



Revolutionizing TV

with User-Centered Design and Research

BY ELISSA LEE AND MARGRET SCHMIDT

TiVo is committed to creating the best home entertainment experience. The company pursues this goal through offering a unique and compelling user experience (UE). To meet both user and business needs, we ground our UE design process in user research and design iteration. The result is an innovative product as well as an evangelical subscriber base.

In a recent survey, more than 98 percent of our subscribers reported that they “couldn’t live without” their TiVo® Digital Video Recorder (DVR); 40 percent said they would sooner disconnect their cell phone than unplug their TiVo DVR. A TiVo DVR records television to a hard drive instead of video tapes. You can select shows by title, actor, director, or keyword through “Pick Programs to Record,” or easily record from the on-screen TV guide. For example, instead of setting a VCR-style timer—“record channel 5 at 8:00 p.m. on Thursday for an hour”—you can simply tell the DVR to record “Survivor.” The DVR looks at the program information, figures out when Survivor airs, then records it for you each week, even if the time is extended or the day of the week changes. You access all of your recorded shows from the “Now Playing List.” You can pause live TV to answer the phone or hit instant replay when you miss a bit of dialogue. In addition, TiVo DVRs that

are connected to a home network can also take advantage of “Home Media Features”: Music, Photos, Multi-Room Viewing, and our most recently launched feature, TiVoToGo™. Some models allow you to create DVDs of your favorite shows. But while TiVo’s features are impressive, it is the experience that our subscribers rave about.

TiVo Design and Usability Tenets

From the very beginning, ease of use has been a goal of the company. Early designs were inspired by appliances and interfaces that “just worked”—in other words, ones that did not require reading manuals or learning complex controls.

Even though TiVo hardware has always had more in common with computers than TVs, the UE team constantly keeps in mind that we are designing a TV product. People have a mental model for television that differs greatly from the one they have for computers:



TVs are for entertainment. We use them in our time off. They are very dumb but wonderfully reliable. Computers, on the other hand, are powerful and smart but extremely fickle. They need to be reset and restarted, and this is considered fairly normal behavior for a computer. However, when was the last time your TV crashed?

In designing and researching TiVo, we kept this understanding in our “design mantras.” In particular, our first guidelines focused on:

- It’s entertainment, stupid. It’s playful and fun, not work.
- It’s TV, stupid. Not a computer-ish interface; no pull downs, scrollbars, cursor, etc.
- It’s as close to the TV-watching experience as possible.
- It’s a ten-foot experience (TV), not a one-foot experience (using a computer, surfing the web), or a six-foot experience (video games).
- It belongs in family rooms, dens, bedrooms, and not offices.
- You are leaning back, not leaning forward.

- It handles the “my kid pulled the plug” test.
- It’s a robust appliance, like a TV. Instant on and never crashes.
- You never have to “paper clip” it.
- If, for some awful reason, it does crash, it recovers gracefully.
- It’s video, damn it. Everything is smooth and gentle.
- There is no modality or deep hierarchy.
- It respects the viewer’s privacy.

As TiVo evolved, we revised our design mantras, but kept many of the same themes:

- The TiVo box makes TV better...
- It is reliable.
- It puts me in control.
- It’s easy to use.
- It’s smart and helpful.
- It’s responsive.
- It’s all about entertainment.
- I can’t imagine life without it.



Opposite Top: The TiVo Digital Video Recorder (DVR) replaces your VCR.
 Above Top: All of your recorded programs appear on the “Now Playing List”.
 Above Bottom: TiVo Central: When you press the TiVo button on the remote, you go to the main menu, “TiVo Central,” on the TV screen.

Our process

While it’s nice to have ideals, the success of these mantras depends on key stakeholders (management, marketing, engineering, customer support, and quality assurance) buying into the importance of a user-centered design and research process and understanding how it fits into the TiVo product release process.

The following steps in our release process assure a wonderful product that meets both business and user needs:

1. Establish requirements, including business goals, user needs, and technical limitations.
2. Iterate a design concept.
3. Write a detailed specification document.
4. Build it (engineering does this, not UE).
5. Play with the built product and ensure quality.
6. Following the product release, measure use and satisfaction.

