We studied how we can improve user experience and help customers get more value from the AutoCAD mobile app.

We learned
• Users struggle because of inconsistencies between our desktop and mobile app.
• Users sometimes struggle to find commands in mobile and they want to be able to type commands like they do on desktop.
• Users find common operations cumbersome. An easier way to start and end a command is needed.
• Users are missing commands and functionalities such as guidance while they are within a command.

We built
• The command link from AutoCAD desktop was adjusted for mobile and implemented.
• We have added new commands to help our customers do more with the app.
• Now it’s easier for users to find, operate, and end a command.

Next we are measuring and evaluating the command line experience, collecting feedback, and looking into new opportunities to improve it.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied how customers expect to access their blocks in AutoCAD and invited them to walkthrough our new blocks palette concepts.

We learned
• Customers expect to be able to insert a .DWG block more smoothly.
• Customers expect clearer on boarding experience for cloud syncing.
• Customers want the ability to select a Library folder.
• Customers want to be able to remove selected Recent blocks.

We built
• The new "insert .dwg as block" function which helps customers quickly insert blocks during their design process.
• We enhanced the onboarding experience of the blocks palette.
• Customers can remove selected Recent blocks or Clear the Recent block list on Recent tab. They can select a Library folder as well as a file.
• The Favorites tab allows customers to flexibly manage their design elements.

The new AutoCAD blocks palette experience helps customers who don't have time to manage their block libraries by providing an easy way to reuse blocks.

Customers can access their block libraries and recently used blocks from different devices (desktop and web) with their Autodesk account.

Next we will continue exploring how to provide better performance experience. You can read more about the updates here.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied which AutoCAD Windows features are most useful and important to Mac customers. We also studied which AutoCAD Mac specific features are most valuable to them.

We learned
• Non-purgeable objects information is important. Xref-compare helps differentiate between two versions of reference files.
• Recently used commands in a right-click menu can improve productivity. A floating command-line window is useful. It could be placed in another monitor or on top of the canvas.

We built
• A new tab in the Purge dialog-box to display non-purgeable object information.
• The Xref-compare feature can compare two versions of Xref and highlight difference using unique colors.
• Recently used commands are displayed in right-click menu.
• The command-line window can dock / undock and can be dragged to anywhere.

Next we will continue listening to customer feedback, collecting requirements, and providing valuable features.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied why and how our customers customize shortcut keys and how they manage their block libraries.

We learned
• Customers want to set shortcuts and use them across all platforms.
• They want customization to be intuitive and smart.
• They store their blocks in folders/drawings on a server or local computer.
• Sample block libraries are useful to new AutoCAD Mac users.

We built
• A way to edit and modify shortcut keys.
• A way to manage block libraries by adding a folder or a drawing as a block library. This is same as in AutoCAD Windows.
• A Sample block library.

Next we will continue improving block libraries and exploring the customization experience for AutoCAD Mac.

Join us! Customers inform design and decision-making at Autodesk. Your feedback is important, and we want to hear it. Join the Autodesk Research Community!
We studied data on product use and content use and read feedback comments to find out what information was needed most.

We learned

- There are a lot of requests for functionality that is already available in AutoCAD.
- People like a small amount of conceptual information and then want to dive right into trying.
- Functionality can be overlooked because of drafting habits, being new to the product when it was first introduced, or perceived complexity.

We built

- A new content pattern that makes it easier to quickly learn features.
- Short videos that demonstrate the usefulness of a feature.
- Examples that show how to apply a feature to real world situations.
- Link: Welcome to Have You Tried

Next we are working on ways to reach more customers, looking at expanding the series to other products, and researching this format for documenting new features.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We heard that customers needed a more robust integration between FormIt Pro and Dynamo to create complex geometry and easily complete time-consuming processes.

We learned

- Customers need to be able to select FormIt geometry to manipulate using Dynamo.
- FormIt users need a way to work in multiple Dynamo graphs at one time and run the graph editor while executing runs from the FormIt Properties panel.
- Customers needed access to a variety of features that could be offered as Dynamo samples.

We built

- The new SelectFromFormIt node, allowing customers to select FormIt geometry as input for Dynamo graphs.
- An ability to launch multiple instances of Dynamo.
- Exciting additions to the Dynamo Samples library in FormIt, like 3d Text and Array Along Path.

Link: FormIt 2021.2 and New Revit Add-In Now Available

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We tested how to deliver the right amount of information about new features to help customers understand their value.

We learned that, when learning about new features, customers prefer...

- Clickable cards over a bulleted list of features with links.
- A factual voice and tone (direct, simple, and concise) over a casual or benefit-first style of wording.
- Visuals (images, videos) that support descriptive text to draw the eye and make the content more engaging.

We built...

- A framework that supports clickable cards to deliver new feature information in a more engaging, interactive way.
- What's New pages for many Autodesk products, with more on the way.
- Other uses for this framework, so you can use cards to navigate Have You Tried articles, video playlists, and more.

Next we are implementing What's New cards for more products for a consistent Autodesk experience.

Link: [What's New in Revit 2021](#)

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. [Join the Autodesk Research Community!](#)
We heard that transferring model data from FormIt to Revit often resulted in tedious repairs.

We learned

- Customers need to be able to import materials from FormIt consistently, without losing scaling or rotated faces.
- When customers converted smoothed edges into Revit from FormIt, the hidden edges would become visible.

