

Just what you need:
simplifying electronic devices through configuration

Steve Hodges
Richard Harper
Microsoft Research Cambridge

Electronic consumer devices are becoming increasingly sophisticated. As a consequence, there is a real danger that they become harder and harder to use. One solution to maintaining ease of use is to limit the functionality exposed – less is often more in this regard. However, designers find this hard to do because of market demands; a wider range of features will potentially appeal to a wider audience. This paper outlines how a new approach to configuration may be the solution to this dilemma – whilst a device can support a large number of features, only a subset of these are exposed to the user, thereby keeping the usage model simple and easy to understand.

With continual advances in technology, we are seeing more and more electronic consumer devices. Moreover, these devices are becoming increasingly sophisticated in the type of operations they support and at the same time, increasingly versatile in the number of operations. Perhaps a good example is the digital camera. Not only do the latest cameras have higher resolution image sensors and more memory than previous models, but they support additional operations such as on-camera red-eye removal.

With more and more complexity in the underlying device, the role of design is becoming increasingly important. This is because the exact manner and form in which the capabilities and features of the device are exposed to the user becomes critical. Without good interaction, user interface, product and industrial design, devices can quickly become very difficult to use. Examples of poor design range from products with deep, difficult to navigate menu hierarchies, to those which require complex combinations of button-presses.

However, good design isn't just about exposing complex functionality in an easy-to-use, intuitive manner. (Although if this can be achieved, so much the better.) Often, the hardest part of design is deciding which features should not be present at all. Every feature that is included adds complexity to the usage model for the device [1]. Even features that aren't used have to be mentally processed, adding a cognitive overhead and increasing potential of operator error. Of course, it is very difficult to measure the cost of these extra features in terms of reduced usability of the device. On the other hand, it is much easier to predict how the removal of a feature might reduce the potential market for a device. For this reason, the phenomenon of 'feature creep' [1] dominates. The perception in electronic consumer device design tends to be that the 'safe' option is to incorporate more features, without much regard to the hidden cost of reduced usability. As a result there are few examples of clean, simple, compelling designs.

This paper introduces a novel, two-part approach to the difficulties of user interface and interaction design for electronic consumer devices. Whilst the resulting device may be capable of supporting a large range of features, only a subset of these will ever be exposed through the user interface. This means that each specific device need only support the features relevant to its specific user (or set of users), thereby making it easier to use. This new approach can be characterized simply as follows:

1. Exactly which features are available and which are not is specified during a configuration phase, prior to a specific device's ongoing usage phase. The way in which the features are accessed may also be specified during configuration.
2. Since the configuration process is not tied to the use of the device itself, it is possible to use a much richer user interface for this process – such as the GUI available on a PC.

A number of different characteristics of a given electronic device could be configured, such as: the number of features in a soft menu; the function of each of the physical buttons on a device; the nature and format of information presented on an electronic display; settings for time-based functions, and so on. Some of these individual ideas have been implemented on specific consumer devices in the past, but a unified approach to these techniques, which also leverages the richer user interface on a separate device, is both novel and valuable.

The configuration for a specific device could be specified at the time of manufacture of the device, and programmed into it for all time. Another possibility is that electronic device retailers provide a configuration service, where a trained member of staff can help to define a suitable configuration for a given customer and then provide a device configured in that way. Finally, it would also be possible for a consumer to configure a device themselves, perhaps using a web interface to specify which features they want to expose and then downloading the configuration information to the device before it is used. The last of these options also opens up the possibility for the user to change the configuration of the device from time to time if appropriate. Perhaps a feature that was not initially deemed useful suddenly becomes important – a simple re-configuration of the device would remedy the situation. Or maybe the ownership of a device changes, and the new owner has different needs.

This new concept of mass customization of consumer electronic devices, either at the point of manufacture, at the point of sale, or by the consumer themselves, brings with it a number of issues which warrant significant investigation. These include:

- Device documentation: Electronic consumer devices are traditionally supplied with printed manuals which outline their operation. Whilst a configurable device should be reasonably intuitive for its intended user, paper documentation is still likely to be important. Some way of generating a printed manual for a device automatically, based on the specific configuration of that device, would be very useful.
- Device labeling: Electronic devices typically have icons or labels next to buttons and/or indicators to describe their behaviour to the user. If the physical hardware can be mapped to different functionality, then some way of labeling the device appropriately at configuration time would be invaluable.
- Downloading configuration information: If configuration is specified using a separate device, such as a PC, there must be some mechanism for linking the consumer device to the PC to download the configuration information. Existing interfaces such as USB may prove too expensive for integration into many consumer devices, in which case a new electrical interface would be required.
- Representation of configuration: The configuration choices downloaded to a consumer device need to be represented in a defined format. A high-level, XML-type format may be too difficult for a simple device to interpret, yet a low-level binary format would be specific to a particular type of device. The solution may be for manufacturers to support automatic compilation of a configuration to a low-level format appropriate to a specific device.
- Configuration user interface: In order to make the configuration process as simple as possible, the design of the configuration interface and the exact nature of options for configuration needs to be researched and implemented accordingly.

These issues are explored at greater length in the paper, along with an in-depth consideration of the motivation of this new approach and specific examples of how it may be applied. If suitably developed, this work may form the basis of a technology that makes electronic devices simpler, and therefore easier to use.

[1] The Simplicity Shift: Innovative Design Tactics in a Corporate World, 2002, Scott Jenson, Cambridge University Press, ISBN: 052152749X