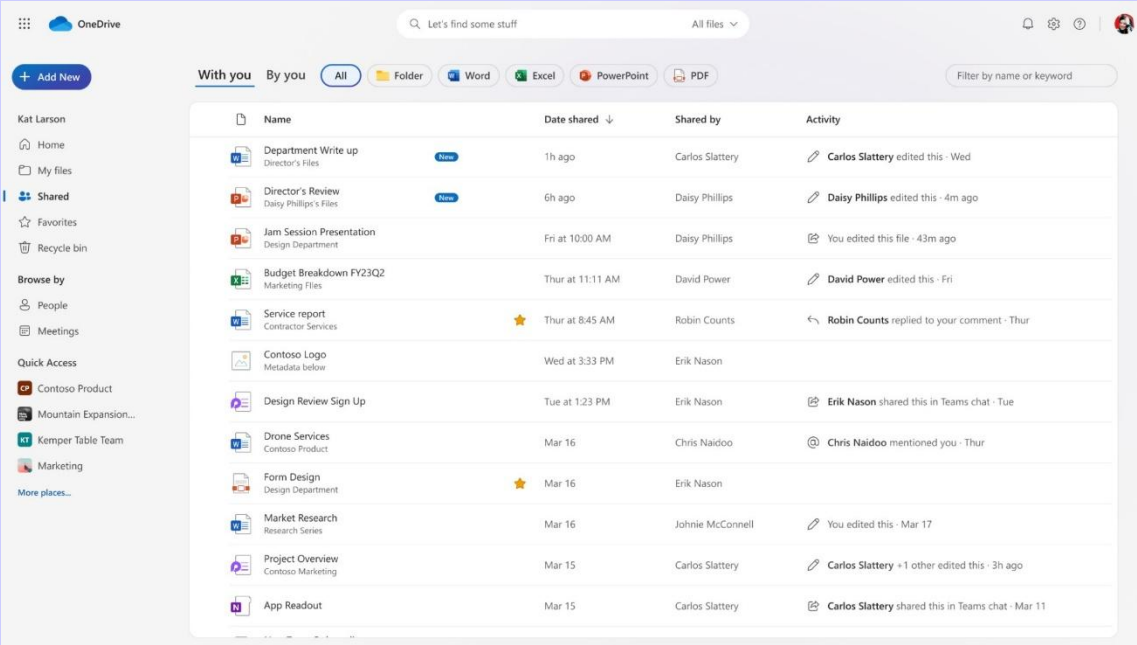

Figure 8: Example OneDrive software in desktop view.
Source: /www.theverge.com/2023/10/3/23901682/microsoft-onedrive-new-design-copilot-offline-features

Edge

- Microsoft Edge is the standard web browser for many companies.
- Professionals can use Google Chrome or Apple Safari on their personal devices and Edge for work only, keeping total separation between work and personal accounts.
- Edge Workspaces is used to create a shared set of browser tabs that are relevant to a project. Each team member can open the shared tabs.
- Using integrated Copilot, Engineers can seek advice, gain technical insights, quickly summarize long project reports, industry articles, or dense technical specifications.
- Use the split-screen feature to compare two web pages side-by-side in a single browser tab.
- Access Outlook inbox or OneNote notes in the Edge sidebar to respond to urgent queries without leaving current web task.
- Use Bing maps for directions and gain aerial images of work sites.

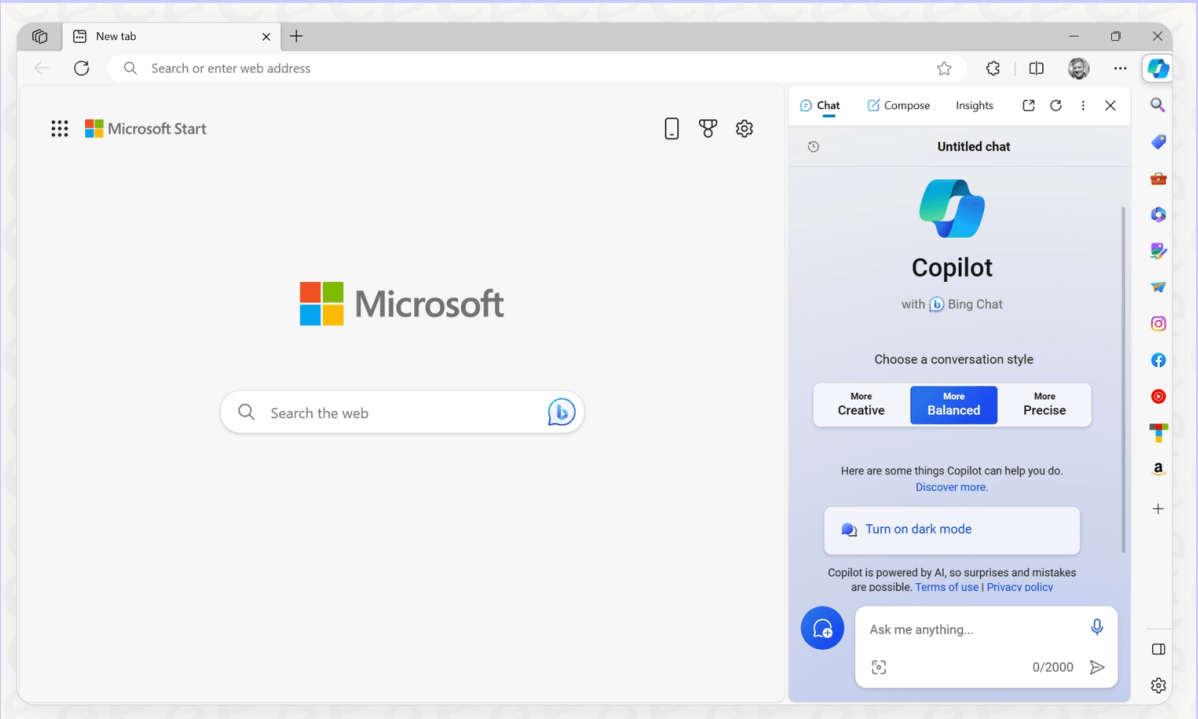

Figure 9: Example Edge homepage with Copilot on the right.
Source: www.eesel.ai/blog/microsoft-edge-copilot-pricing

Power BI

- Engineers use Power BI to transform raw data into high-level visual intelligence which can be shared in reports, presentations, and technical articles
- Visuals reveal trends and anomalies that static spreadsheets might miss
- Ways professionals utilize Power BI:
  - Portfolio Dashboards: Aggregate data from multiple tasks or projects into a single view to give a "bird's-eye" status
  - Automated Status Reports: Clear and concise graphics created from latest data
  - Budget vs. Actuals: Track spending in real-time by linking Power BI to accounting systems, visualizing cost variance and forecasting final spend
  - Visualize Technical Data: Graphs and charts display complex data, real-time data, compare alternatives, and predict outcomes
  - Issue & Risk Logs: Turn boring text-based logs into visual "bubble charts" where the size of the bubble represents the impact and probability of a risk
  - Power BI Content Pack: Visualize data directly from Microsoft's modern scheduling tools, with web integration

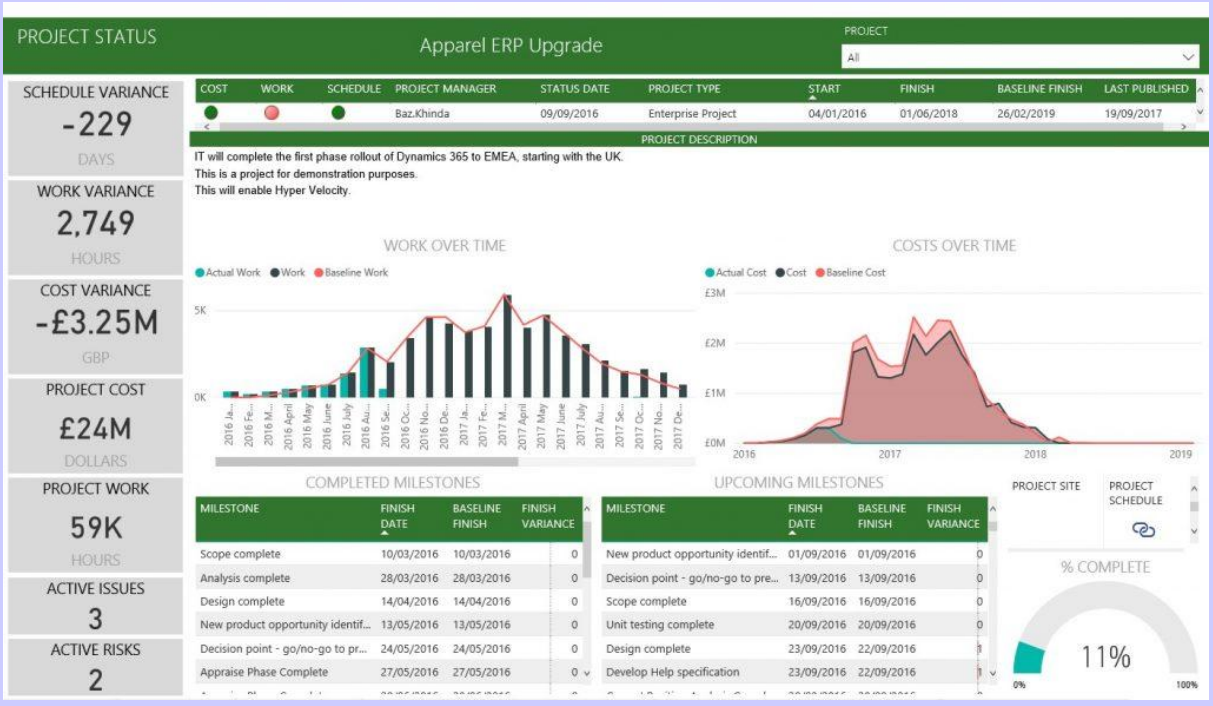

Figure 10: Example project status using Power BI Content Pack.
Source: wellingtone.co.uk/power-bi-content-pack-microsoft-project/

3. Other Professional Tools

This section covers other digital tools that engineers will find useful in 2026.