We built

- Edge visibility consistency: Smoothed (hidden) edges between FormIt faces now remain hidden when converted to Revit (for Revit 2021.1)
- Material consistency: Materials that were scaled or rotated on a face in FormIt (using the Adjust Material Consistency tool or from imported geometry) will now remain at the correct orientation when converted to Revit

Based on customer feedback in the FormIt Ideas forum, we improved workflows so you can bring content like materials and hidden edges into Revit more easily.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied customer expectation for true information modeling experience in utility design, as well as elements needed to achieve an easier, faster, and more accurate design for utility.

We learned
• Our customers trust that we will evolve Pressure Networks and address their long-standing concerns.
• While utility design plays a key role in infrastructure design projects, workflows are inconsistent among the solutions currently offered.
• Many customers are committed to cultivating a BIM workflow for infrastructure design. They view utility design as moving them closer to a BIM workflow.

We built
• A more efficient and dynamic workflow to create and edit pressure pipe.
• Multiple enhancements to improve accuracy of documentation in utility design.

Next we are evolving the utility design experience and enhancing cohesion between different types of utility design.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We tested the released Civil 3D Application Home and explored in what ways customers expect the same experience in InfraWorks.

We learned

- Features, functionality, and layouts to improve Application Home. This also helped improve Autodesk’s overall design patterns for multiple products.
- Requirements for InfraWorks to keep the connection with legacy home and to highlight the frequent features.
- How to address a new approach to switch between home and active models.

We built

- Added new shared components into Application Home repository/framework so that other applications could easily adopt it, e.g. Tiles View (has been adopted into Civil 3D home).
- Separated the Model Builder button out in primary actions and moved the Notices into the utility bar.
- Unified the model types and cloud model status icons as a shared library into AppHome repository.

Next we are adding new shared components into Application Home repository/framework and making it more flexible for adoption into other Autodesk applications.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied the process of adding design intent in a model, its relationship to the analytical model, and the results of structural analysis.

We learned

- Adding large steel connections in the early stages of a project helps with coordination among disciplines.
- When placing steel connections, the forces considered by most users interviewed are those at the ends of the steel members.
- Opportunity exists to develop feature that facilitates connecting structural steel to concrete.

We built

- The dedicated Autodesk Steel Connections 2020 Dynamo package.
- A new set of nodes that read structural analysis results from the Revit native analytical model or the data stored in the Results Manager. Information is easily importable from other applications.

Next we are developing and adding more benefits to the Steel Connection Automation initiative.

Link: New Dynamo Features to Automate Connections Modeling with Design Input and Predefined Libraries

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied how engineers store and use their steel connections from project to project. We dove into how they collaborate with other disciplines and contractors in the process of designing and modelling steel connections.

We learned
- Only having the connections you need in the Revit model is time-saving and impactful.
- Coordinating and validating connections is a rather manual process.
- Engineers rely heavily on the visual aspect when they are modifying connection parameters.

We built
- The dedicated Autodesk Steel Connection 2020 Package.
- More out-of-the-box scripts that are ready to be used or ready to be tailored and adapted to your engineering practice.
- Capability to reuse engineering knowledge to help speed up your projects.

Next we are developing and adding more benefits to the Steel Connection Automation initiative.

Link: [New Dynamo Features to Automate Connections Modeling with Design Input and Predefined Libraries](#)

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. [Join the Autodesk Research Community!](#)
We studied customers’ workflow related to bridge design and their pain points, current workarounds, and expectations for an ideal experience.

We learned

- Bridge designers and engineers need a basic way to annotate alignments so that they can communicate their location and properties.
- As far as annotation for alignments in Revit, users want to see station marks, station intersection (station equation) marks, and the “highest elevation” of the alignment.
- Users require a better update mechanism from InfraWorks to Revit.
- Developed elevations are important for the target users.

We built

- An ability to import alignment from InfraWorks data. This functionality is built on the Autodesk Revit InfraWorks Updater plugin.
- New functionality for annotating alignment station and station set.

Next we are working with customers to prioritize and implement other requests.

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We created alignment datum in Revit that allows bridge designers or engineers to complete detailed design and documentation in Revit.

This expands the Revit workflow to support infrastructure related design.
We heard that Revit users have the challenges of designing for physical distancing due to COVID-19.

We learned
- Users need to find multiple paths of travel between points.
- Users need to quickly and visually understand the distances within a room.

We built
- Multiple Paths: multiple routes between points for Path of Travel to show options.
- One-way Indicator: families to represent direction of travel. These are respected by the Path of Travel calculation.
- People Content: Families which block path of travel and are used for occupancy.
- Spatial Grid: Grid overlay for visual indicator of spatial distancing.

Next we are developing more architectural improvements to improve customer satisfaction.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. [Join the Autodesk Research Community!](#)
We studied customer communication and problem reports.

We learned
- Many customers encounter issues with models not being able to open due to missing elements and they have no way to fix it.
- 600+ problem reports were created regarding elements missing since 2014.

We built
- A prevention mechanism to avoid missing elements.
- A data collection process to help us understand how missing element prevention works and identify potential root causes.

Next we are collecting data to determine which elements genre, Revit version, or other related property is most vulnerable.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied the user journey of Revit Cloud Model experience, including cloud model navigation, modification, sharing and managing, at AU 2019.