To illustrate how our process works, we will discuss the development and release of our newest feature, TiVoToGo. TiVoToGo allows subscribers to transfer recordings from their TiVo DVR to their PC over a home network so they can watch shows from their laptop while traveling, or create DVDs of their favorites.

Step 1: Establish requirement

We continually work to understand what drives our subscribers and prospective customers. We ask how and why they are using their TiVo DVR, what their ongoing needs are, and how satisfied they are with their present TiVo experience.

Product requirements are established by Product Management based on business goals, working with the User Experience group on user needs, and with Engineering on technical innovations and limitations. If necessary, User Research defines and conducts any needed additional research.

For TiVoToGo, we knew that there was subscriber interest in taking TiVo recordings with them. We heard stories of subscribers who would take their TiVo DVR with them on vacation to their beach house or who went through the strenuous process of extracting video off their DVRs so they could take the content with them. It was also bubbling up on our feature enhancements survey. For TiVoToGo, we knew that there was subscriber interest in taking TiVo recordings with them. We heard stories of subscribers who would take their TiVo DVR with them on vacation to their beach house, or who went through the strenuous process of extracting video off their DVRs onto their computers. It was also bubbling up on our feature enhancements survey.

When we conducted a survey specifically on the concept of TiVoToGo, 96 percent of subscribers reported being very interested; 89 percent reported that, if necessary, they would upgrade their present computer to use TiVoToGo. In addition, we looked at subscribers’ present behavior of viewing DVDs on the go, and watching and editing video on their computers, and found that 82 percent watched DVDs away from home and 60 percent watched and edited video on their computer.

Step 2: Iterate a design concept

From the requirements and the research findings, a designer creates an initial design concept with Visio or PowerPoint wireframes—reviewing them first with the User Experience team and then with the stakeholders for the project.



Fig 1

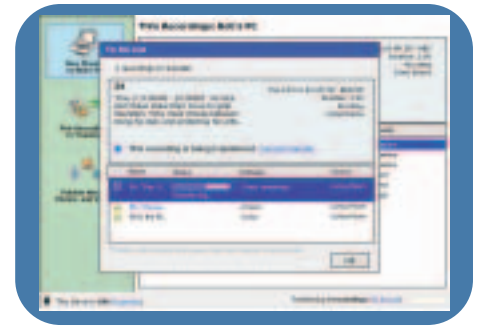


Fig 2

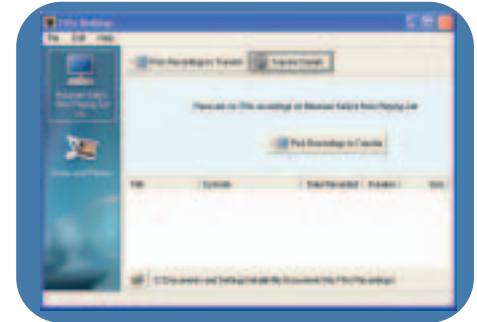


Fig 3

The design concept is a walkthrough of the most frequent tasks we expect users to undertake. If the stakeholders believe the concept meets the requirements, we begin usability testing of the design. Typically, we create a fully functional prototype that can be displayed on a TV and controlled with a TiVo remote.

In usability testing, the researcher uses the following criteria to assess the design:

Ease of learning

- How fast can a subscriber who has never seen the UI before learn to do basic tasks? Does the design make sense to subscribers? Do they understand what they can accomplish in the new UI?
- How fast can someone who has never used TiVo or seen the UI before learn to do basic tasks?

Memorability

- Can existing subscribers remember enough to use it effectively the next time, or do they have to start over again?

Severity and frequency of errors

- How often do users make errors while using the new design?
- How serious are these errors?
- How do users recover?
- What are the users' reactions to errors? What is the intensity of their response?

Subjective satisfaction

- "How much does the user *like* using the new UI or feature?"
- "Mental models and TiVo conventions"
- "Does the proposed UI fit within users' understanding and conception of television?"
- "Does the proposed UI fit within users' conceptual model of how TiVo works?"

Based on the findings, we iterate the design and the usability testing.