Smartphone Work Apps

- Smartphone apps allow professionals to maintain productivity and oversight while away from the desk, offering a "virtual office" that fits in a pocket
- Work apps can be separated from personal apps
- Common uses of phone apps:
  - Checking and responding to emails
  - Real-time status updates
  - On-the-go task management
  - Integrated chat features, like in Microsoft Teams or Slack
  - Conference calls and video calls on the go
  - Document and file access
  - Time and expense entry and tracking
  - Approval & workflow management
  - Field data capture including photos, record daily site logs, weather conditions, and inspections with geotagged evidence

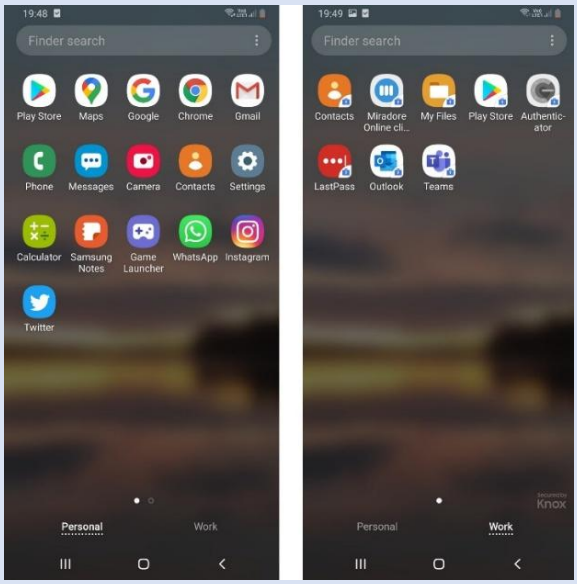

Figure 11: Android phone with personal (left) and work profile (right).
Source: www.miradore.com/blog/separate-work-time-from-free-time-with-android-work-profile/

Scheduling Software	
Description	**Software**

• Engineers use scheduling software to transform project goals into actionable, time-based plans.
• Scheduling software automates complex logic, such as calculating how a delay in one task ripples through the entire project timeline
• Gantt charts are standard for waterfall projects
• AI tools use previous project data and predictive analytics to perform the following scheduling tasks:
  ○ Create a baseline schedule based on tasks and milestones in a proposal or business plan
  ○ Assign resources org chart and resource plan
  ○ Modify schedule based on project progress
  ○ Create schedule status report
  ○ Plot earned value s-curves and other graphics
	• Asana
	• ClickUp
	• Excel
	• Forecast
	• Monday.com
	• MS Planner w/ Copilot
	• MS Project (phasing out)
	• Motion
	• Reclaim
	• SkedPal
	• Smartsheet
	• Trello
	• Wrike

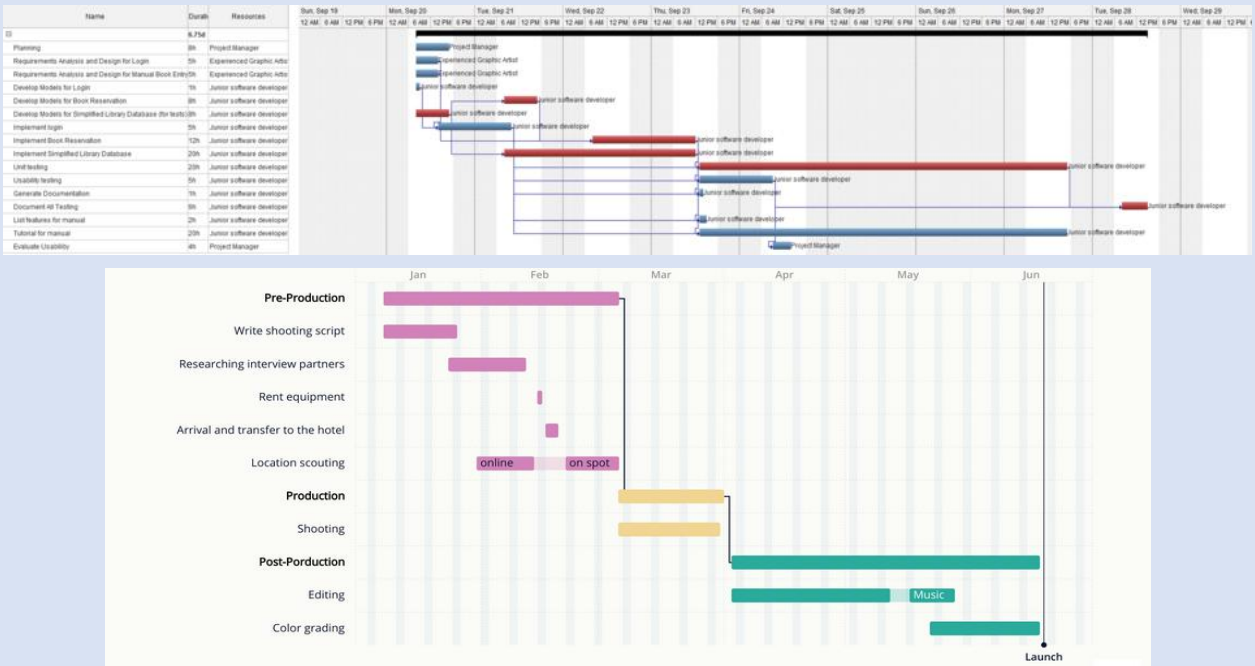

Figure 12: Example project schedules.
Source: commons.wikimedia.org/wiki/File:Gantt_Chart_Template_for_Film_Production.png, HarryTruinkers, CC-BY-SA-4

PDF Software	
Description	**Software**

• Engineers use PDF software as the "digital paper" of a project; to lock down official documents to ensure they look the same for every contractor, client, and stakeholder.
• Core uses:
  ○ Print to PDF in nearly any software to save and share documents in a preserved format
  ○ Shared studio sessions for drawing markups
  ○ Use digital signatures in PDFs to send legally binding contracts and change orders
  ○ Markup and peer review with color coding
  ○ Document security and redaction
  ○ Merging and organizing deliverables
  ○ Optical Character Recognition (OCR) and searchability
  ○ Form creation and filling
	• Adobe Acrobat
	• Bluebeam Revu
	• Foxit PDF Editor
	• Nitro PDF Pro
	• PDF Studio
	• Wondershare PDFelement

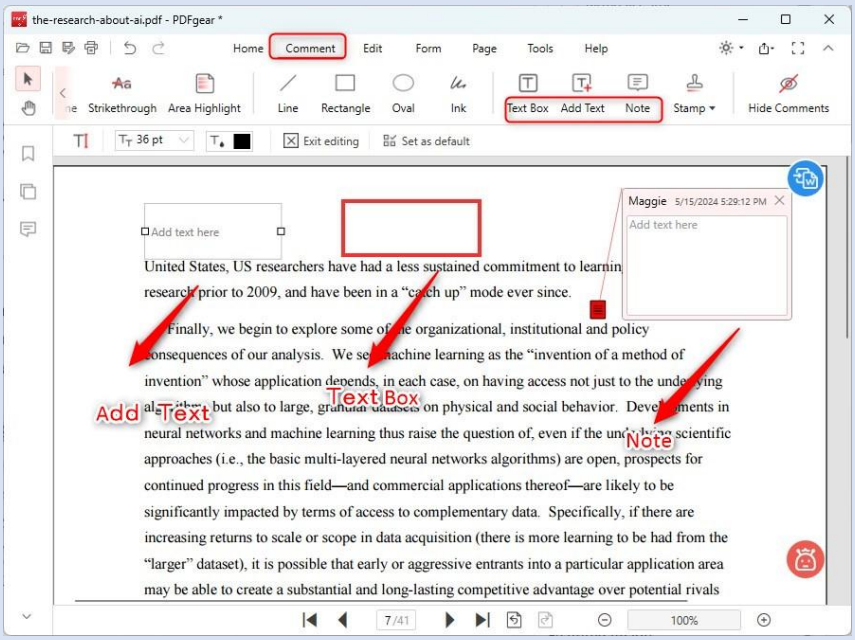

Figure 13: Ways to add comments in Adobe.
Source: www.pdfgear.com/windows-user-guide/add-comments-to-pdf.htm

Digital Signatures	
Description	**Software**
• Professional engineers digitally sign and seal drawings, specifications, and reports. A digital signature is added over or next to an image of the seal. Each state has specific req's. • Digital signatures are also used to approve documents, execute agreements, and lock down official documents to prevent future changes. • Professionals transition from chasing physical signatures to automated, verifiable workflows. • Digital signature software provides a detailed audit log (identity, IP addresses, timestamps, and emails). • Examples include contracts, master service agreements, non-disclosure agreements, change orders, invoices, letters, and certification of technical documents. • Third party verified digital signatures are sometimes required for additional verification of critical documents.	• Adobe Acrobat Sign • Bluebeam Digital Signature • DocuSign • Dropbox Sign • PandaDoc • SignNow • Smallpdf eSign • Zoho Sign

Figure 14: Example digital signatures for sign and sealing documents.
Source: https://nj.gov/dep/landuse/download/lur_052.pdf

LinkedIn

- LinkedIn serves as a professional portfolio and networking engine for engineers
- Use the Featured and Projects sections to highlight accomplishments such as deliverables for engineering projects, startups, innovations, patents, articles, presentations, 3D models, etc.
- Attract potential clients and display qualifications during pursuits, proposals and pending contracts.
- Find consultants and contractors to team with, provide consultancy, or hire to perform project work.
- Confirm qualifications of staff and companies.
- Talent acquisition and networking.
- LinkedIn Learning has an extensive library of courses and learning tools.
- Join specialized groups and follow industry hashtags to stay current and collaborate.

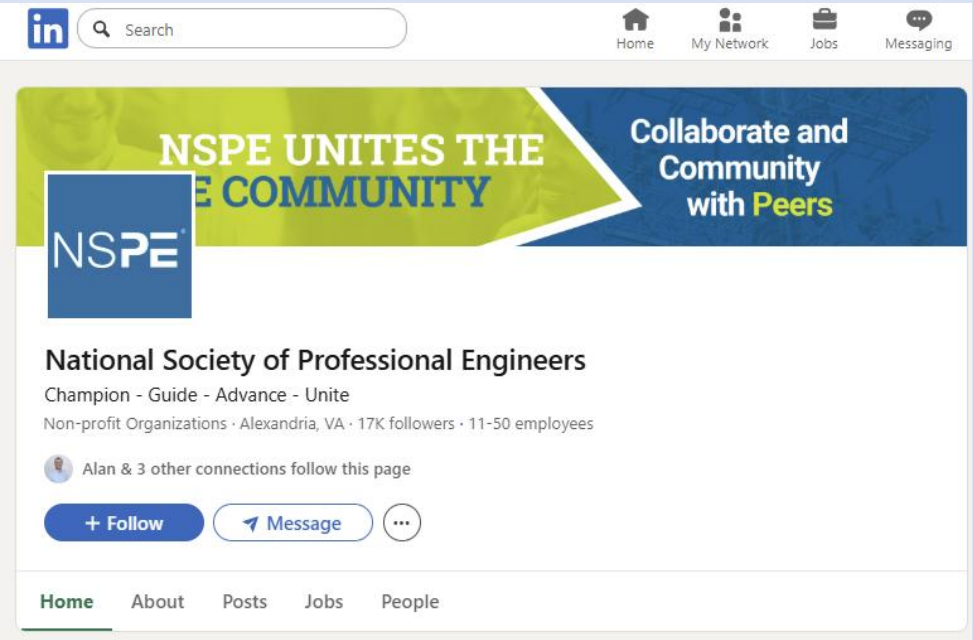

Figure 15: NSPE profile page on LinkedIn.
Source: www.linkedin.com/company/national-society-of-professional-engineers/