We learned

• When using Cloud Models and Desktop Connector, customers may accidentally open, save or link the wrong file.
• It’s difficult for customers to discern the published file version from Desktop Connector and Cloud Models.
• In addition to inconsistencies and confusion, this issue can result in performance issues (linking) or even data loss (not opening the most up-to-date version).

We built

• Information guidance for users to avoid opening the wrong model.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We heard that Revit users have a hard time resetting shared coordinates in Revit projects.

We learned
- The ability to eliminate the shared coordinates relationship with linked models and the GIS coordinate system acquired from a link model would be useful.
- Moving the Survey Point back to the internal origin and setting its shared coordinates as (0,0,0) with an easy reset button would be useful.

We built
- A new button under coordinates that resets shared coordinates in the current model.

Based on customer feedback, we improved the design of reset shared coordinates.

A one click solution to resetting shared coordinates in your model

Next we are exploring potential improvements around Revit shared coordinates.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We heard that Revit users typically click the link model twice when using the acquire coordinates command due to lack of notification.

We learned:
- Users would like to see a notification when acquiring shared coordinates.
- For users, it’s hard to tell if they picked the right link model because there are usually multiple ones overlapping each other.
- Users would like to see the unit of the acquired GIS coordinate system so that they better understand the coordinates value.

We built:
- A notification dialog which includes the link file name and unit information of GIS coordinate system.

Next we are collecting potential improvements around Revit shared coordinates.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied how we might reduce usage effort and lower the barrier to entry into Dynamo for users.

We learned

- Novice Dynamo users need help understanding the relationship between nodes, object types, and default inputs. They wanted to be able to find viable nodes without going through hundreds of non-viable nodes in the library.
- Advanced Dynamo users seek ways to increase productivity and lower the error rate.

We built

- A node suggestion dialog that offers suggestions for the most relevant and viable nodes for each node port.
- Search functionality within the auto-complete dialog.
- Auto-connection of selected node to corresponding input port.

Next we are working on a smart way to rank search results based on input ports. We are adding this functionality to output ports (the first pass was limited to input ports). We are also exploring the use of machine learning to rank on a per-user basis the node results ranking.

Link: [Feature Preview] Node Autocomplete

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We heard from customers about their pain points and IFC needs during previous AU research sessions.

We learned

- Customers need to be confident that their data is accurately exported from Revit.
- Governments would mandate the use of certified software.
- Customers need this capability in the existing versions of Revit.

We built

- Enhancements to get Revit export into IFC. We ensure that it is compatible with Revit 2019.

Next we are working on IFC4 certification for MEP.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. [Join the Autodesk Research Community!](http://www.autodesk.com/research)
An intuitive way to model Slanted Walls in Revit

An intuitive way to model Slanted Regular Walls and Slanted Curtain Walls with straight, curve/arc, or elliptical paths using standard “Wall” tool.

We studied customer pain points when creating Slanted Walls using existing workarounds. We then prioritized the functionalities they would need for Slanted Walls.

We learned

- Customers use workarounds to model Slanted Walls. Workarounds do not provide all the functionality that they need.
- Customers need both parameters and in-canvas controls to model Slanted Walls.
- A lot of the Slanted Walls customers create are Curtain Walls.

We built

- Ability to model Slanted Walls using standard “Wall” tool.
- Slanted Walls modeled using this new functionality will behave the same way as any other generic wall in Revit.

Next we are working on Tapered Walls in Revit.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We heard that Revit users would like Revit to remember settings customers have used for Modify Tools across sessions.

We learned
- Modify tools are the most used tools in Revit.
- Users don’t need to change tool settings often. Remembering the settings can improve customer efficiency.

We built
- Revit now remembers the settings customers have used for all the Modify Tools across sessions. The settings are written in Revit.ini.

Next we are developing more architectural improvements to improve customer satisfaction.

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Based on customer feedback from the Revit Ideas Forum, we improved the Modify Tools setting so that customers can use Revit more efficiently.
We heard that Revit users would like to override the object display per category based on different phases.

We learned

- Using phase filters to control the appearance of elements is limiting and confusing.
- View Filters completely override Phase Filters. Phase Filters control line-styles, line weight and halftone only. View Filters control colors and transparency only.
- Users want to add more colors to the phases. For example, new walls are red, new floors are yellow and new roofs are green vs, existing walls, floor and roofs that are grey.

We built

- New phase parameters in View Filter.
- Users can override the object display per category.

Next we are developing more architectural improvements to improve customer satisfaction.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We heard users were using workarounds to tag curtain wall mullions. These workarounds required a lot of work and were very inaccurate.

We learned
• Curtain walls are becoming more complex and more widely used nowadays. Tag would help users to work more efficiently.
• This capability would be especially helpful for heavily customized curtain walls (e.g. multiple cap profiles, depths, mounted accessories, etc.).

We built
• New functionality that allows users to add tags to curtain wall mullions by using “Tag by Category” and “Tag All”.

Next we are developing more architectural improvements to improve customer satisfaction.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied the detailed workflows of over 50 customers for setting up and enforcing ISO 19650 and PAS 1192 standards, learning what was most important for customers to quickly set up compliant projects.

We learned

- If project owners can’t set up and enforce naming conventions from the beginning, they can spend hours every week fixing errors or sending files back to designers.
- Project owners are creating multiple workarounds to define ISO 19650-compliant workflow attributes and metadata for their end users.
- Architects and design engineers are spending too much time fixing naming and metadata errors, and project owners need a way to see and quickly correct errors instead.

