Mechanical & Industrial Engineering
UNIVERSITY OF TORONTO
READY LAB

Onshape CAD Analytics: A Gold Mine for Studying CAD Designer Behavior

ptc

CAD analytics provide a new, exciting, and previously under-explored mechanism to study how designers use CAD by directly analyzing their actions

By collecting time series data of CAD designer actions using Onshape audit trails:

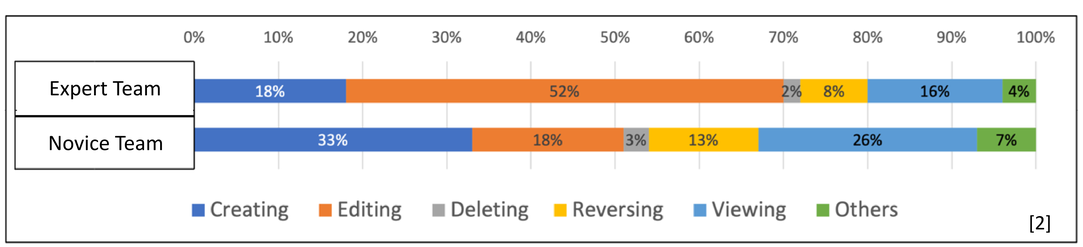
Event Time	Tab	Description
10:50:19 PM	Part Studio 1	Delete part studio feature
10:50:19 PM	Part Studio 1	Delete : Fillet 1
10:50:06 PM	Part Studio 1	Suppress : Sweep 1
10:49:24 PM	Part Studio 1	Insert feature : Sweep 1
10:48:49 PM	N/A	Cancel Operation
10:48:32 PM	Part Studio 1	Insert feature : Fillet 1
10:47:09 PM	Part Studio 1	Edit : Extrude 2
10:47:03 PM	Part Studio 1	Start edit of part studio feature
10:46:38 PM	Part Studio 1	Insert feature : Extrude 2

We can quantitatively characterize and analyze CAD usage by key metrics such as:

- Time spent on each action type
- Task switching frequency
- Recursive and iterative actions
- Number of creation-deletion cycles

No more complex cursor tracking, keystroke logging & custom scripts. Onshape's analytics collection imposes no performance penalty

Find out what distinguishes experienced and novice users



[2]

By visualizing the design process of engineers, we can **identify bottlenecks** and **assess the effectiveness of CAD training / interventions**

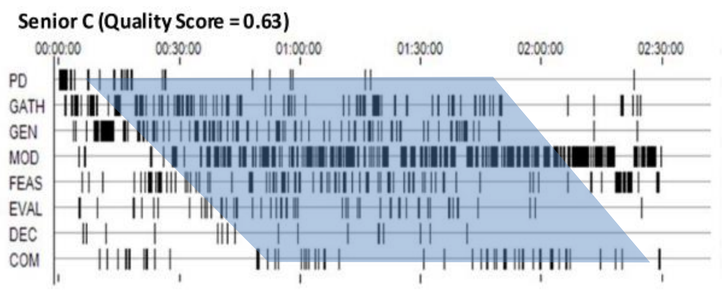
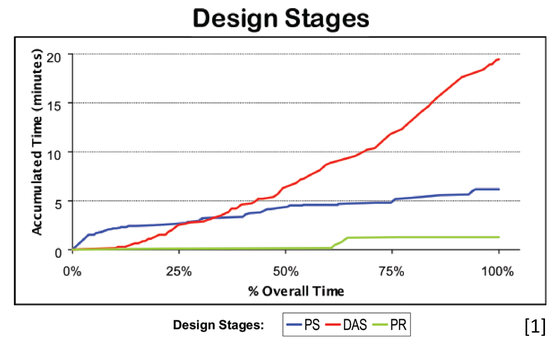


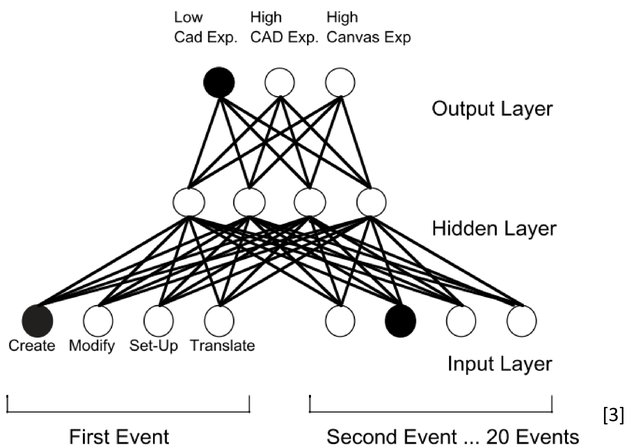
Figure – Design Process Timeline [1]



[1]

We can adopt a data-driven approach to improve CAD training:

- Identify and **encourage positive CAD practices**, such as iterative design behavior
- Provide **real time feedback** on design process
- **Validate** and **improve** existing CAD best practices



[3]

Further analyzing this data using machine learning techniques, such as artificial neural networks, offers new possibilities for evaluating, characterizing, and understanding CAD designers directly through their usage of CAD

Are you an Onshape expert? New to Onshape? We would love to have your participation in our upcoming design study! Sign up below or scan the QR code!

http://bit.ly/ReadyLabCADStudy

[1] C. J. Atman, K. Deibel, and J. Borgford-Parnell, "The Process of Engineering Design: A Comparison of Three Representations," *ICED 09*, pp. 483–494, 2009.

[2] Deng. F, Olechowski. A, "A Proposed Analytical Framework for Multi-User Computer-Aided Design Collaborative Learning Activities"

[3] S. Bhavnani, J. Garrett Jr, and D. Shaw, "Leading Indicators of CAD Experience," 5th Int. Conf. Comput. Archit. Des. Futur., no. August 2014, pp. 313–334, 1993.