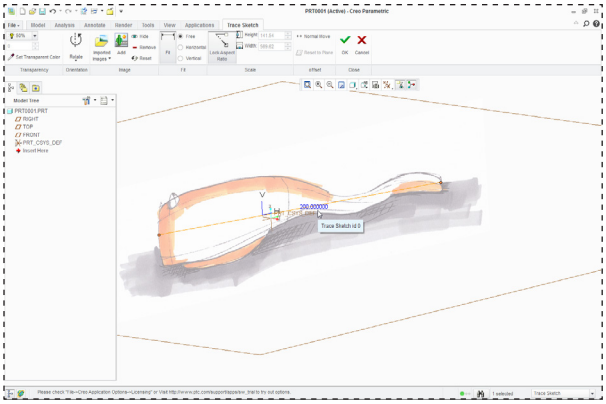
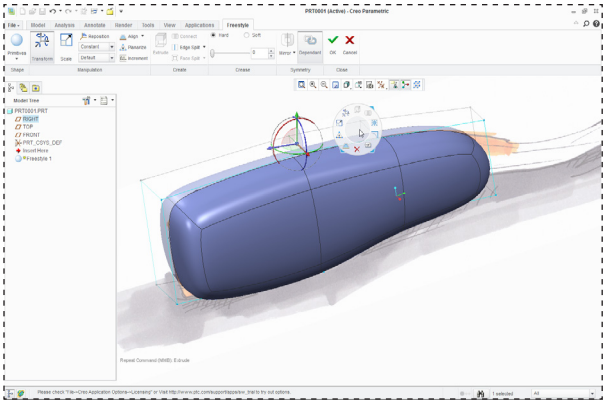
CONCEPT DESIGN WITH CREO 2.0

DEVELOP3D
SPECIAL REPORT

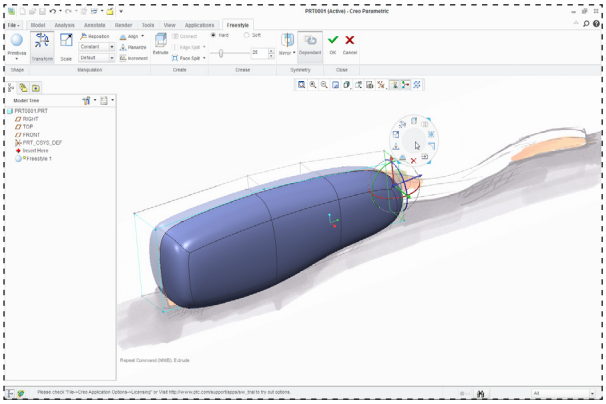
Concept design is a fundamental part of the product development process. Whether using traditional methods or computerised techniques, it's here that a product's potential can be explored most fully. DEVELOP3D explores how Creo 2.0 can fit into the process



1 Creo's Trace Sketch tools can arrange drawings to provide a reference for the Freestyle modelling tools. Each plane can be adjusted to the correct size



2 Freestyle allows the use of a primitive as the base feature. Automatic mirroring means that symmetry can be maintained in the model where needed, saving lengthy set-ups to control tangency and curvature continuity



3 Surfaces are edited using drag and drop of edges, faces and vertices of the control cage. The influence of each entity can be adjusted to build in hard edges

Making a quick sketch, creating a simple model or just throwing together ideas for conceptual design is something that designers and engineers excel at. It's at this formative stage that creative ideas can have their biggest impact – before a design is encumbered with weeks of development.