We are building

- The ISO 19650-compliant naming convention builder and validator, with configurable folder enforcement settings.
- Document uploading with naming enforcement.
- Document holding area allowing project managers to fix uploads flagged as non-compliant.
- Approval workflow enhancements.

Next we are exploring additional workflow improvements and integrations to streamline and unify the experience.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. [Join the Autodesk Research Community!](#)
We heard users highly value the capability to do energy and systems analysis entirely in Revit and generate shareable reports.

We learned
- The Energy Analytical Model helps communicate design intent with no physical model. The visual representation needs to look more “air-tight” in order for the analysis to be trusted.
- Being able to do everything in a single tool helps keep consistency and saves money. Reports need to be revised so that they are more navigable and legible.
- Both Architects and Engineers can run estimations earlier in the design process and collaborate more efficiently.

We built
- Enhancements to Energy Analytical Model surfaces and performance to improve efficiency, accuracy, and stability.
- We’re building loads and psychometrics reports allowing engineers to clearly understand the size and cost of their system needs.

Next we continue to enhance the Energy Analytical Model with an improved 3D representation and continuing to improve the workflow and user interface.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We heard your comments, requirement and expectations for using multiple, 4k and other high-resolution monitors.

We built

- Updated InfraWorks so that the interface, fonts and icons all scale properly, according to your Windows ‘Size and Layout’ settings.

Next we are continuing to improve our UI technology so that it is more adaptable to a changing office environment and is more consistent with the other Autodesk products that you use.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!

Based on your feedback on Forums, in 1:1 discussions, and live at AU, the Autodesk InfraWorks teams are working to better support your 4k monitor work environment. This will allow all your fonts and icons to scale properly in your windows environment.
We studied customers’ impressions of Load Autodesk Family at an Inside the Factory testing event in November 2019. We followed up with usage data analysis from Technical Preview release.

We learned

- Customers want the cloud experience to open as fast as a desktop feature.
- They have different preferred strategies to find content, so a content experience with multiple filtering options, like an online shopping website, is effective.
- We should help customers orient themselves when varying filtering settings are active, so they can immediately see and understand why certain results are showing.
- Customers like the familiar web browser paradigm of back, forward, and home for navigating content choices.

We built

- Based on usage data, we found ways to greatly speed up the time to open the dialog and to show search results.
- We’re now adding back, forward, and home controls.

Next we are continuing to invest in improving the cross-product content experience. Stay tuned for future announcements! Learn more about improvement here.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied the current data migration process and found that customers face a range of issues. A simple tool to help fix issues and automate the migration process is needed.

We learned

- Moving bigger projects and resolving issues afterwards is not ideal. A migration tool could handle a lot of issues in an automated and guided way, helping our users to bring in data and start working within our BIM360 solution.
- After migration, customers report broken references, folder structure, missing data. Customers end up recreating and fixing things manually.

We built

- A standalone tool to help users check and help fix data integrity before the data migration process.
- The tool could help users migrate selected data from local environments to BIM 360.

Next, we are making it to support multiple tasks for different projects and investigating on how to help users to handle the project health/dependency tracking in BIM 360.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!

Migrating existing data sets from their local environment to BIM 360 is our top priority for the C4C3D project.
We studied the journey for Inventor customers to access, use Fusion 360 Generative Design, and collaborate with results.

We learned
• Setup: unexpected barriers to set up Fusion Team accounts and an unfamiliar collaboration tool for Vault users.
• Moving Files: expectation for 2-way communication between Inventor and Fusion exists. The Vault workflow was unclear.
• Using Generative Design: there is a new project organization and structure to learn and additional steps are needed to collaborate with stakeholders.

We built
• A new getting started guide for “Inventor + Generative” design.
• A new tutorial documenting the end-to-end workflow process for Inventor and Fusion on using Generative Design.

Next we are exploring how to improve the data connection to Fusion 360 for Manufacturing and Generative Design workflows.

Links:
• Get Started with Generative Design
• Tutorial: Front Loader - work with an Autodesk® Inventor® file
We studied consumer product workflow delighters, pain-points, and customer generated solutions.

We learned

- Top customer delighters were in the Concept Definition and Detail Design phases, namely: Experience Design.
- Top customer pain-points were in the Concept Definition, Detail Design, and Drawing phases, namely for ease of use / learnability, Team Collaboration, and Data / Project Management.
- Top customer-centered solutions were to improve Collaboration, ease of use and learnability, in addition to drawing weld call-outs.

We built

- Detail Design improvements: ruled surface, loft edge alignment, parting line draft, emboss and fit and finish work on mirroring.
- Sketching improvements: 3D sketching, fast parameter naming.
- Drawing improvements: 2D drawing tools, Hole Notes, All-Level Parts Lists. See the Fusion 360 Drawings Road Map.
- Collaboration and data management improvements, such as Edit in Place and awareness of collaborators in the same project.

Fusion 360 Consumer Products stakeholders ran a customer workshop that included a journey mapping exercise and ideal solution activity aimed at solving common problems. We built many improvements since last year and updated our roadmap in response to this feedback.
We studied how BIM customers are using the 3D model, how they navigate models and extract data for different workflows.

We learned

- If users cannot easily navigate and visualize the model, the data is hidden from them.
- Users like to easily section the model at every point.
- After placing a section, users like to be able to easily edit the plane position.
- Users like to place and control the section from every zoom level.