Enterprise Resource Planning (ERP) Software

Description	Software
• Enterprise Resource Planning (ERP) software is used for managing opportunities, projects, programs, vendors, agreements, orders, procurement, invoicing, insurance tracking, resource planning, timesheet entry, expense report entry, and employee information. • Engineers use ERP software for finding reference projects, finding staff based on qualifications, managing suppliers and contractors, viewing budgets, and managing team workloads. • ERP bridges the gap between day-to-day tasks and company's financial and resource realities. • Intelligent ERPs provide automated project setup, advanced analytics, forecasting, auditing, risk identification, and virtual assistant interface.	• Acumatica Cloud ERP • Deltek Vantagepoint • Epicor Kinetic • Infor CloudSuite • Microsoft Dynamics 365 with Copilot • Oracle Fusion Cloud ERP NetSuite • SAP S/4HANA

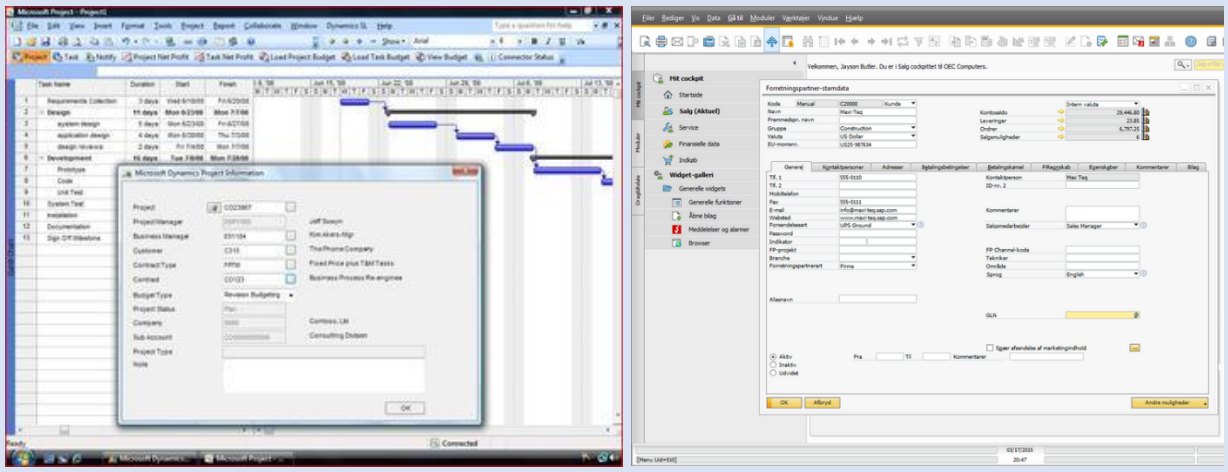

Figure 16: Example ERP screens for inputting project data.
Left) Dynamics with Project/Planner Connector; Right) SAP

Source: commons.wikimedia.org/wiki/File:Conector_de_Microsoft_Dynamics_SL.jpg, MarioCneo-9872, CC-BY-SA-4.0
commons.wikimedia.org/wiki/File:SAP_Business_One_Klient.png, Rwj dk, CC-BY-SA-3.0

4. AI Tools

Artificial Intelligence (AI) is computer software that creates human-like cognitive functions. AI software utilizes AI algorithms which can learn by looking at past data, create new logic/rules, and apply these rules to new situations. AI tools can provide several benefits, including quick access to information, greater efficiency at regular tasks, report and specification writing, and assistance with various design tasks.

The following tables have common AI tools used by engineers.

Copilot - Enterprise Version	
Description	**Software with Copilot**

• Microsoft Copilot has a enterprise (paid) version with far more engineering and project capabilities than the free version.
• Use Microsoft Copilot as a "force multiplier" to automate administrative "grunt work," such as writing a paragraph in Word or plotting data in Excel.
• Common ways engineers use Copilot:
  ○ Synthesize large amounts of data into summaries, trends, and charts
  ○ Draft portions of emails, letters, presentations, specifications, and documents based on prompts
  ○ Create presentations based on project documents
  ○ Virtual meeting note-taking and meeting summaries
  ○ Email management
	• Word
	• Excel
	• PowerPoint
	• Outlook
	• Teams
	• OneNote
	• Dynamics 365
	• GitHub Copilot
	• Power Platform
	• Windows
	• Microsoft Edge

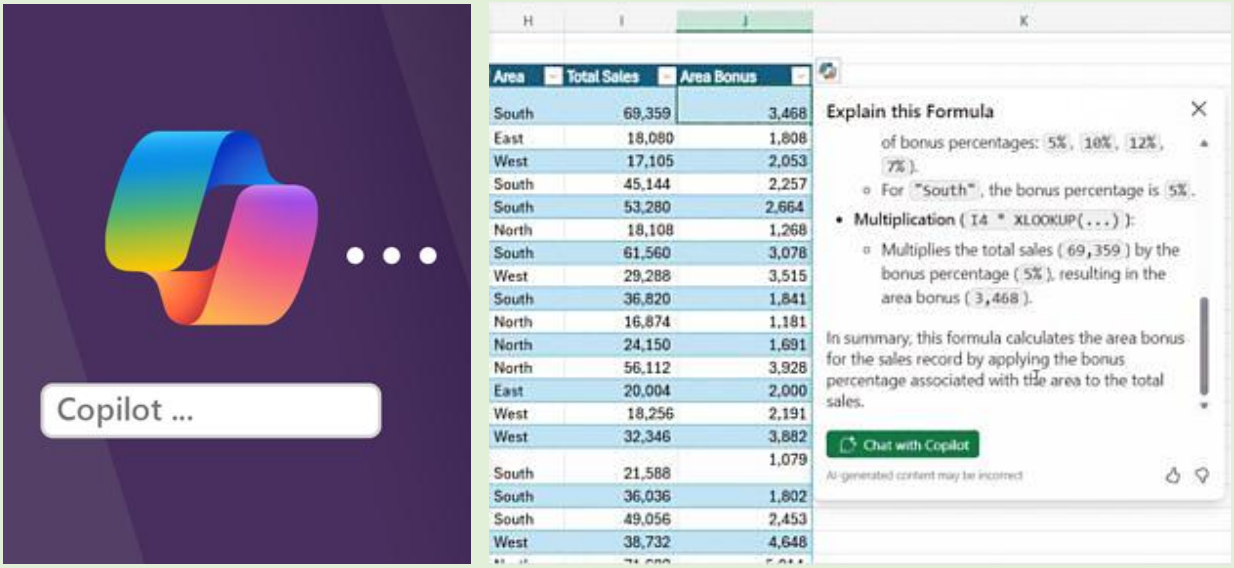

Figure 17: Example of Copilot being used to help write an Excel formula
Source: https://betanews.com/article/excel-can-now-explain-formulae-with-copilot/

Virtual Assistant	
Description	**Software**
• Virtual assistant (VA) can have specialized knowledge, previous project data, and access to company networks to form a knowledge base • Can perform a range of tasks or services based on user input such as commands or questions. • Typically simulates human conversation. • Assist in finding information, making informed decisions, writing text, prioritizing tasks, identifying risks, analyzing and presenting data, managing meetings, identify procedures to follow, write emails, simple design tasks, mathematics, summarizing specifications, and more.	• Apple's Siri • Apple Intelligence • Amazon Alexa • Asana AI Assistant • Google Gemini • Jira Virtual Agent • Joule Copilot from SAP • Microsoft Copilot • Mycroft (open source) • Samsung's Bixby • Slackbot

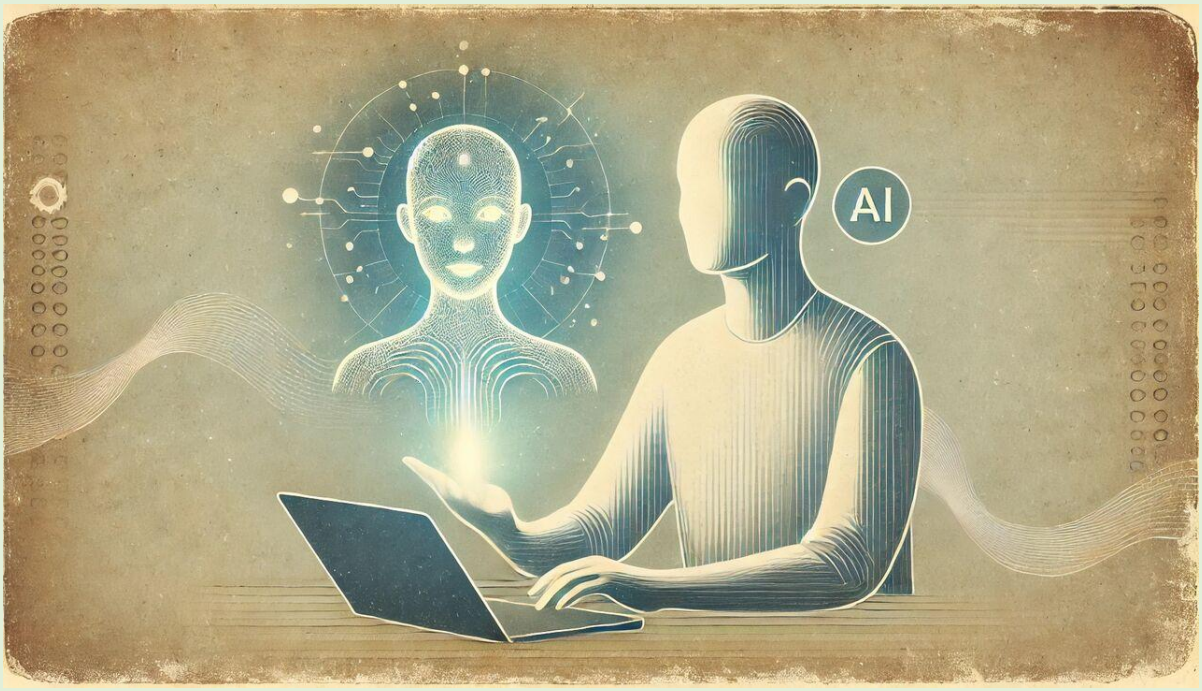

Figure 18: Depiction of a virtual assistant within a computer.
Source: https://dri.es/i-gave-an-ai-agent-edit-access-to-my-website

AI Document Preparation

Description

- AI can automatically setup folders and save documents and emails in the proper location.
- AI can utilize existing documents to extract key information, analyze it, compare it to past projects, and create project specific documents.
- AI can write specification sections, format them, and compile a specifications book.
- AI can setup reports and write sections based on project information.

