10 PROTOTYPING AND EVALUATION
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10.1 INTRODUCTION
A prototype is a representation of a product and its purpose is to be used to validate a design model. Prototyping and evaluation are related and sequential steps in a user centred product development process. Prototyping is needed prior to creating, adapting, changing and updating an atlas or any other map product, whether online, other digital or in printed format. This chapter will examine a series of prototyping methods and their evaluation.

Every methodological description and process described in this chapter is written within the context of a User Centred Design (UCD) process. UCD is both a philosophy and a process (Katz- Haas 1998). As a philosophy, it approaches atlas and map design from the position of the user. UCD is a process because it focuses on understanding what users need and how they think. UCD effectively combines the map-makers business and organizationally mandated needs with those of the atlas user by taking both into consideration and finding the best combination of each. This approach saves effort and cost due to the quality of the end-product and the reduction of design errors (Nielsen, 1994). The result will also offer greater user satisfaction and success.

There are many UCD models and methodologies, but many are made up of a variation of common stages (see Figure 10-1) as shown by the methodology used by the Atlas of Canada (Maskery 2002-05). The first stage is an examination of business requirements, followed by user requirements research in the second stage. The third stage involves the product and systems design, followed by deployment. Various research methods can be used in each stage as shown in Figure 10-1. Prototyping and evaluation occur in the second and third stages. This chapter will focus on various forms of prototyping from simple to complex and the three most valuable methods of evaluation: focus groups, one-on-one interviews and usability testing.

There must always be a target audience or group(s) of users in a UCD approach. It is important, therefore, to define target groups for a new product or determine the user group(s) of an existing one. A common method of doing this is with surveys or questionnaires, either online, by telephone, in person or by mail. For surveys, the sample size should be large enough for the results to be representative the user group(s) being researched. There are many online sample size calculators that can help reduce the effect of poor and inaccurate assumptions by permitting informed decision making.

Balances business and user requirements
Separates developers from evaluating their own designs
Increases user satisfaction and product effectiveness
Yields the right product, for the right reasons, for the right users
to determine this. The primary challenge in effective prototyping is obtaining thorough answers from users, using objective and unbiased ques-
tions, to make effective and objective design decisions. Those who make atlases and maps do not have the same perspective as those using them.

10.2 METHODS OF PROTOTYPING
There are many methods of creating good prototypes. Simple approaches can yield effective results and it is not always necessary to build elaborate functional mock-ups or prototypes. Simple prototypes are best in the beginning, gradually building in complexity with user feedback. A UCD principle in design and evaluation is that of iterative testing — start with simple and move to more complex prototypes with each usability testing iteration. One level of prototype leads to the next taking the most suitable ideas forward. This reduces risk by allowing a design team to reject unsuitable choices and make informed decisions. This approach makes the best use of resources and time, resulting in more accurate designs and greater success. This approach works equally well for atlas information architecture models, navigational paradigms, user interface designs, map layout and content designs and map reading evaluations. Not all the methods, described in this chapter need to be used. At the outset, an approach best suited for the product and budget must be determined. Prototypes should not be considered early views of final designs. Putting too much effort in early prototypes should be avoided so they do not become a barrier to design changes (ISO1999).

Card Sorting
Card sorting is an effective way to determine how map users expect an atlas or map to be organized and structured. This method, done in the early stages of development, will also make obvious what’s missing and what does not make sense. The name of each component of your atlas or map is written on a separate card or paper. The number of cards can vary from 10 to 20 or go as high as 25 to 50 or more. The user organizes the cards into what they see as logical groups and flows. If required, they can assign pre-selected group names or choose their own based on group relationships. Each card sorting exercise should be recorded through notes, a photograph or both and be repeated for a series of users. Once completed, the patterns will become evident and a logical user centred organization takes shape. Figure 10-2 shows an example of a completed simple card sorting exercise.

Storyboards
Storyboards are typically used in film and animation creation but are also effective tools for designing atlas and map prototypes. Storyboards show the step-by-step design and flow of information and can be simple or contain considerable detail. In atlas prototyping, they are useful to show the end or various end results of a card sorting activity. They are very effective in summarizing and communicating the structure of an atlas, the relationships between all parts of it and how users navigate within an atlas structure. Creating story-
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boards is easily done by pencil and paper, or in more detailed ways using illustrations. They are a useful resource in a focus group or one-on-one interview environment to discuss and obtain feedback on an atlas design. The next step could be a more detailed flow chart, wire frame diagram or static prototype showing the results of the story-board.

**Simple Static Prototypes**

Simple static, or non-interactive, prototypes are easily made using paper mock-ups or any word processing or presentation software. Creating prototype maps and atlas navigational design models this way is simple and inexpensive. They are a suitable next step after card sorting and story-boards. At this early stage, there are certain to be many possible directions that a design could take, so eliminating unsuitable design directions is the main focus. These models are basic, with no graphic embellishments, and allow atlas and map designers to initially test different map designs and atlas navigational paradigms. The design of these prototypes focuses on outlines for map and atlas page components together with basic text.

Figure 10-3 shows an example of atlas web pages using this method. Atlas users can be asked questions as part of simple scenarios to find a map or other content. Many pages like this are suitable to represent the various atlas pages; making selections from one page will lead to others. These prototypes are suitable for a usability test. Since they are so portable, these tests can be done almost anywhere, at any time.

**FIGURE 10-3:** SIMPLE STATIC PROTOTYPE USING POWER POINT FOR AN INITIAL SITE NAVIGATION USABILITY TEST, THE ATLAS OF CANADA.
Simple Functional Prototypes

The next level of prototype offers a modest amount of functionality along with more graphical enhancement. The functionality would typically be limited to that which is necessary for a successful testing scenario. For example, a user is asked to find a specific location on an interactive map, find the legend and describe what is there. For this scenario, only the zoom tool and link to the legend would be functional. If the user attempts to use another tool or link, these would not work, and the person would have to retry. This type of prototype may be more suitable for some general user groups, instead of a simple static prototype, as it will cause less distraction from the scenario activity. Figure 10-4 shows an example of this type of prototype where the increased level of detail is easily compared with the simple static prototype in figure 10-3.

Complex Functional Prototypes

Complex functional prototypes offer full or near full functionality of components of an interactive atlas. These prototypes are typically produced towards the end of the design process after simple static and functional prototypes have been produced, tested and evaluated. Too many unevaluated navigation and design ideas would compromise and clutter the testing results. The design and functions at this level of prototype are more in the nature of fine tuning than exploring new options. Figure 10-5 shows an example of a complex functional prototype, with its level of detail giving the impression of a finished product.