We built

- A new contextual experience allowing customers to select every surface on the model and section the model according to this plane.
- We improved the UI by removing the section rotation that was distracting for the users.
- We enabled the creation and control of the section at any zoom level and every position.

Next we are exploring a multi-surface sectioning tool.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied the lifecycle of various construction forms on a job site to understand who and how data is collected when multiple people are involved.

We learned
- There was a need for users to easily collect data from multiple people in one space related to a single topic.
- There are three main ways that organizations collaborate on data collection through Field Reports.
- Organizations have varying levels of trust regarding how data is collected when multiple people are involved.

We built
- The ability for an organization to choose a contribution model that fits their need for any Field Report template.
- A multiple contributor model that allows any user the ability to create or edit a Field Report to collaborate simultaneously.
- A multiple contributor model that allows any user with the ability to create or edit a Field Report to assign it to another user once they have completed their work associated with it.

Next we are building features that improve trust on Field Reports with multiple contributor models.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied reopened RFIs.

We learned

- It would be helpful if closed RFIs can be reopened.
- It is common that decision changes affect RFIs and there may be a need to overwrite an OLD RFI, especially in big projects.
- Admins/Project Engineers/Project Managers need the functionality of opening closed items.

We built

- An ability to open a closed RFI item, update it with additional information and redistribute it to all relevant stakeholders in the project.
- An ability to Reopen using the same numbering and a revision number.
- Opening the item allows flexibility in the RFI flow with resending the question to the Reviewer.

Next we are adding more to RFI flow in the future for more flexibility and capabilities in order to improve the product user experience.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!
We studied organizing, sharing documents and their permission level from over 25 customers across various company types, project delivery methods and time zones.

We learned
• Customers use various tools to manage and support documents required for construction. They want one system.
• All project members need easy access to approved documents.
• A baseline permission model that was simple, flexible, and tailored for construction for all members is needed.

We built
• Clearly distinguishable locations for storing and accessing approved and WIP construction documents.
• We simplified the default permission levels to allow one-click access to reach all project collaborators.

Next we are improving efficiencies for viewing and collaborating on the right construction documents (sheets, models and other documents) at the right time.

Join us! Customers inform design and decision-making at Autodesk. We want your feedback. Join the Autodesk Research Community!

Ever worry about whether your project collaborators can view your documents meant for construction?

We created an effortless and flexible set of access control tiers to differentiate between construction documents (sheets, models, or other documents) approved for construction from those that are WIP.
We studied the process of modeling Subd geometry over scan data.

We learned

- Many Automotive customers use subdivision surfaces in other applications to quickly surface scan data.
- Alias users didn’t have an easy way to snap to this data inside Alias.
- The modifiers required to address all functions made the tool complex.
- Users had a higher success rate when tips were provided.

We built

- An integrated function that employs hotkeys for fast access to tools like create face, extrude, cut, and insert.
- Preview highlighting on the wireframe that helps the user understand the different behaviors in the tool.
- We created a ‘hint’ card that is displayed in-canvas to assist users as they learn the new tool.

Next we are exploring enhanced trimming tools to improve the experience of dividing a Subd body into separate regions for hybrid modelling with NURBS.

Alias Product Managers listened to feedback from the introduction of Subd modelling inside Alias 2020. We addressed their top request by implementing the new Subd Retopology tool.
We studied customer need and listened to feedback about improving modelling workflow.

We learned

- Users needed a way to replace input geometry.
- Users need to visualize the flow of history in Alias.
- Users want to quickly iterate between various shapes while exploring design options.
- Users want to get more out of the history-based modelling workflows.

We built

- An all new tool called the History Visualizer.
- A new Replace input workflow so users can quickly swap input geometries without having to open the tool control window.
- A way to visualize the flow of history in Alias.
- Color tags to represent input types to help users quickly swap inputs and replace them.

Next we are exploring how to improve the History Visualizer based on user feedback.

The new node-based History Visualizer provides the ability to replace input geometries in Alias. This solution allows users to view the entire flow of history in the scene and replace inputs to quickly build design options.
We studied beta feedback to understand the problem space and find the right solution.

We learned

- Our current Chamfer tool was inadequate for modern modeling approaches.
- There is more to chamfering than just rounding an edge. Important functionality includes multiple weighting types, a variety of inset methods, and appropriate smoothing.
- Beta testing provided important insights on the variety of modeling approaches. All need to be accounted for in producing a design that meets real-world needs.

We built

- A best in-class-solution that resulted from in-depth customer engagement.
- We received a patent for our vertex chamfering solution.
- Our solution is more than a one-off feature. It provides the customer a whole procedural workflow that capitalizes on data from other parts of the application.

Next we are using customer driven development to envision other core modeling workflows.

The New Chamfering Modifier makes even tough cases easy. It supports multiple Mitering types, gives localized control over the location and character of the chamfers, and enables user defined presets for fast, customized application.

We love customer input
We studied what customers liked about extrusion as a rapid modeling approach and where the current method was limiting.

We learned

- Our assumptions on the workflow were changed radically by the ideas from our customers.
- For customers, the hard work of cleaning a mesh after the extrusion is as or more important than the extrusion itself. This revelation was a game-changer.
- Customers would rather be empowered to fluidly create than manage the details of cleanup.

We built

- A best-in-class solution that has delighted our customers and forced our competitors to re-evaluate their solutions.
- A workflow that allows customers to think creatively and not worry about compromising the mesh integrity.
- A fun and less technical experience for the user.

