How Mott MacDonald and Autodesk Are Using Product Insights to Build Skills

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Mott MacDonald

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Learning Objectives

• Learn how individuals and organizations can build their skills using existing data.
• Discover the vital role tool-based insights can have in accelerating learning.
• Learn about key challenges associated with developing and maintaining technical skills.
• Benefit from the lessons we have learned throughout the last 18 months.

Description

In an ever-changing and increasingly automated world, the need to develop and improve individual skills is vital. Our people and their skills are the key to our future success, and it is our imperative to create an environment where they thrive. To do this, we need to integrate learning insights with project and individual development. We need to chunk up learning to make it digestible, and we need to make it easy to apply that learning. Mott MacDonald and Autodesk are partnering to explore how product usage and other data can inform individual and organizational software skill development through Autodesk Insights, Skill Tree, and Mott MacDonald's own learning systems to build a stronger business and a more equitable team. We'll share how our partnership has developed an innovative approach to growing and maintaining skills that allows us to connect people, projects, processes, and data to transform our approach to building skills and scaled technology adoption across projects.
Speakers

Ian Besford, Mott MacDonald
Head of Digital, UK Buildings
@ibes77

Ian Besford is Digital Lead for UK buildings at Mott MacDonald and is driven by helping our people be their best selves by supporting their development and delivery using the best that data, technology and insights can bring. Ian has over 20 years experience as a Chartered Structural Engineer creating buildings and spaces that inspire a better, more sustainable future for us all. He/him.

Tom Hughes, Mott MacDonald
Programme manager – Project Systems
@bimostb

I am a Civil Engineer that followed a passion of using technology to do my own job more efficiently into a career of helping others to do the same. After working on a variety of infrastructure projects during the early days of Mott MacDonald's BIM strategy and UK BIM Level 2, I joined a small team whose primary focus was the application of leading technology on engineering projects. As the small team has grown into a global network, I have the privilege to work with project teams and digital leaders from around Mott MacDonald. As part of my role I regularly get the opportunity to work closely with both our Autodesk account team and the Autodesk product teams. Away from work I like to surf, bike, Xbox, and binge watch comedy.

Jo Vermeulen, Autodesk
Principal Research Scientist
HCI & Visualization team – Autodesk Research
@jozilla

Jo Vermeulen is a Principal Research Scientist at Autodesk Research in Toronto, Canada. His research interests lie at the intersection of human-computer interaction, ubiquitous computing, and data visualization. At Autodesk, he currently focuses on projects in Software Learning, conducting research into new interfaces that facilitate learning of complex and feature-rich software. He has published over 30 journal and conference articles on various topics such as intelligible systems, situated visualization, design tools, and novel interactions. Before joining Autodesk, he was an Assistant Professor at Aarhus University (Denmark), and held positions as a postdoctoral researcher at the University of Calgary (Canada) and at the University of Birmingham (UK). He obtained his PhD in Computer Science from Hasselt University (Belgium), for which he received the 2015 IBM Innovation Award.
What if...we could really help people access training that’s relevant for them. Training that helps them upskill, and as a result improves the efficiency and quality of the work they deliver?

Making it happen is a real challenge for many people at the front line of delivering projects.

People have a wide range of characteristics:
- Experienced time served employees
- New starters
- Recently changed roles
- Design managers
- Design approvers
- Model authorers in different tools
- Busy people who have little time to keep up to date with the latest tools and features
- People who proactively develop their skills
- People who don’t understand our standard processes and ways of working
- People keen on helping others improve
- People who aspire to become a recognised expert in their field
- People who struggle to work out next steps for development..

They all want to develop their tool based skills and competency, just in very different ways.

The future, and our present, is where our tools and our systems are intelligent enough to know what our people would benefit from and to help them achieve their goals.

The importance of learning
People have a natural drive to learn. The real challenge is how we train effectively, and how we get maximum return on the money we set aside for training.

At Mott MacDonald we have 6000 monthly active users of Autodesk tools, accumulating 250,000 hours a year giving a great opportunity to gain efficiency from more skilled use.

To get maximum value from our training budget we:
- Need to invest in skills that are missing
- Train at point of use
- Make it easy to reduce overhead.

Together with Autodesk we are both using concepts from the skills models used in video games.
Skill builder and experience points

Idea - Can we use the data we have available to do the heavy lifting and provide proactive suggestions for people to develop their skill and hence competency in their role?