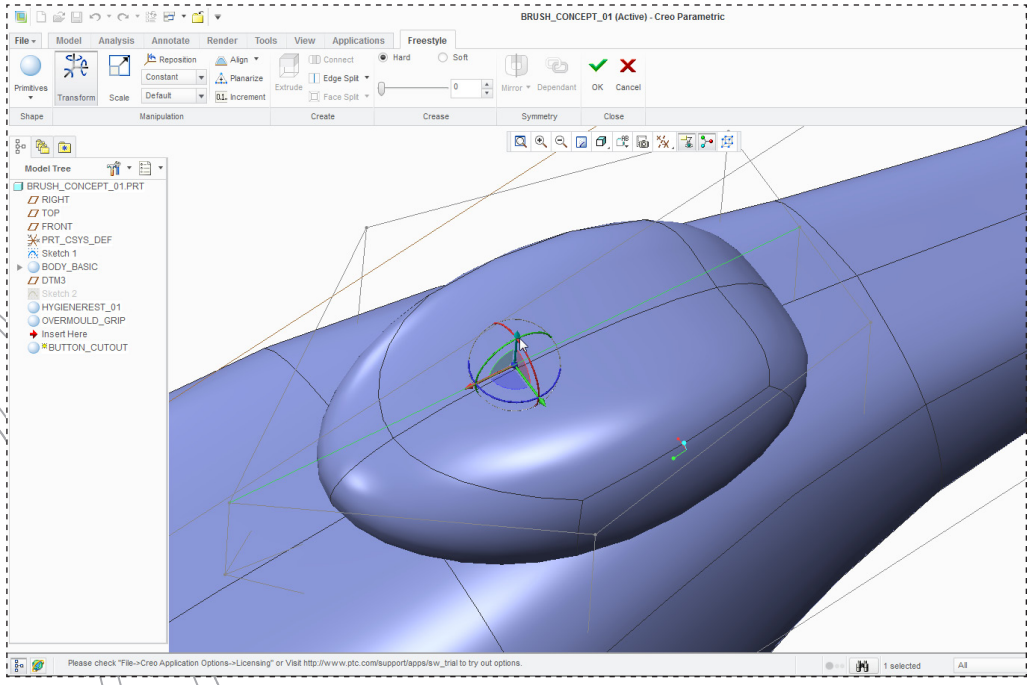
Traditional & digital sketching

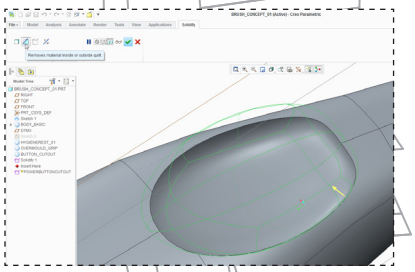
A hand drawn sketch using pencil, marker and fineliner is the traditional way to capture a concept. However, some designers are also keen to dive into the digital realm and flesh out an idea using digital sketching.

If your designs do start on screen, then there's good news. Creo 2.0 supports the import of many common data formats – including those from scanned hand sketches, industry standard systems such as Photoshop and Illustrator or from PTC's own Creo Sketch (which is a free download for anyone).

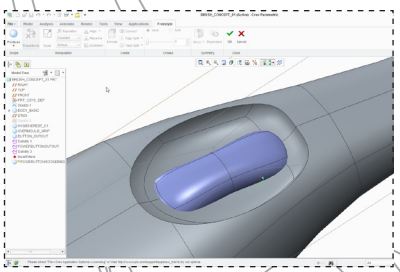
Creo 2.0 allows these sketches to be imported into image planes, scaled to size and used as reference for the 3D modelling.

4 Single parts can contain multiple Freestyle primitives which, when combined with the Solidify command's "remove material" option, allows the creation of negative features with ease while retaining editability of the originating geometry feature