Next we are using what we have learned to empower creativity along with functionality.

Extruding faces has never been easier, and we do all the cleanup for you!
We studied the time and effort it takes for artists to manually clean up and retopologize their models. We studied how many steps and processes were involved in these manual workflows.

We learned
- Artists can spend days manually retopologizing their models.
- Artists want an easier way to create clean, all-quad and animation-friendly models.
- Our customers need a solution that allows them to automatically and quickly convert complex high-poly geometry, while still giving them the freedom and control to manually perfect their models afterwards.

We built
- Remesh & Retopologize, which allow artists to take messy, uneven meshes and convert them into all-quad topology they can use for rigging and animation.
- Easy-to-use tools and easy-to-learn workflow.
- Specialized learning content to guide users through the new retopology experience, including a special tutorial on how to use Bifrost to completely skip the manual cleanup process!

Next we are continuing customer-driven development to cut down the amount of hours artists spend on redundant modeling work that can instead be automated.

Link: Automatic Retopology - Maya 2020
We studied the accessibility needs of our animation and rigging community and found a great improvement opportunity for animators with color vision impairment.

We learned

- Graph Editor-focused disciplines often attract artists with color vision deficiency since color perception is usually not critical to their work.
- Maya’s Graph Editor uses red, green and blue as default curve colors without any other types of affordance. This makes the everyday work of artists with color vision deficiency extremely difficult.
- We learned from colorblind users that we must rely on shades instead of colors because everyone perceives colors differently.

We built

- A Graph Editor theme with three different shades based on user recommended colors where the darkest shade is blue, the middle one is red, and the lightest is teal.
- We also gave users the option to set their own colors in the Graph Editor.

Next we are identifying other areas of Maya that could benefit from similar inclusive design approaches.

Link: [Graph Editor Color Themes - Maya 2020](#)
We studied rendering practices, requirements, and pain points of Design Viz customers by way of a survey, an ‘Inside the Factory’ event, and customer site visits.

We learned
- Some customers are dissatisfied with Arnold: it lacks specific features, is hard to use and is not believed to be artist friendly.
- There’s a lack of awareness of Arnold’s progress and features by customers with many not knowing that it was available in 3ds Max.

We built
- In 3ds Max 2021, Arnold is the default renderer. This raises customer awareness of it. Making it the default has driven us to focus on ease of use for multi-skilled customers.
- We streamlined interactive adjustment of output in Arnold’s RenderView, e.g., exposure and access to Arnold’s render layers (AOVs).
- We built plans to improve learning content for 3ds Max rendering workflows.

This research was about understanding the most important considerations for 3ds Max Design Viz customers when choosing a renderer and identifying how we could improve Arnold for them.

Next we are continuing to put Arnold ‘experience’ work on the 3ds Max roadmap, focusing on creating more presets and better defaults for customers.
We studied through Idea Connection feedback, testing, and interviews, how customers interact with viewports in 3dsMax and other products to understand what was needed.

We learned

- Although sometimes customers needed more than 4 viewports, they primarily wanted to have larger views into the scene and to take advantage of a second monitor to present their view to someone.
- Because viewport layouts are stored in scenes, a floating viewport created inconsistent expectations of what view should be inside of a floating viewport when a new scene was loaded.
- The simple ask of "tearing off a viewport" opened our eyes to challenging dependencies with workspaces.

We built

- In 3ds Max 2020.1, we implemented the first phase in allowing users to float a viewport and retain its position in the workspace, even though new scenes are loaded.
- This work enables a quick transition to a presentation mode that could be expanded on for future workflows.

Next we are preparing for future development phases. These phases will explore how we can integrate floating viewports with more flexible workspace layout configurations.
We studied the impact of working remotely while using Maya, 3ds Max and/or Flame by way of a survey and in-depth interviews.

We learned

- Most have adapted to WFH lifestyle and appreciate greater flexibility and empowerment when, where and how they work.
- Customers are taking time to focus on learning new products, features and tools.
- Pain points include: difficulties collaborating, communication, internet bandwidth, asset management, context switching, cost of cloud, and having to run Maya, Max or Flame on less-equipped home/personal laptops.
- There is a sense of openness and acceleration towards creating cloud-friendly workplaces, but customers are worried about cost of cloud and reliability of internet.

We built

- A series of live virtual community events and workshops, available on the Autodesk AREA, including ‘Show and Tell’ and instructor-led classes and reviews.

Next we are revisiting our strategy and using the Covid Study data to help figure out what aspects to accelerate what aspects to deprioritize, to best support our customers’ rapidly changing needs.
Maya USD Plugin
(Universal Scene Description)

Pixar’s Universal Scene Description, also known as USD, is a framework for the interchange of 3D data with a focus on collaboration, pipeline efficiency and scale. Maya USD is a game-changer and getting it right is a priority. Autodesk is working directly with Pixar and countless other industry partners to implement USD in Maya as an open source initiative.

Embracing industry standards and open source development

We studied the growing popularity of USD among key M&E customers such as Pixar and Animal Logic. After partnering with these studios early on, it became clear that a common yet modifiable USD plugin for Maya would benefit all users.

We learned

- An open standard for 3d data is needed in order to facilitate collaboration and remove bottlenecks between DCC tools.
- Maya should work as a native editor for this pipeline data.
- Some customers want this functionality in Maya (out of the box) while others need to customize it to work within their pipelines.