Example Programs

- Asana
- ClickUp
- Jira
- Microsoft Copilot
- Notion
- Wrike

Example Documents

- Proposals
- Go/No-Go forms
- Subcontractor agreements
- Project management plans
- Baseline budgets
- Baseline schedules
- Risk registers with common risks
- Project presentations
- Meeting agendas
- Design review checklists
- Status updates
- Invoices
- Reports
- Technical Specifications
- Lessons learned logs
- Cover letters

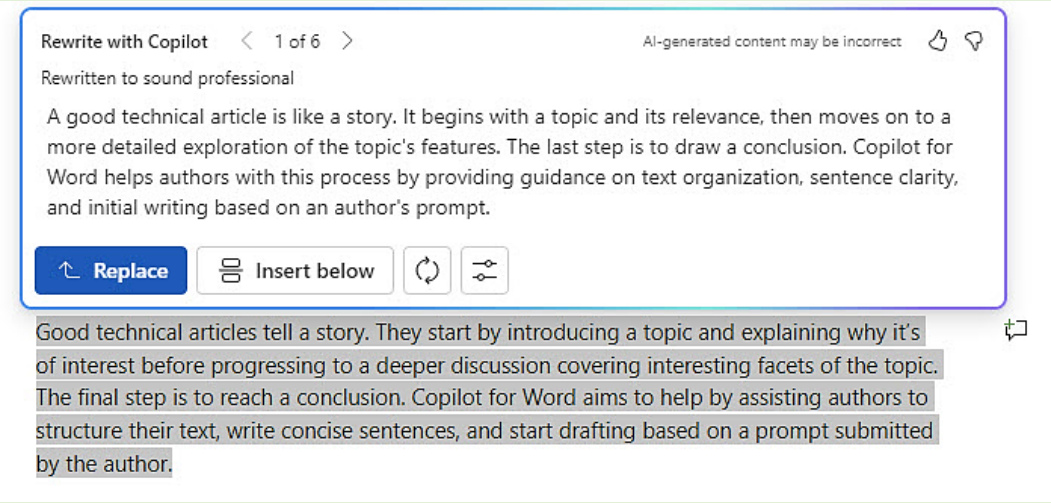

Figure 19: Using Copilot to rewrite a paragraph.
Sources: office365itpros.com/2023/12/14/copilot-for-word/

Predictive Maintenance	
Description	**Examples**
• Predictive maintenance (PdM) uses AI algorithms to predict failure or detect the first signs of failure of physical parts such as machines or electrical parts. • Early detection allows maintenance or replacement prior to a costly failure. • Predictive maintenance uses data analysis to continuously monitor operating conditions and working environments to detect early clues for degradation of equipment. • Engineers can require PdM features when specifying equipment. • Existing equipment can be reviewed to identify the potential payback for adding PdM.	• Accruent • IBM Maximo® Predict, • InfluxData, Fiix • Limble CMMS, • LLumin, MaintainX, • MATLAB, UpKeep, • Reftab, Samsara, • Siemens MindSphere

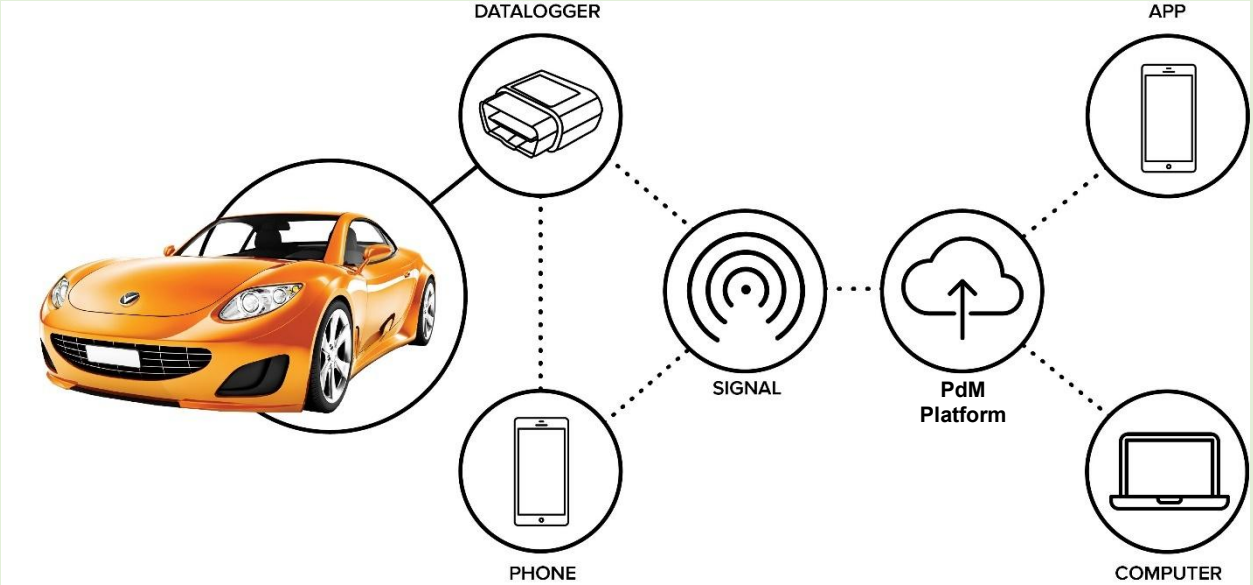

Figure 20: Communication paths for automobile preventative maintenance (PdM).
Source: commons.wikimedia.org/wiki/File:DataLogger_Platform-_How_it_Works.jpg, Danlaw Inc

Automation and Robotics	
Description	**Examples**
• AI is transforming automation and robotics from rigid, rule-based systems into intelligent, adaptive agents capable of perceiving their environment, learning from experience, and making autonomous decisions. • AI enhances traditional control frameworks, like PLCs and SCADA, with "cognitive" capabilities. • Adaptive Process Control: AI-driven systems automatically adjust setpoints and parameters in real time to compensate for environmental variables like temperature or material fluctuations. • Generalist Robotics = where a single foundation model allows a robot to perform diverse tasks. • Swarm Robotics = where fleets of robots work collectively to solve large-scale problems.	• AWS SageMaker • Azure AI • Falkonry LRS • Ignition ML Manager • Peltarion • Siemens MindSphere • SparkCognition Manufacturing AI • ThingWorx (PTC)

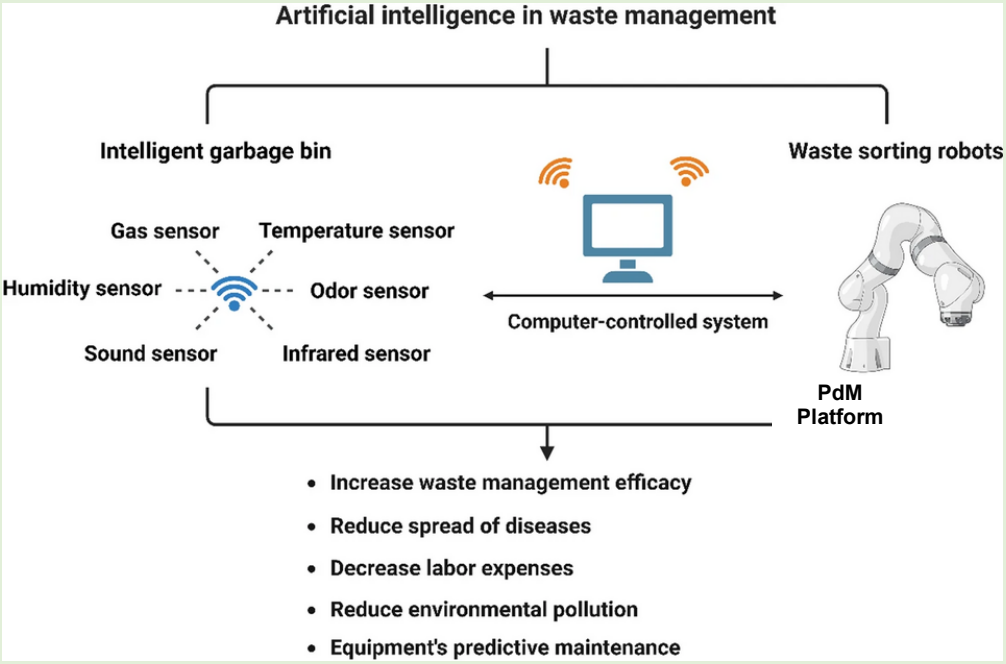

Figure 21: AI software for controlling waste sorting robots.
Source: commons.wikimedia.org/wiki/File:Uses_of_artificial_intelligence_in_the_garbage_bin_and_waste_robotic_sorting.webp

Digital Twins	
Description	**Examples**
• A digital twin is a model of a physical system with a boost of AI and real operations data to help simulate dynamic real-world scenarios. • Uses both deep learning and generative AI. • Digital twins are built using the current asset condition and relevant historical data about the asset. • Digital twins can be used to optimize the current condition, optimize operations and maintenance, and predict future behaviors. • The models can reflect ongoing operations by direct streaming of data into the AI algorithms.	• Example applications include machinery, engines, pumps, production equipment, assembly lines, packaging systems, power plants, or an entire fleet of vehicles. • Bentley's iTwin • frontline.io Digital Twin

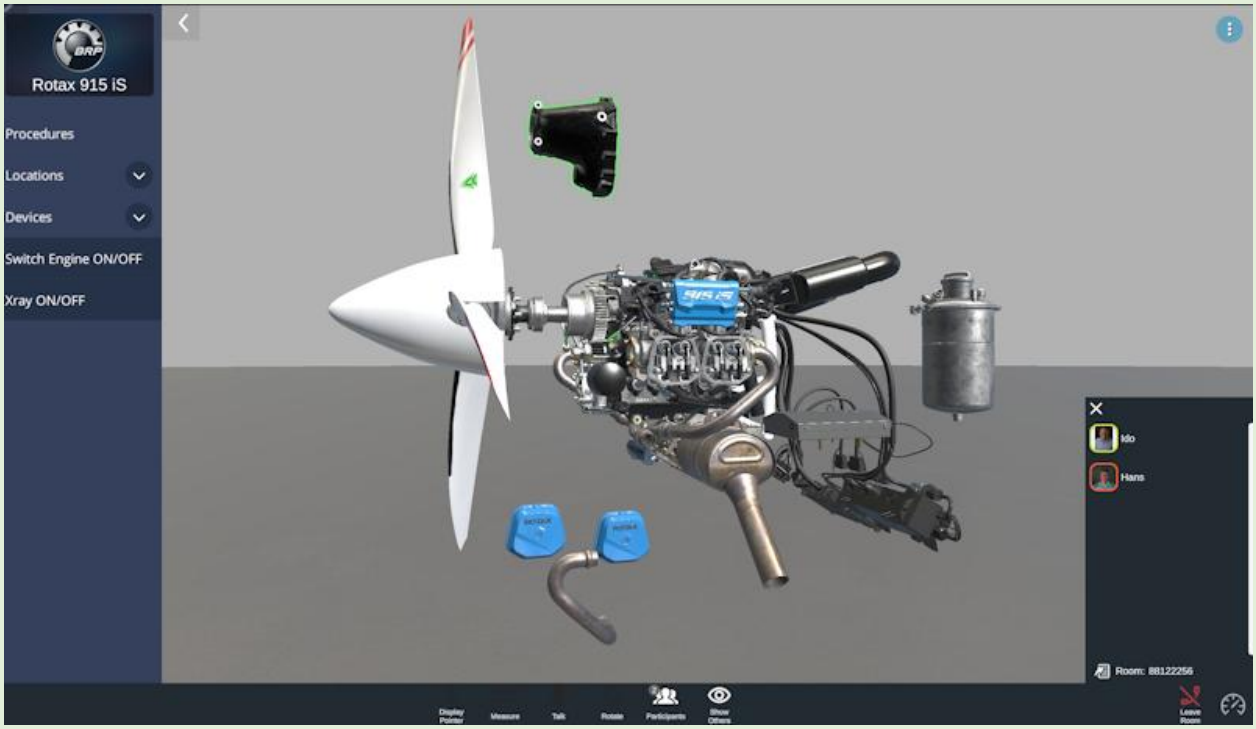

Figure 22: Example digital twin model of a propeller engine.
Source: commons.wikimedia.org/wiki/File:Training_with_digital_twin.jpg, Iditsulkin, CC-BY-SA-4.0