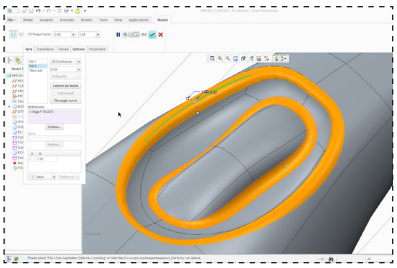




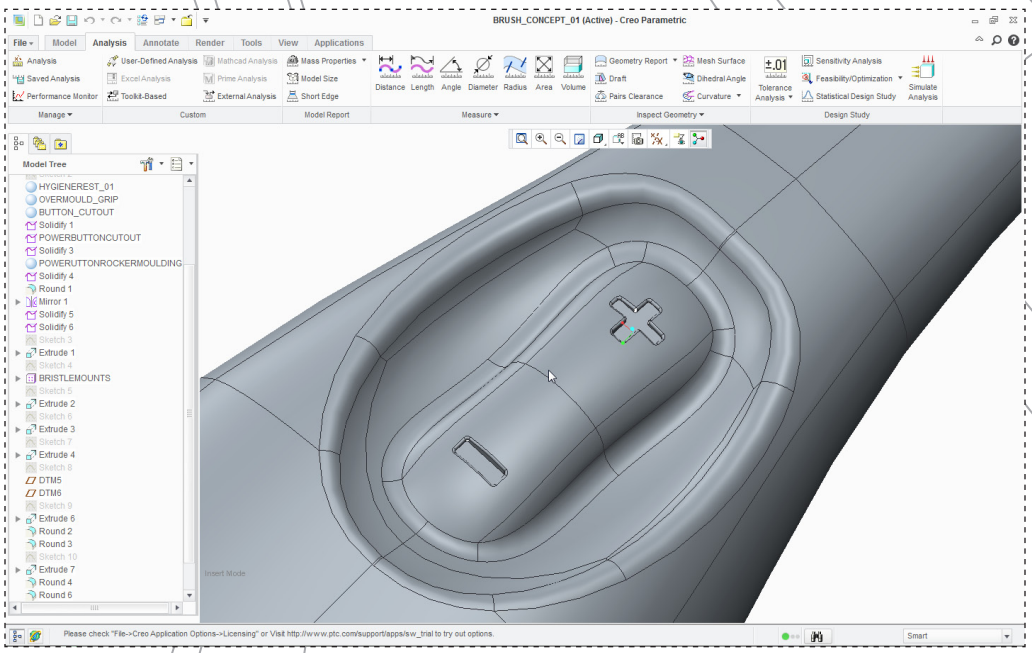
5 Here the power switch area has been recessed by removing the sub division surface primitive from the model, giving a smooth area



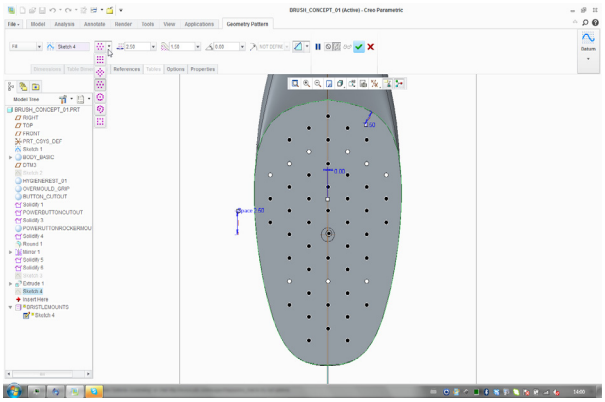
6 A second Freestyle feature is used to create a rocker switch cover intended for over moulding in a more flexible material



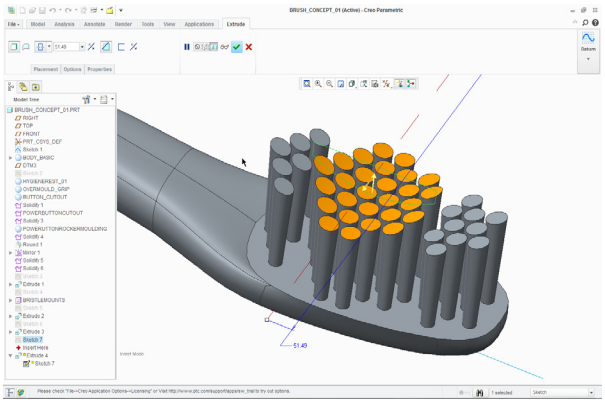
7 Rounds are used to break the sharp edges. When used in combination with the curvature continuous geometry is highly mouldable



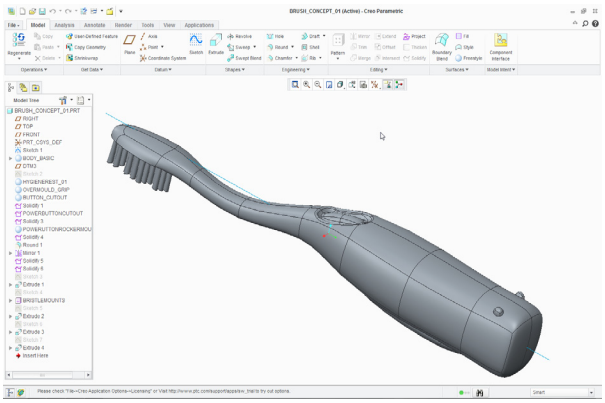
8 The recessed rocker switch cover and product details (on/off switch) are all added into the model with minimum feature overhead. The recess has been created in a single feature. With traditional modelling methods (either surface or solid-based) this would have been problematic to create and not offer as much in terms of editability. Three additional features and this portion of the concept is complete