We built

- Autodesk, partnering with Pixar, Animal Logic, Luma Pictures and Blue Sky Studios, opened a unified, open-sourced repo on GitHub that serves as the home for USD in Maya.
- We seamlessly integrated USD, a foreign data model, into Maya allowing users to not only load and edit massive data sets at lightning speed, but to also work with the data using Maya’s native tools.
- We worked with the open source community to build robust referencing functionality, nondestructive data editing workflows and support for complex variants on top of USD.

Links: USD Plugin for Maya: An Overview | USD Plugin for Maya: Fundamental Pillars | Maya USD Github

Next we will continue to evolve this technology through industry engagement and collaboration with the open source community.
We heard that FX artists and TDs needed procedural tools in Maya that would allow them to tackle complex simulations, while many other artists would benefit from a general procedural platform that could support a wide range of workflows.

We learned

• Studios need a flexible tool that caters to artists at all levels of technical expertise.
• Knowing how effects will look after lighting and rendering often comes down to guesswork.
• TDs often re-create the same effect many times. They need a tool that makes it possible to package up effects for re-use.

We built

• Bifrost is a visual programming environment with cutting-edge dynamic solvers for creating a wide range of effects like smoke, fire, explosions, cloth, snow, sand, and particles.
• Interactive progressive rendering in the Arnold Viewport makes it easy for artists to prototype Bifrost effects while viewing final pixels right in Maya.
• TDs can publish any working effect as a portable graph that can be re-used by artists.
• A library of pre-built graphs make it easy for artists to get started creating effects that meet today’s quality demands – without having to be experts in visual programming.
• Link: Lights, Cameras, FX: Exploring What's Possible with Bifrost

Next we are continuing to expand what’s possible with Bifrost, exploring capabilities like instancing, character FX, point clouds and volume tools.

Last year, we unveiled Bifrost for Maya, a powerful visual programming environment for creating complex FX quickly and easily. This toolset has grown significantly over the last year thanks to feedback from the beta community.
We heard that artists needed the flexibility to use CPU and GPU rendering depending on their specific needs and task at hand.

We learned

• Artists need to be able to preview lighting and uncover issues immediately, rather than waiting on overnight renders.
• Without the right tools, increasingly heavy datasets and complex scene files can stall workflows and slow productivity.
• Users need to be able to take advantage of the latest technology, adding GPUs for increased rendering power when production demands it.

We built

• From real-time look development to interactive lighting, Arnold GPU brings speed and power to user workflows, resulting in shorter iteration cycles and reviews.
• With a single click, users can switch seamlessly between CPU and GPU rendering, without changing materials or scene files.
• The speed of GPU-based rendering makes it possible for artists to work with near final quality renders at interactive rates.
• GPU rendering makes it easier for artists and studios to scale up rendering capacity quickly.
• Arnold GPU supports complex shading networks, SSS, hair, atmospherics, instancing, and procedurals.

Next we are focusing on expanding support for key areas like OSL, OpenVDB and volume displacement. Initial support is already available with some limitations.

Arnold can now be used for production rendering on both the CPU and GPU.

Arnold GPU is based on NVIDIA’s OptiX framework and optimized to take advantage of NVIDIA RTX technology.
In Inventor 2020, you can now place your drawing or sub-assembly on a separate monitor for reference while you are modeling in the main Inventor window.

We tested many solutions to ensure we delivered the most valuable workflows.

We learned

- Our customers prefer simple solutions delivered sooner over waiting longer for complex solutions. We delivered in a more iterative way providing value earlier.
- After release, we found that the minimize button is important to support workflows with multiple documents, but also for document management. Minimize helps users keep files hidden when arranging documents.

We built

- Inventor 2020 provides functionality to be able to drag a document tab outside the main Inventor window onto a different monitor.
- The new tab system provides a more complete docking solution with better resizing and snapping behavior than the existing window system.

Next we are continuing to make improvements each release based on your feedback. We are currently working on a minimize button for hiding documents quickly including MyHome.
We tested different color themes, iconography, contrast levels, and UI styles to ensure a visually appealing, functional, and clear interface.

We learned
- Contrast is extremely important for text and icon clarity.
- The browser is complex and understanding requires visual cues to connect child and parent elements. Inventor users need these cues.
- We worked hard to provide the highest contrast possible. But for some users there is no substitute for contrast provided by the legacy amber icons.
- After release we found that iLogic and MyHome are important to support dark theme.

We built
- Working alongside AutoCAD, we developed interface guidelines for the entire company thanks to your feedback.
- We shipped the pre-release of the dark theme in Inventor 2021. If you haven’t tried it out yet, please try it and share your feedback.

Next we are continuing to make improvements each release both to polish the interface but also add dark theme support for features like iLogic and MyHome.

For many years at AU, the Inventor team has heard requests for dark theme. Together with other Autodesk products, we now have dark and light themes for you to choose from including consistent iconography, colors, and visual style.
We studied needs and gaps based on the initial design prototype and MVP deliveries to get an understanding of what is most important from our customer's perspective.

We learned

- Users want to review more properties and downstream actions when making replace decisions.
- Some customers want to filter out mirrored cases, search exact same shape, and have specific filtering capability for quick searches.
- Customer preference regarding quick options, default status, and autosave mechanisms, etc.