The key challenges we face are:

- Self reporting of skills is low, inconsistent, and skills change over time
- Goals need to be relevant for a person's project role and experience
- Advancing technology is changing both the tools we use, and how we learn
- We have access to a wealth of data including what tools people use

But just because we have data, can and should we use it?

Can we – The use of system data to support learning and development is one of the permitted purposes of processing personal data in our employee privacy policy. But just because we can, doesn't mean we should!

Should we – Predicted skills are not the same as actual skills. Just because we predict someone is a world class expert doesn't mean they suddenly become one. Predictions are inherently limited by the data we use to make them and may not tell the whole story.

What could go wrong – Not everyone will use information how it was intended to be used. For example, showing where a group of people might have skill gaps would be acceptable, but exposing an individual's predicted skills could be easily misused.

Senior leader buy in to this sort of approach is essential.

Our gamified framework takes typical events that might occur and their frequency to apply an experience weighting:

<table>
<thead>
<tr>
<th>Data source</th>
<th>Event</th>
<th>Frequency</th>
<th>Gamified framework</th>
<th>Experience weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autodesk</td>
<td>Tool use</td>
<td>High</td>
<td>Actions</td>
<td>Smallest</td>
</tr>
<tr>
<td></td>
<td>Class</td>
<td>High</td>
<td>Tasks</td>
<td>Next smallest</td>
</tr>
<tr>
<td></td>
<td>Beginner learning path</td>
<td>Medium</td>
<td>Missions</td>
<td>Next smallest</td>
</tr>
</tbody>
</table>
We then track activities for individuals over time by tool to give a growing (and decaying) experience profile:

<table>
<thead>
<tr>
<th>Data source</th>
<th>Event</th>
<th>Frequency</th>
<th>Gamified framework</th>
<th>Experience weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermediate learning path</td>
<td>Medium</td>
<td>Side quests</td>
<td>Next smallest</td>
</tr>
<tr>
<td></td>
<td>Advanced learning path</td>
<td>Low</td>
<td>Story quests</td>
<td>Next smallest</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Benchmarked skills assessment</td>
<td>Low</td>
<td>Bosses</td>
<td>Highest</td>
</tr>
</tbody>
</table>

In order to calibrate our model we used a sample of 1000 users and selected 50 with well known skill levels in our 6 most commonly used tools and used these to set our thresholds for experience. These were then tested on another group of users within the same 1000 person set to validate the model and refine where needed.

Once the model was tested and validated and piloted, we built an automated data pipeline and data processing services that sit behind a front end.
Our front end is built as a SharePoint web part that offers the user the ability to view their predictions based on their job role and technical discipline. It provides them with a recommended skill level and a predicted skill level, together with personalized development goals.
Insights and skill trees

Introduction

The HCI and Visualization team in Autodesk research focuses on near term research that can have immediate product impact (e.g., the ViewCube) as well as longer term research that spans 5-10 years out like programming within a VR space or interactive on-body fabrication design.

Some of our past research projects are quite relevant to what we are talking about here today. In Community Commands, we adapted collaborative filtering algorithms for AutoCAD to recommend new tools you have never used but people who are similar to you have used. Building on this idea, we developed the Command Map, a research project that was released as a plugin for Fusion 360 and presented at AU 2019. It allows our customers to reflect on their skills, their development over time, and how their skills relate to others in the industry.

We now also have these kinds of innovations more widely available in our products, like the My Insights feature in AutoCAD that provides personalized advice based on your usage that help you identify new commands to try or even automate your tasks, with a growing number of different insights that are available for our users.

The key focus for this class is a project for which the HCI and Visualization research team collaborated with the team developing My Insights for AutoCAD to create a new insight that shows a user their most used skills for a given time period. The core concept underlying this is what we call the AutoCAD skill tree.

Skill trees

Both Autodesk and Mott MacDonald were thinking about skills as they relate to video games. Skill trees in a gaming context are about characters with different “professional classes” (e.g. druid, shaman). They can advance their skills and powers through different “levels”. And the Learning Strategies team at Autodesk is doing something similar with skill trees for our products (like AutoCAD).

The advantage is that instead of talking about software features, with skill trees, we are now talking about skills that map to people’s jobs and careers.

The AutoCAD skill tree has 2,281 commands categorized into workflows, which are subdivided into skills, sub skills, and tasks. Each single command (e.g., LAYER) is mapped to these workflows, skills, sub skills and tasks. We use this to relate the different commands together and also talk about skills at a higher level than just individual commands used.
The AutoCAD skill tree, which categorizes commands into workflows, skills, sub skills and tasks.