AI Risk Assessments

Description	Software

• AI analyzes vast amounts of historical and real-time project data
• Uses machine learning and predictive analytics to perform the following risk management tasks:
  ○ Identify potential threats
  ○ Assess likelihood and impact
  ○ Score and rank risks
  ○ Risk combination simulations
  ○ Recommend mitigation strategies
  ○ Monitoring of risks
  ○ Monitoring key performance indicators (KPIs)
	• Asana
	• Celoxis
	• ClickUp
	• Forecast
	• Microsoft Copilot
	• Wrike

Example Risk Register

ID	Risk Description	Category	Probability	Impact	Risk Score / Priority	Response Strategy	Owner / Assignee	Status / Notes
R1	Delay in material delivery due to supplier issues	Operational	High (0.8)	High (0.7)	**High (0.56)**	Mitigate – engage backup supplier	Procurement Manager	Monitoring – supplier confirmed secondary source
R2	Software integration failure between control and monitoring systems	Technical	Medium (0.5)	High (0.8)	Medium (0.40)	Mitigate – early integration test	IT Lead	In progress
R3	Unexpected weather delays during foundation installation	Environmental	Low (0.3)	High (0.9)	Medium (0.27)	Accept – include 5-day weather buffer	PM	Active
R4	Change in regulatory approval timeline	Legal	Medium (0.6)	High (0.8)	**High (0.48)**	Transfer – use legal consultant	PM	Open
R5	Loss of key technical staff	Human	Medium (0.5)	Medium (0.5)	Low (0.25)	Mitigate – cross-train engineers	PM	Resolved

Figure 23: Example risk register with scoring and response strategies.
AI tools can help create and maintain a risk register.
Source: Author

External AI Meeting Assistant	
Description	**Software**

• AI driven software that integrates with meeting platform software to provide meeting administrative tasks, including:
  ○ Agenda
  ○ Written transcription with speaker names
  ○ Live translation
  ○ Meeting notes and summary
  ○ Action item list
• Meeting analytics such as talk time, topic time, sentiment analysis, and issue progress tracking
• Ability to create project timeline of events
• Capable of finding requested information by searching all previous meeting recordings
• Usually join your calls as an AI user to gather information
	• Avoma
	• Fathom
	• Fellow
	• Fireflies.ai
	• MS Teams w/ Copilot
	• Otter.ai
	• tl;dv

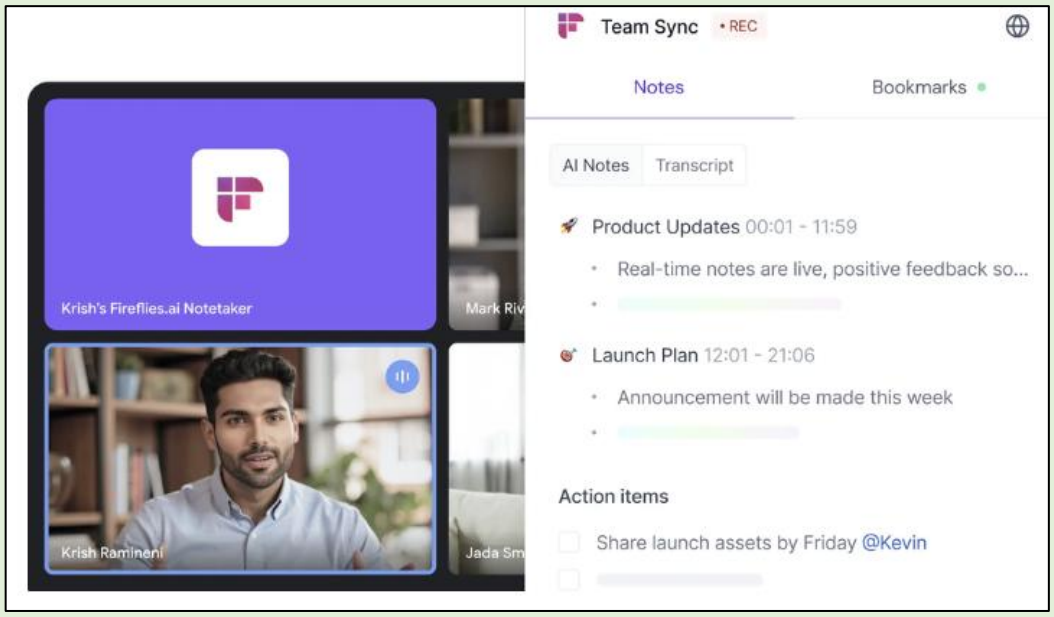

Figure 24: Example external AI meeting tools that provide transcription, meeting summary, and action items.
Source: www.columbusbusinessconsulting.com/firefliesai

Automated Task Management	
Description	**Software**
• AI software to streamline, simplify, and automate repetitive or data-driven aspects of task execution and tracking • Minimize manual administrative work, increase efficiency, and ensure consistency. • Tasks created and assigned based on predefined workflows, project milestones, deliverables, and specific triggers. • Provide notifications and reminders to staff. • Approval workflows for management review and confirming changes. • Intelligent prioritization based on critical path. • For example, a draft design status report is auto-created and sent to the design manager for review. Upon approval, the report can be auto-sent to recipients. AI will learn from the previous markups, so the next report doesn't have the same mistakes.	• Asana • ClickUp • Jira Atlassian • Monday.com • Trello Butler • Wrike

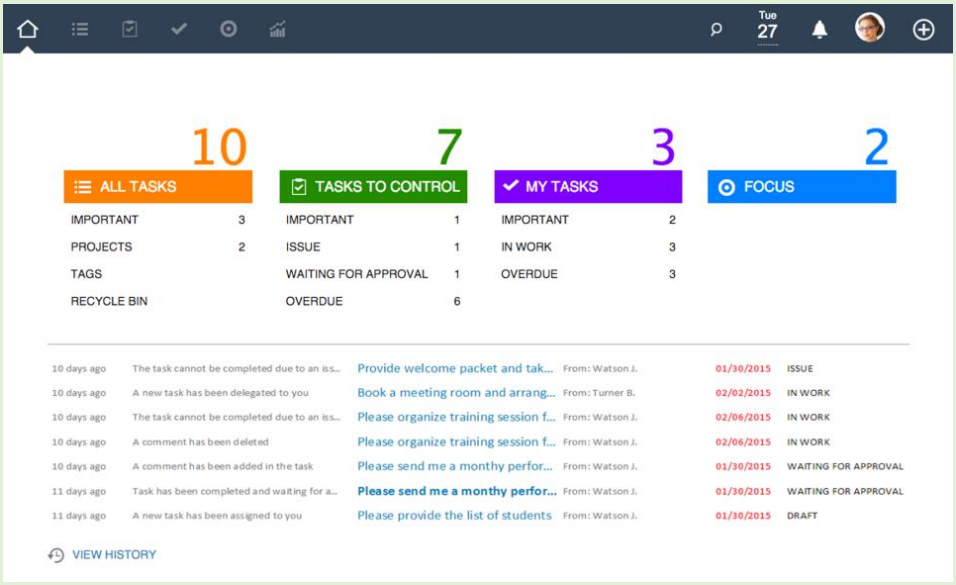

Figure 25: Example task management dashboard.
Source: commons.wikimedia.org/wiki/File:Dashboard_en.png, Andreybae, CC-BY-SA-4

AI Audits	
Description	**Software**
• Continuous monitoring of project information to identify issues and risks in real-time. • Confirm compliance with company procedures and documentation requirements. • For example, AI can run an audit on all active project folders to check for required documents (contract, project plan, risk register, baseline schedule, baseline budget, quality plan, quality review checklists, meeting notes, safety plans, field reports, inspection logs, etc.). • Audit results can be displayed graphically. • Project documents and events can be automatically monitored and staff alerted.	• AuditBoard • Fathom • Hyperproof • LogicGate • MindBridge Ai Auditor • OneTrust • SAP Audit Management

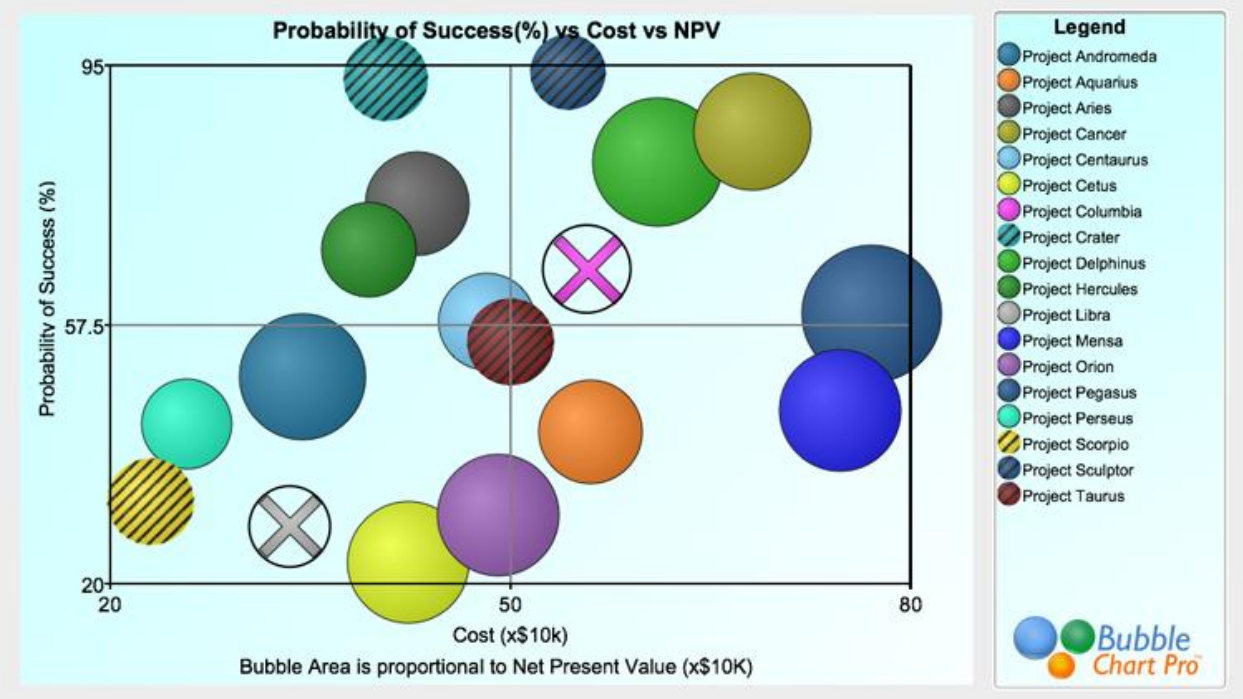

Figure 26: Portfolio status with bubbles for each project.
Audits can determine the current values and produce such graphically displays.
Source: commons.wikimedia.org/wiki/File:Project_Portfolio_Bubble_Chart.png, George Huhn, CC-BY-SA-3.0

5. Key Engineering Tools

There following tables focus on software that is popular or rapidly growing in popularity with engineers.