We built

- A table view switcher for checking additional property details.
- A combined geometry search with meta-data search.
- The option to Only Include Exact Same and to Exclude Mirrored objects.
- A workflow for applying filters to groups of duplicates without impacting initial search performance.

Next we will continue building future road map features for duplicate search and duplicates dashboard, while continuing to receive feedback from customers and improve existing features.

Link: What’s New in Vault?
We studied and validated workflows according to customer needs for Inventor's Vault Add-in enhancements.

We learned:
- Inventor's Vault Add-in customers value the Show Details information within Inventor's Vault Add-in to minimize switching to Vault Client.
- Customers want to view details of Uses, Change Orders, and Bill of Materials (BOM) tabs from Inventor's Vault Add-in.
- Customers prefer to have more commands in the Show Details pane so that they can find details.

We built:
- Show Details pane to a floating and dockable pane.
- A 'Show Details' command to Ribbon menu for easy access.
- Uses tab, Change Orders tab, BOM tab, Go To command and Assign Item command in Show Details pane.

Next we continue laying the foundation of exciting enhancements for Inventor's Vault Add-in and other Add-ins. We appreciate your continued support as we work towards enhancing the features.

Link: What's New in Vault 2021.1?
The VRED Team worked with our technology partner Varjo and our customer KIA to trial the new Varjo XR-1 MR (mixed reality) HMD (head mounted display).

We sought to understand how to evolve beyond VRED’s current Virtual Reality experience to support the future of Mixed Reality.

**We studied** the capabilities of the Varjo XR-1 MR HMD with our customer KIA and its effect on the current VRED user experience.

**We learned**
- A 'visually clean' real-world feed (no virtual content) to allow unobstructed mobility would increase comfort and utility for users.
- Typical Virtual Reality (VR) navigation tools (such as teleport) are not effective for MR user navigation.
- Typical Avatars used for VR collaborative sessions are unnecessary for MR participants using the same VR room (tracked space), as the real people already exist.

**We built**
- View mode option allowing VR, MR and Clear (unobstructed) HMD views.
- Avatar and collaborative behaviors to detect MR HMDs using the same VR room, allowing the real-world participants to be clearly seen.

**Next** we are improving the user experience and developing enhancements to further bring the virtual content closer to the real world for MR users.
Fillet is one of the most frequently used and highly requested commands to modernize. Because of its complexity, the team engaged with users in detailed usability studies to better understand requirements and uncover workflow issues.

We tested the legacy UI’s usability as the benchmark. This provided a deep understanding of user pain points and expectations. We also validated design concepts early with beta customers creating opportunity to learn and iterate faster and earlier.

We learned
- The legacy UI is overly complex and misleading. We need to simplify the user interface and streamline the workflow in order to improve productivity.
- Error handing is the biggest usability issue for users.

We are building
- A completely refreshed fillet command experience, including a streamlined workflow, a flexible in-canvas experience, and improved UI clarity.
- Fillet received one of the highest satisfaction rates with the feedback community.

Next we're looking to improve the error handling experience by providing more useful error messages real-time and in-context.

Deep user research ensures high satisfaction rate
We studied how we can enhance the Vault Thin Client experience.

We learned
• Users want to navigate and view data in a single app.
• Users want relevant file actions to be easily accessible.
• Users want to distinguish certain information from the rest.

We built
• An aesthetically pleasing interface that manages a huge amount of data.
• A new navigation and viewing of data in one single application.
• Introduced a new workspace, entitled “Change Orders”, for accessing the change orders.
• Enabled easy collaboration with others by sharing data links.

Next we are exploring more ways to help our customers manage and visualize their data easily. We appreciate the time you have spent with us in sharing your experiences and insights that helped us build Vault Thin Client over the last few years.
We studied how to foster a global community.

We learned
• AU international events host their learning content on separate websites.
• A website in English does not foster international audiences even if it hosts content in other languages.

We built
• A global website and conference experience, supporting translation and content in seven languages.
• A global team to support attendees in all time zones.

Next we are transcribing all 2020 on-demand content, making it easier to follow content in another language and possible to translate.

Link: Autodesk University

Autodesk University 2020 is open 24 hours, across all time zones, and includes content in seven languages, providing a truly global experience.
Last year, at Autodesk University in Las Vegas, we polled attendees about how we can better support their professional development year-round.

We studied how we can better support your professional development throughout the year.

We learned

• Webinars and shorter form content would be most helpful for professional development throughout the year.
• Our Advisory Council also recommended that shorter form content would be better for contributors and speakers.

We built

• Theater talks (10- to 15-minute thought leadership presentations).
• Articles (short form written content – continued development).
• On-demand sessions with varying duration.
• Content from our customers and industry leaders that is available right away and year-round.

Next we are looking at other ways product and industry learning content can be shared at our live conferences and online, including how content can be delivered in series.

Link: Autodesk University
We studied how to provide methods for attendees and website users to interact with each other and with the speaker.

We learned
• Users have great interest in connecting with peers to discuss technical topics.
• Attendees want the opportunity to ask the speaker questions year-round.

We built
• Comments on every on-demand class page, enabling year-round conversations with the speaker and others with similar interests.
• Recommend (thumbs up), providing a way to share your recommended classes with others and see content recommended by peers.
• Share, allowing you to create deep links into content (sharing at a specific location in a class handout or video).

Next we are looking at ways public and private groups can engage with learning content. We’re also exploring ways to use community interactions to better highlight the content that is resonating with our community.

Link: Autodesk University