**Most used skills report**

So how are we using this skill tree? The skill tree lies at the basis of the most used skills report. This report provides an interactive table that shows how you have been using AutoCAD in a particular time period, broken down by your most used skills. You can explore this report in detail to get powerful insights into your AutoCAD usage, including recommendations for new commands related to a particular skill that you can try.

### Most used skills

Your most used skills in November 2021.

<table>
<thead>
<tr>
<th>Skill</th>
<th>Core</th>
<th>Occasional</th>
<th>Rare</th>
<th>% of Total</th>
<th>Commands Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Modification</td>
<td>299</td>
<td>18/109</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open and Save Drawings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5/27</td>
</tr>
<tr>
<td>Drawing Environment Customization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3/64</td>
</tr>
<tr>
<td>Object Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6/63</td>
</tr>
<tr>
<td>Object Creation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4/71</td>
</tr>
<tr>
<td>Dimensioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6/321</td>
</tr>
<tr>
<td>Annotation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3/168</td>
</tr>
<tr>
<td>Object Properties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3/122</td>
</tr>
<tr>
<td>Application Setup and Settings Mod.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3/132</td>
</tr>
<tr>
<td>Navigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3/43</td>
</tr>
</tbody>
</table>

**How do I read this?**

- **No commands**: A related collection of commands
- **Core**: Common, everyday commands that form the basis of most users' usage
- **Occasional**: Targeted, less frequently used commands
- **Rare**: Rare commands that meet the needs of specific workflows

The most used skills report provides an overview of which AutoCAD skills and commands you have been using the most, as well as the commands you haven’t used yet but are available within that same skill. This helps users see what else they can try or learn.
When moving your mouse over a particular command, you get more information such as how often it was used, the command’s icon in the user interface, and a short description of the command.

Recommended commands are highlighted with an orange outline. Skills with available recommended commands (such as “Object Creation”) also have a badge to indicate that you can discover recommended commands upon expanding this skill.

**What it takes to enable this capability**

We capture the types of commands that users invoke when using our software and then that data can do a number of different things, such as help us improve product performance or deliver these kinds of personalized experiences and insights.

This data is processed and linked to the skill tree to categorize it based on workflows, skills, sub-skills, and tasks. We then calculate the frequency of use and aggregate all of this data to build the visualization used in the most used skills report, highlighting the core, occasional, and rare commands. We present that usage data back to you so that you can understand your own usage patterns and identify opportunities to upskill and learn more about the specialized features that our products offer. Additionally, we may also suggest personalized recommendation and learning pathways for you.

**Combining Opportunities**

As we explored both these in parallel, we started to think about what the opportunity was to bring these two different approaches closer together. One of the key limitations of skill builder is that it depends on quantity of usage of tools but has no real concept of quality. As Skill tree splits commands into different levels of complexity, we can take the blend of tools an individual uses and assess how advanced they are. As a result, we can weight tool usage so using more advanced tools builds experience faster, one of many marginal gains that aggregate up.
We also provide the user in Skill Builder with suggestions as to how they can improve the accuracy of their predictions. If they aren’t signed up to receive Autodesk insights we can provide a prompt to do so, so they get more support and we get better data.

So what?

Skill Builder and Skill Tree gives people bespoke development recommendations which are suitable for their role and experience and that are only one click away from them.

As a result of implementing these, we have learned that

- People are simple – putting ideas in people’s line of site is key, so good quality help one click away or, even better, in tool whilst they use it.
- People learn best with a variety of content. Short bite sized content, videos, sharing knowledge with others, being a superuser, getting certification from vendors are just as valuable to the users as training.
- Chunked up learning is great in a busy world.
- The data you have can really influence learning.
- Start small but think big - we know that Skill Builder will work because we did a robust pilot.
- Create a minimum viable product for the pilot as a proof of concept.

And finally share your ideas. Skills and ideas can’t be walled into one organisation. As an industry we all need to travel the improvement journey together.

How to get involved

There are two main avenues to get involved.
1. My Insights are continually being developed and the team behind this effort are always looking for customers to provide feedback or participate in user research.
2. Autodesk Research is exploring what in-product insights could look like in the next 5–10 years and conducting research into intelligent features that help our customers be more productive and achieve better outcomes. To realize this, we rely on high-quality customer data, and are looking for customers who would like to partner with us.

You can sign up for the Autodesk research community here: https://autode.sk/3p3FvVf