Autodesk Suite	
Description	**Software Apps**
• Autodesk offers a vast ecosystem of engineering software, primarily organized into industry collections for civil engineering, mechanical design, and construction. • Popular drafting software includes AutoCAD, Civil 3D, Revit, and Plant 3D. • Revit can create data-rich 3D models of buildings with various properties associated with components, which is Building Information Modeling (BIM). • With Autodesk CFD, engineers simulate liquid and gas behavior to optimize HVAC efficiency, predict flood patterns, or improve vehicle aerodynamics. • Engineers use Navisworks and BIM 360 to share 3D models with clients and identify "clashes". • Engineers use the Autodesk Construction Cloud (ACC) as a Common Data Environment (CDE) to unify design, coordination, and execution on one platform.	• AutoCAD • Revit • Inventor • Fusion • Civil 3D • Plant 3D • Autodesk CFD • InfraWorks • Navisworks • Autodesk Construction Cloud (ACC) • Forma • Vault • ReCap Pro

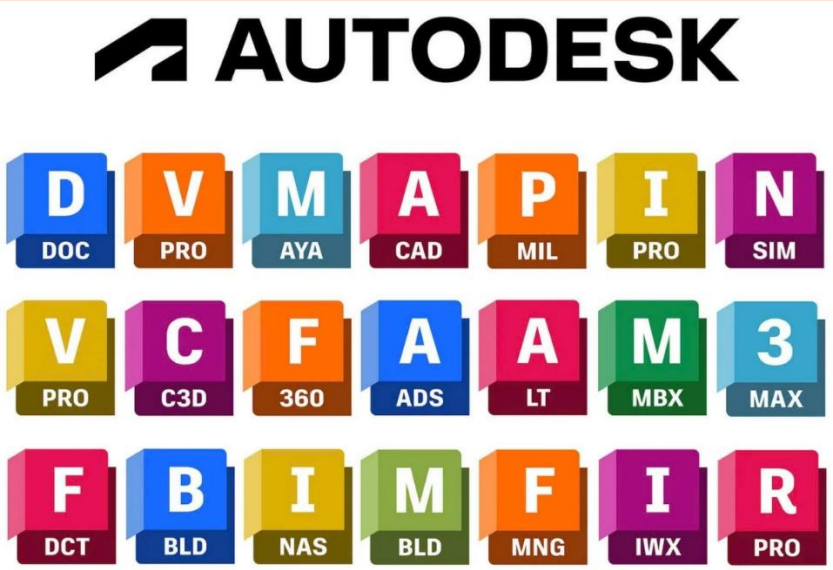

Figure 27: Abbreviations for common Autodesk software (over 100 apps).
Source: https://quadrasol.co.uk/blog/autodesk-software-collection/

Ansys Suite	
Description	**Software Apps**
• Ansys offers a comprehensive suite of engineering simulation software categorized by the physics they simulate. • These tools are often integrated into the Ansys Workbench platform for multi-physics analysis. • Ansys Mechanical is the flagship tool for finite element analysis (FEA), used for structural, thermal, and acoustic simulations. • Ansys Fluent is the industry-leading computational fluid dynamics (CFD) software for modeling flow, turbulence, and heat transfer. • Ansys Discovery is gaining popularity for fast, real-time, 3D product simulation and design exploration	• Ansys Mechanical • Ansys Fluent • Ansys HFSS • Ansys Discovery • Ansys LS-DYNA • Ansys Maxwell • Ansys Zemax OpticStudio • Ansys Granta • Ansys SIwave • Ansys CFX • Ansys Lumerical • Ansys Sherlock

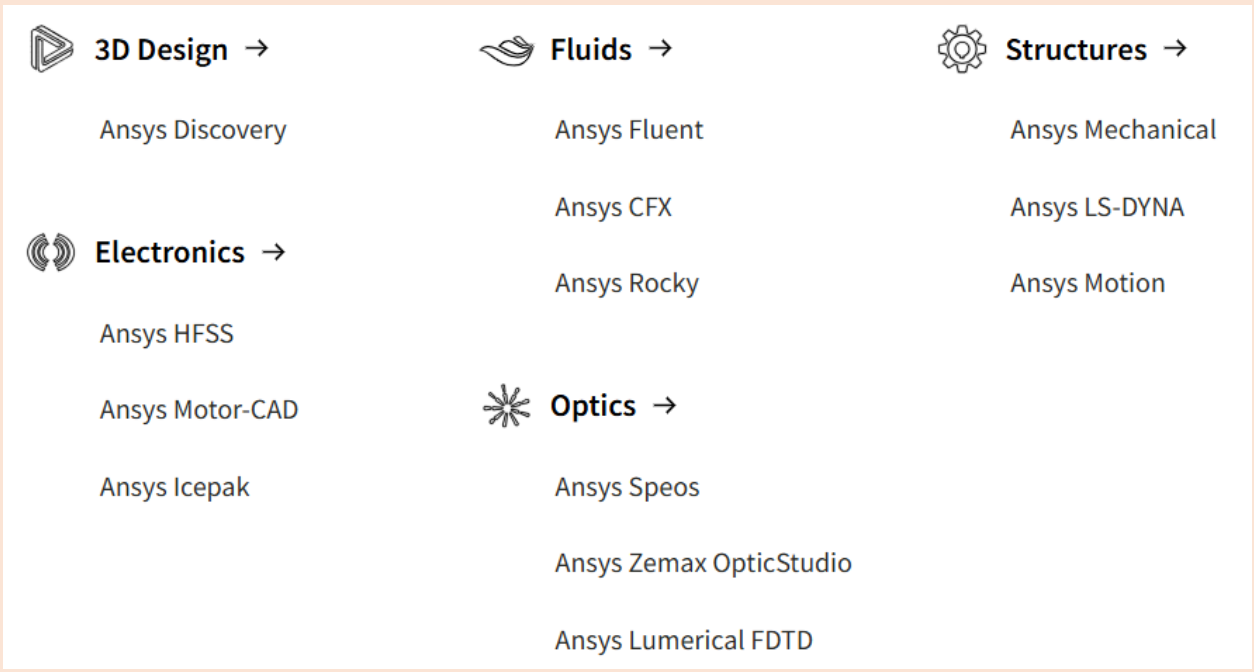

Figure 28: Popular Ansys software.
Source: www.ansys.com/blog/mbd-for-ansys

Bentley Suite	
Description	**Software**
• Bentley Systems offers a wide range of software primarily focused on infrastructure engineering, including civil design, utilities, stormwater, structural analysis, and project collaboration. • ProjectWise is a project collaboration and information management platform. Many companies use ProjectWise as a backed up file storage and management system, accessible anywhere with the internet. • MicroStation is a foundational 2D/3D CAD application specializing in infrastructure design. • STAAD.Pro is a widely used structural analysis and design software for 3D modeling and multi-discipline collaboration. • OpenRoads Designer is a comprehensive application for surveying, drainage, and roadway design.	• MicroStation • OpenRoads Designer • ProjectWise • STAAD.Pro • SYNCHRO • OpenFlows WaterGEMS • PLAXIS • OpenBridge Designer • ContextCapture • OpenBuildings Designer • SewerGEMS • AutoPIPE

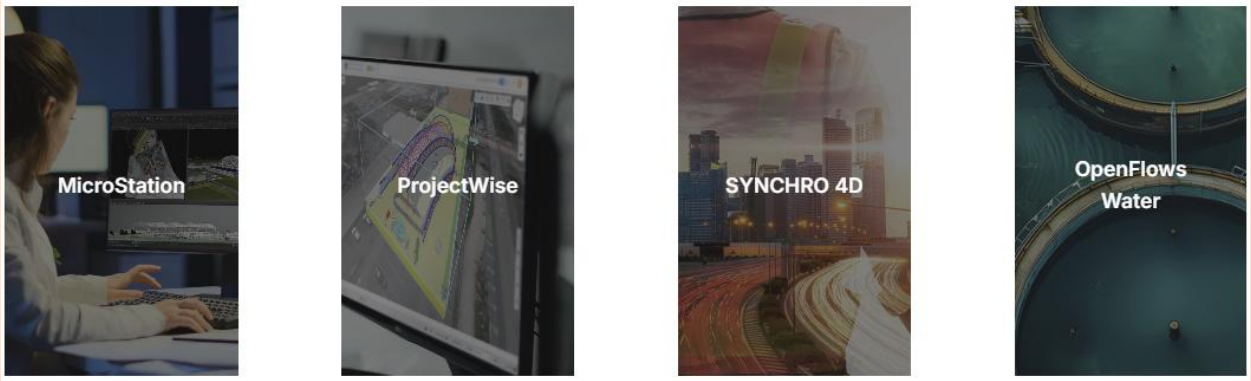

Figure 29: Popular Bentley software apps.
Source: www.bentley.com/software/featured-software/

MathWorks Suite	
Description	**Software**
• MathWorks offers a vast ecosystem of software products centered around the core MATLAB and Simulink platforms. These are typically organized into specialized "toolboxes" and "blocksets" that add domain-specific functionality • MATLAB is the primary environment for numeric computing, data analysis, and algorithm development. • Simulink is a block-diagram environment for multi-domain simulation and Model-Based Design. • Stateflow is an extension to Simulink for modeling and simulating decision logic based on state machines.	• MATLAB • Simulink • Stateflow • Control System Toolbox • Statistics and Machine Learning Toolbox • Deep Learning Toolbox • Simscape • Optimization Toolbox • Signal Processing Toolbox • MATLAB Coder • Simulink Coder • Embedded Coder

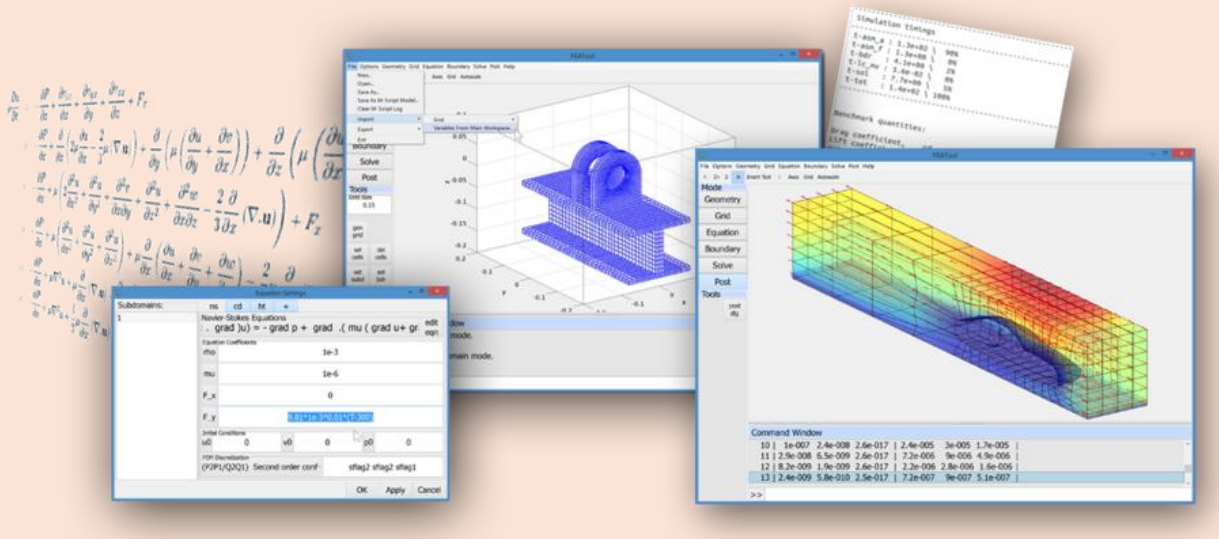

Figure 30: EATool Multiphysics MATLAB and
Octave Finite Element FEM Simulation GUI Toolbox
Source: commons.wikimedia.org/wiki/File:Featool-multiphysics-matlab-fem-gui-toolbox.png, Precise Simulation Ltd. CC-BY-SA-4.0