9 Fill Patterns provide a wide range of possible patterns for bristle positioning. These can be driven by a standard form (such a linear, circular, spiral or angular) or using tabular information for positioning



10 Fill Patterns can also be used to drive feature or part placement as shown with the bristle features. More regular features such as protrusions, cuts and revolves can then be used to add additional form where required



11 The final concept is ready for rapid prototyping, for visualisation using either the rendering tools built into Creo or one of the partner applications.

3D concepting – benefits & inefficiencies

There is a lot of benefit of conceptualisation in a 3D modelling system, irrespective of whether you're starting with 2D sketches or diving straight into the 3D world.

3D models can be used to visualise a concept in a more realistic way, to build rapid prototypes for quick aesthetic and tactile evaluation, or to generate photo realistic renderings. But diving straight into 3D modelling also has its drawbacks.

Traditional 3D modelling tools require a great deal of effort to generate 3D forms. The historical weight of these modelling tools means that experimentation is limited by the time it takes to create and iterate ideas. These barriers occur at a point where experimentation should be at its most free and unencumbered.

Into this environment comes PTC's Creo and a set of tools targeting this inefficiency. By combining Creo's pre-existing capabilities with new technologies based on sub-divisional surface modelling, designers can create and edit forms quickly and efficiently. The resultant geometry can then be moved into further design work and engineering production.

Freestyle: the gateway to clean surfaces

At the core of this new toolset is Freestyle. Included as part of every Creo installation, Freestyle contains all of the sub division surface modelling tools.

Use depends entirely on the type of geometry required, but the starting point is always a primitive – cylinder, sphere, box, or a simple face. These are then manipulated using a 'control cage', which allows quick edits to be made either globally across multiple faces or to tweak specific areas.

Figure 4 shows how a single sphere can be manipulated to create a relatively complex form in a single feature.

Creo 2.0 brings another level of control to Freestyle with new tools to further refine smaller features where needed, but retains the editability of the whole – by either scaling or refining the control cage.

Intelligent iteration & experimentation

While the ability to quickly generate complex forms using sub-D modelling tools isn't unique to Creo, there are some additional benefits to using this particular toolset.

The first is that it is included in the base level package. This means there is no add-on cost and it is available for every user to take advantage of. Data is fully transportable between users and remains editable at all stages.

The second (and arguably more important) is that due to the integrated nature of the tools, design iteration,

experimentation and editing, are more seamless. If the designer wants to make an edit, either as a tweak of form or a more extensive change, then the appropriate features are edited and the system propagates the changes.

Moving into detailed design & engineering

While Freestyle introduces a raft of surface manipulation tools, the user also has the benefit of Creo's inter-operability and legacy with Pro/ENGINEER to assist with taking that concept through the refinement phase, into detailed design and engineering.

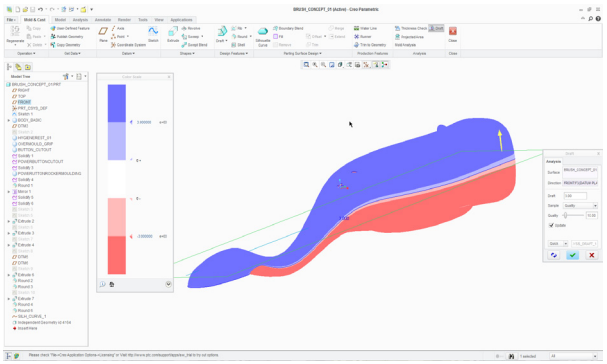
Using either the same dataset or supplementing it with parametric modelling features and additional surface models using Creo's Interactive Surface Design Extension (ISDX), everything can be handled in a single system without having to worry about passing data back and forth.