Specifications Software	
Description	**Software**
• Software for creating technical specifications varies based on the level of technical detail, collaboration needs, and industry standards. • Deltek Specpoint is a leading software for specifications creation and management. It is cloud-based and Powers AIA MasterSpec for architectural and engineering specifications. • Specifications are often based on, or compatible with, EJCDC (Engineers Joint Contract Documents Committee) Front-End Documents	• Conspectus Cloud • MasterSpec • SpecLink Cloud • Specpoint • SpecSources • SpecsText • SpecWizard • VisiSpecs

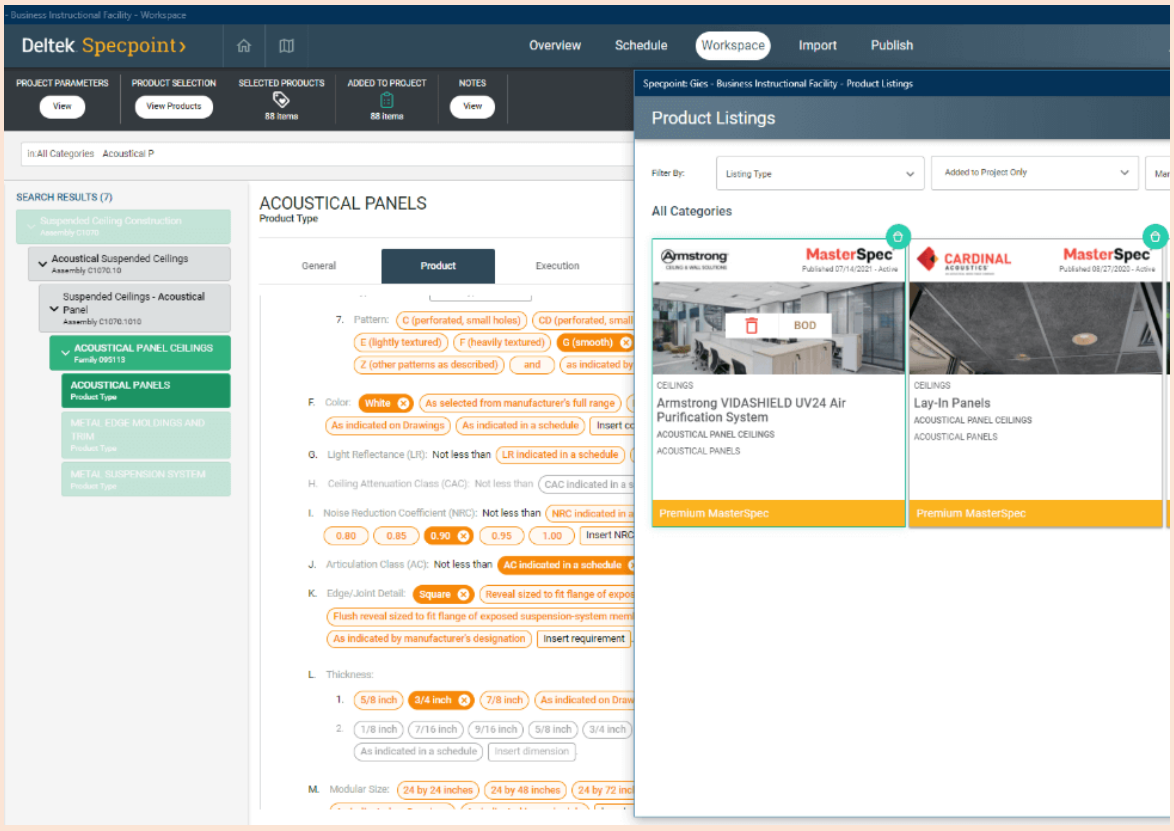

Figure 31: Deltek Specpoint with inputs to build a spec section for Acoustic Panels.
Source: www.deltek.com/en/blog/introducing-deltek-specpoint

Submittal Software	
Description	**Software**
• Submittal management software is primarily used in the construction and engineering industries to track the review and approval process for project documents like shop drawings, product data, and samples • Procore: The industry standard for large-scale commercial projects. It features a "Submittal Builder" that automatically extracts a list of submittals required from specification books. • Autodesk Construction Cloud (ACC): Preferred by teams using Revit or AutoCAD. It uses AutoSpecs to generate registers and integrates submittals directly with 3D BIM models.	• Autodesk Construction Cloud (ACC) • Bluebeam • BuildingBlok • eSUB • Fieldwire • Oracle Aconex • Procore • RedTeam Flex • Smartsheet • SubittalLink

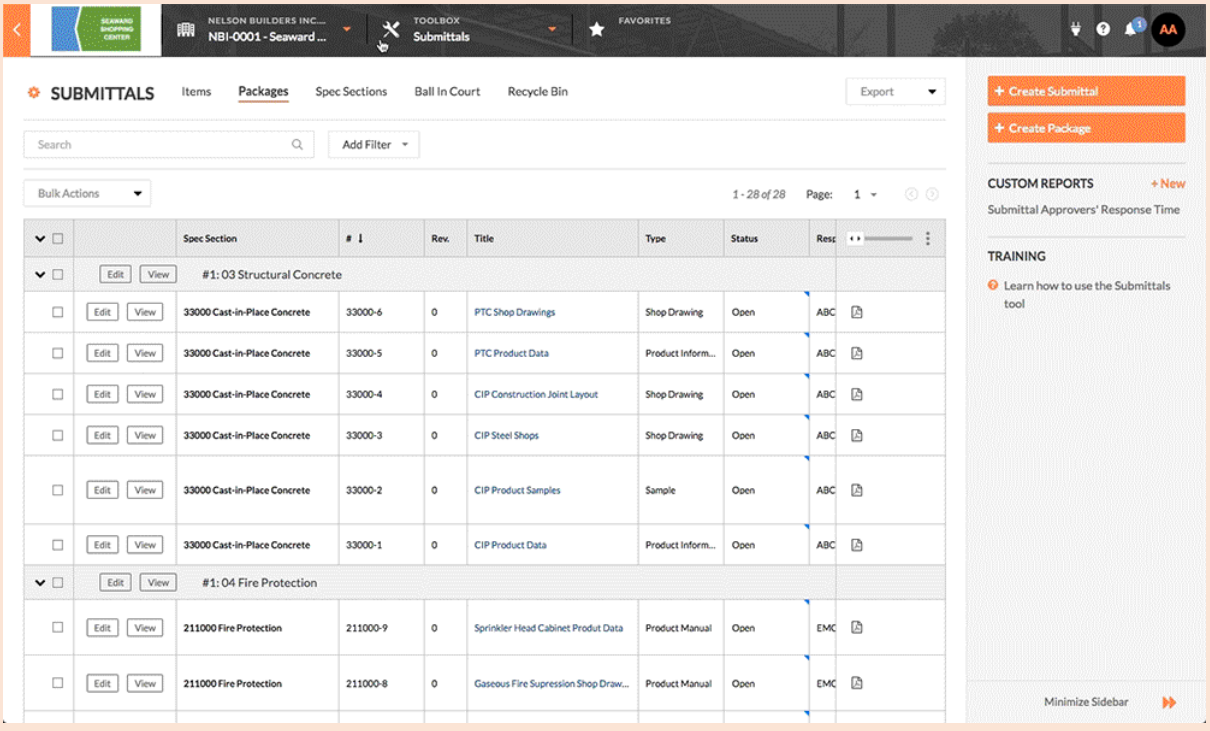

Figure 32: Submittal management page in Procore.
Source: https://en-gb.support.procore.com/products/online/user-guide/project-level/submittals

Finite Element Analysis (FEA)

Description	Software

• Engineers use Finite Element Analysis (FEA) software to virtually simulate and predict how products or structures will respond to real-world physical conditions.
• FEA 3D models allow engineers to identify design flaws, optimize performance, and ensure safety before a physical prototype is even built.
• Stages of FEA workflow:
  ○ Preprocessing / Setting up the Model
  ○ Solution / Solving the Equations
  ○ Post-processing / Interpreting Results
	• ANSYS
	• Enercalc
	• ETABS
	• RAM
	• RISA-3D
	• RFEM
	• SAFE
	• SAP2000
	• STAAD

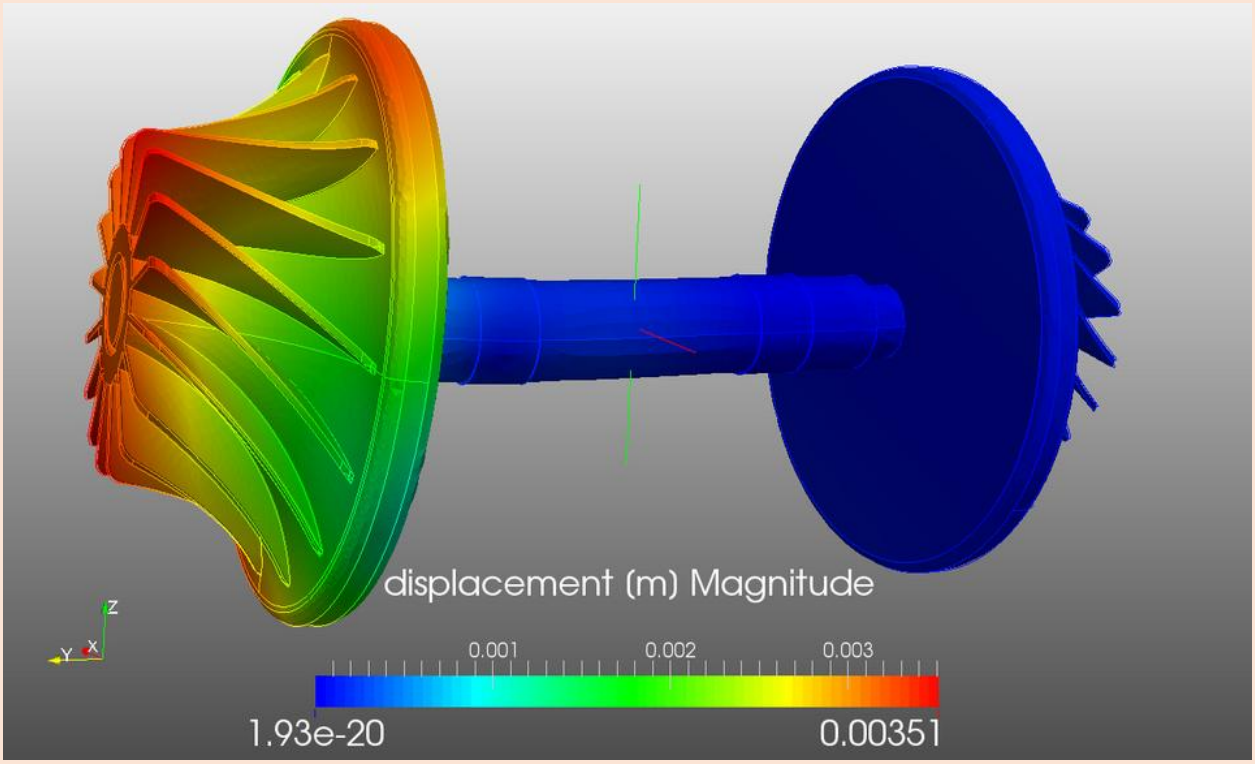

Figure 33: An FEA model with a contour plot of SimScale.
Source: commons.wikimedia.org/wiki/File:HarmonicAnalysisImpeller.png,

Computational Fluid Dynamics (CFD)

Description	Software
• Computational fluid dynamics (CFD) modeling helps civil, process, mechanical, and biomedical engineers simulate designs involving moving liquids & gases. • CFD can solve for hydraulic grade, energy grade, headloss, mixing rate, surface pressure, drag coefficient, flow rate, chemical concentration, velocity, airfoil efficiency, and temperature change. • AI allows engineers to simulate more iterations in shorter times and view the results very quickly.	• Ansys Fluent • COMSOL Multiphysics • OpenFOAM • PowerFLOW • SimScale • Solidworks • STAR-CCM • XFlow

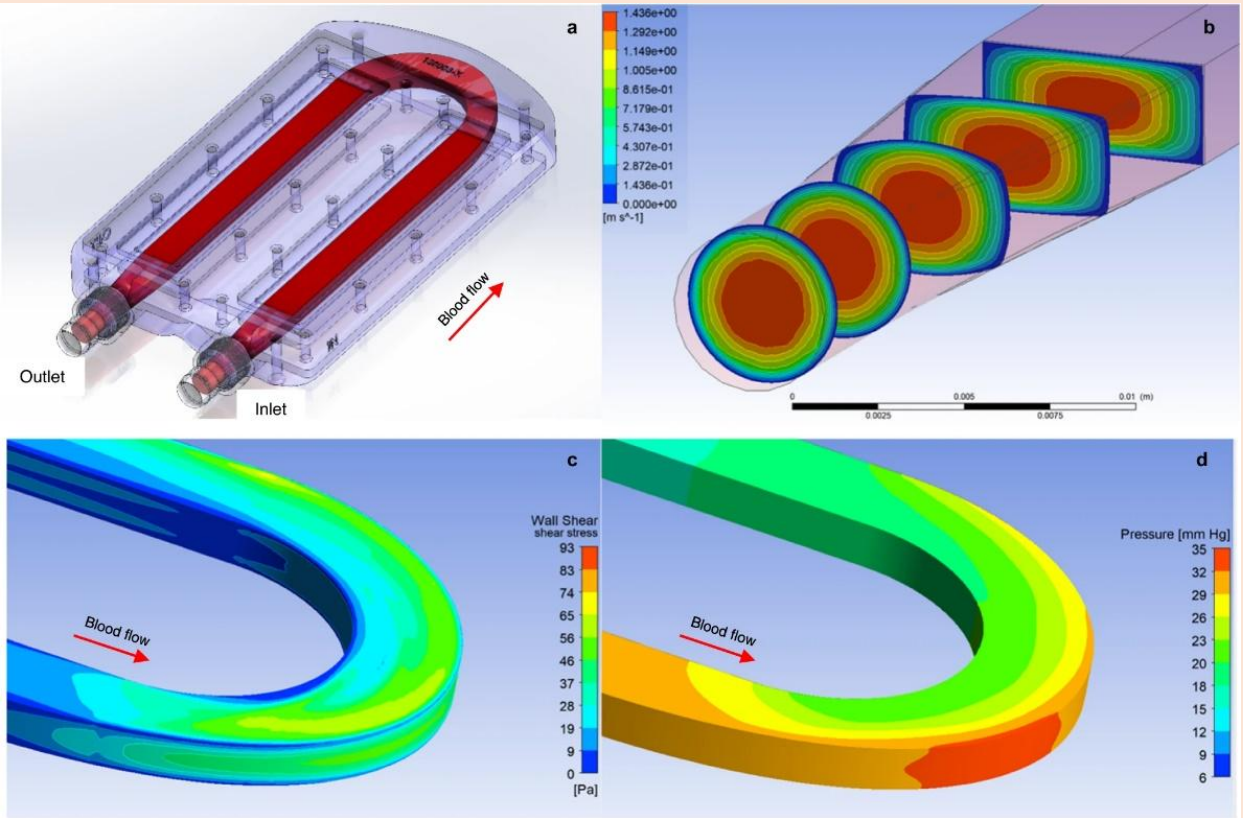

Figure 34: CFD model results for an implantable bioreactor for renal cell therapy.
Source: commons.wikimedia.org/wiki/File:In_silico_optimization_of_the_blood_flow_path_of_bioartificial, Various CC-BY-4.0

AI Code Generation	
Description	**Examples**
• AI Code Generation (also called AI Coding Assistance, Automated Code Generation, or ACG) is the use of an AI program to create code based on a user's conversational prompts. • ACG generates code, writes functions, and aids in code completion. • ACG uses publicly available source code to generate new code. • ACG can create AI-based design tools for specific engineering applications.	• Amazon Q Developer (w/ CodeWhisperer) • Gemini Code Assist • GitHub Copilot • OpenAI ChatGPT • Variety of programming language options • Cloud based or local

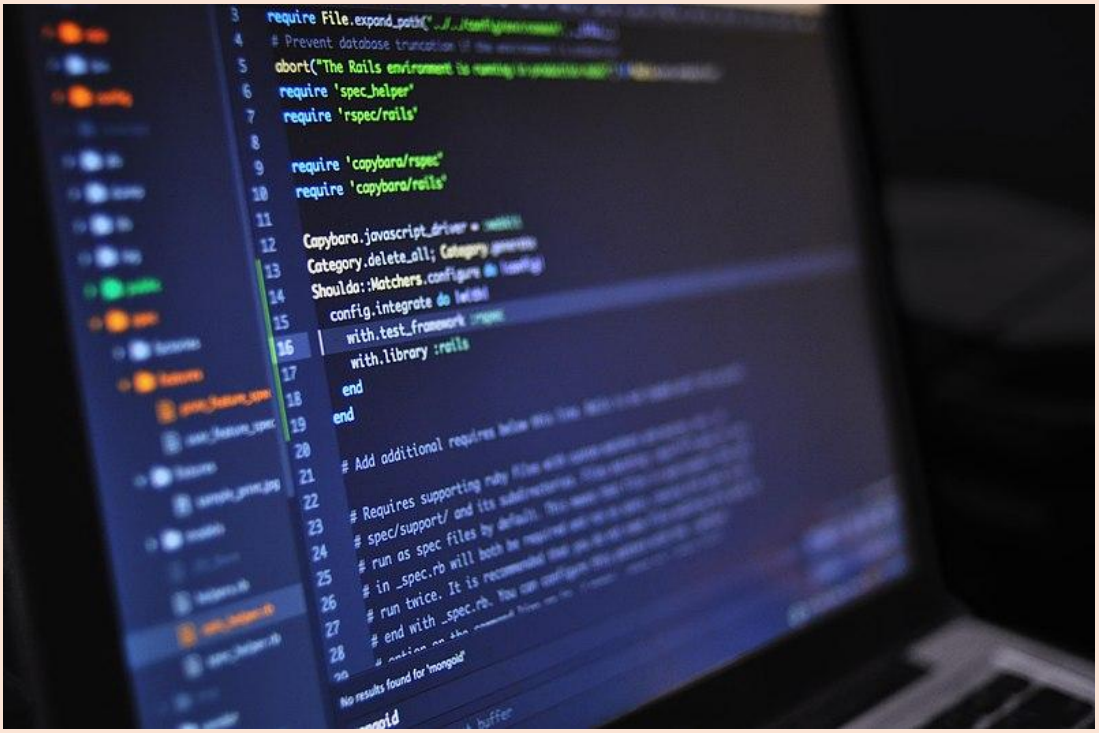

Figure 35: Code like this can be written by AI for engineering applications.
Source: www.pexels.com/photo/close-up-photo-of-programming-of-codes-546819, public domain

Google Earth

- Engineers leverage Google Earth Pro for various spatial purposes. Specific uses vary but common uses include:
  - Gain spatial context for project work
  - Perform a virtual site visit
  - View land use information and land features
  - Streamline site planning and preliminary engineering
  - Download and open KML and KMZ files with detailed information such as wetland inventory, geological maps, NRCS soil types, earthquake tracker, tectonic plate boundaries, parcel and survey data, transportation data, FEMA National Flood Hazard Layer (NFHL), endangered species, and environmental data.
  - View historical imagery
  - Gain 3D views for presenting project information
  - Measure distances and areas
  - View site from Street View
  - Export project points, lines, and areas in a KMZ file to share with others and integrate directly into CAD and GIS software
  - Leverage Earth AI models to answer complex questions about properties, environmental systems, traffic patterns, and community growth

Figure 36: Measuring distance across a property in Google Earth
Source: *Imagery © 2022 Google. Imagery © Maxar Technologies. Map data © 2022*

6. Course Summary

There are a growing number of digital tools to assist professionals with work tasks, including engineering tasks. The following is a summary of the software that is common or growing in use and applications.

Microsoft software for professionals:

- Outlook
- Teams
- Word
- Excel
- PowerPoint
- SharePoint
- OneDrive
- Edge
- Power BI

Other professional tools:

- Smartphone Work Apps
- Scheduling Software
- PDF Software
- Digital Signatures
- LinkedIn
- ERP Software

AI can provide several benefits, including increased efficiency and knowledge. AI software utilizes AI algorithms which can learn by looking at past data, create new logic/rules, to apply these to new situations. The following AI tools were covered in this course:

- Copilot – Enterprise Version
- Virtual Assistant
- AI Document Preparation
- Predictive Analytics
- Automation and Robotics
- Digital Twins
- AI Risk Assessments
- External AI Meeting Assistant

- Automated Task Management
- AI Audits

Key digital tools for engineers include:

- Google Earth
- Autodesk Suite
- Ansys Suite
- Bentley Suite
- MathWorks Suite
- Specifications Software
- Submittal Software
- Finite Element Analysis (FEA)
- Computational Fluid Dynamics (CFD)
- AI Code Generation
- Google Earth