Conclusion

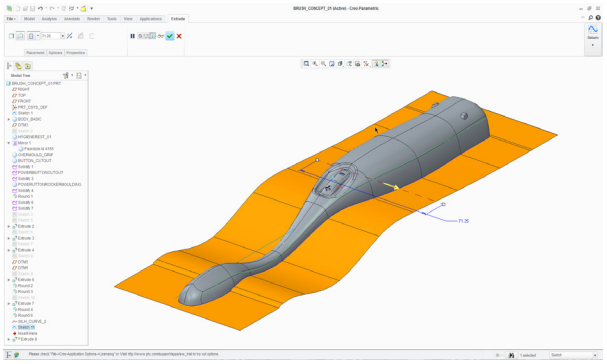
Concept design is at the heart of every project, whether starting with a blank sheet or working on a design refresh. Whether physical tools (pens, paper, napkins) are used or a more technology-led approach is preferred, the ability to flesh out those ideas into something more tangible, then evaluate and refine is key.

Only through quick iterations of these variants, experimentation with form and features can new avenues be found to solve a customer's problem or create market demand.

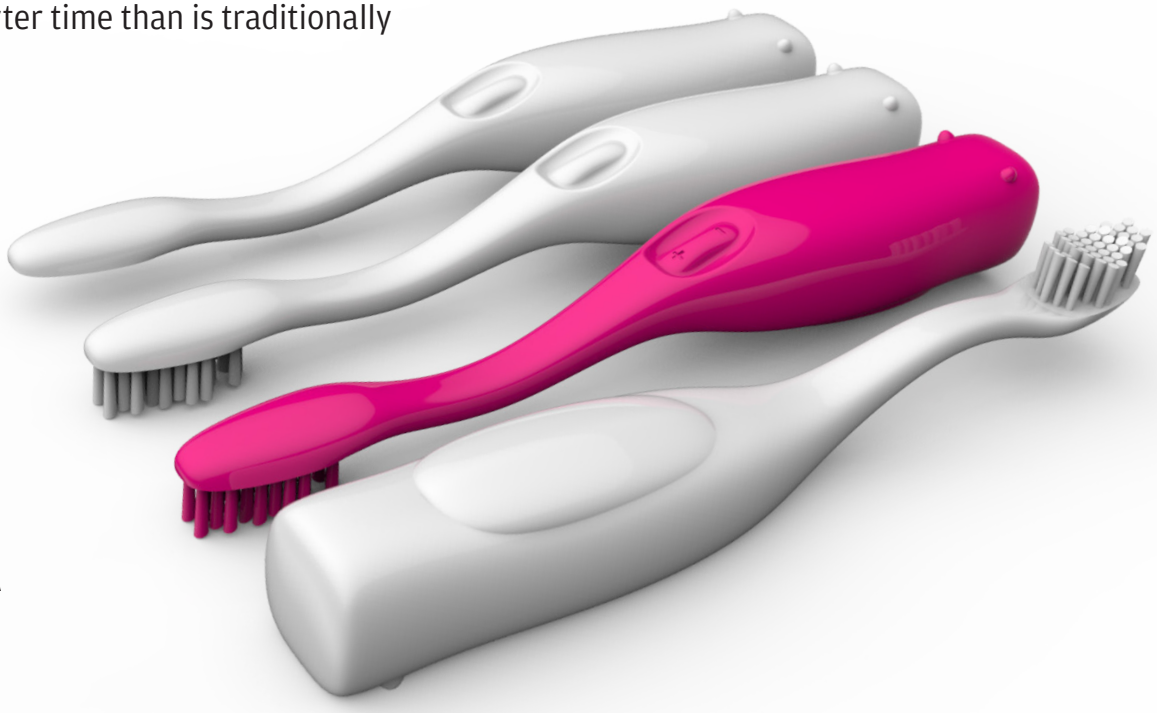
PTC has a legacy of providing advanced shape description tools backed up with some seriously hardcore engineering tools. What Creo brings is the ability to generate concepts that can feed into those tools in a dramatically shorter time than is traditionally the case.



12 At any point in the process, Creo's set of mould design tools can be used to perform draft and thickness analysis to ensure that the end result is not only aesthetically pleasing, but can be manufactured



13 The benefit of using integrated tools for concept design is that the surfaces can be taken through into the detailed design and engineering development. Here the split line is found in the direction of draw and a parting surface is built to assist with tooling design



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