For TiVoToGo, we went through two major design iterations and two usability tests. The first round of usability testing brought to the surface a few big problems with the design. We found that subscribers were having

a hard time discovering how to transfer shows to their PCs and recommended design changes to improve this. While no one failed to transfer a show and everyone was able to use the feature, testing showed that subscribers were using a mental model that we were not matching, and that the user interface was leading them to some incorrect conclusions.

For example, the "To Do List" appeared in a couple of places in the application. TiVo subscribers know that you go to the "To Do List" to check for upcoming recordings. While we thought a similar To Do List in the PC application was a clever way to convey which transfers were upcoming, we found that some subscribers thought it was associated with music and photos. As a result, the top-level navigation was reconfigured and the second usability study found the redesign to be much more in line with users' expectations and mental models. See Figures 1-6 for the design changes that occurred. In addition to testing the transfer experience, we designed and tested the PC application installer and downloading the new "TiVo Desktop" application from the web.

During the usability testing for TiVoToGo, we made a finding that we chose to ignore. We initially found that some buttons in the middle of the screen were being overlooked. While we could have moved or redesigned these buttons, we knew that this problem might have been an artifact of the prototype we were using. We chose to keep this portion of the design the same, and found in our second usability test with a higher fidelity prototype that users did not have any problems with these buttons. We like to tell this story to remind ourselves that the testing artifacts themselves can create problems, and that being mindful of the differences between low- and high-fidelity prototypes is all that it takes to avoid this pitfall.

Step 3: Write a detailed specification

The designer then creates a written specification for engineering that details every screen, error condition, use case (including uncommon ones), and final text. For TiVoToGo, three different specification documents—DVR changes, PC application, and PC installer—were completed, comprising well over 125 pages that detailed the behavior and flow of over 100 possible actions. Even the smallest and least likely use cases were accounted for.

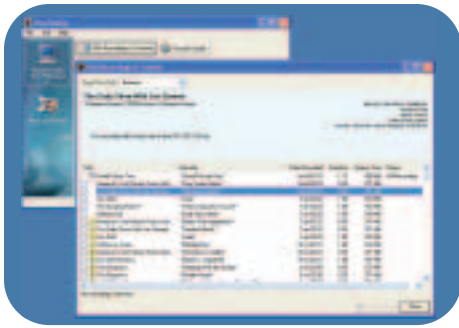


Fig 4

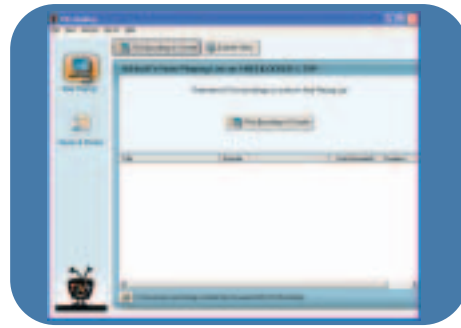


Fig 5



Fig 6

Fig 1 "Pick Recordings to Transfer" was the top level navigation. Fig 2 The "To Do List" was used to show transfer status. Fig 3 Second iteration: "Pick Recordings" became a subtask of the main destination, "Now Playing." Fig 4 The "To Do List" was renamed "Transfer Details." Fig 5 Final version: here is the "Now Playing List." Very few changes came from the final round of testing. One was that "Transfer Details" was renamed "Transfer Status." Fig 6 Here is the final "Pick Recordings to Transfer" screen.

Step 4: Build it

Engineering starts building, and we can begin using the feature at home and then deploying it to alpha and beta testers.

Step 5: Play with it as a built product and ensure quality

As we enter field testing (alpha, beta, and early access), User Research follows up on usability issues and user perception of performance and video quality. The researcher designs the tasks and surveys for the beta testers to complete to get further user feedback. Because some tasks cannot be easily modeled in the lab and need to be evaluated while the user lives with the product, field testing is an invaluable opportunity to understand how new features will be received and used in subscribers' homes.

For TiVoToGo, we checked whether subscribers would know how to get the required video plug-in for the feature, if they could figure out how to transfer shows, and if they were comfortable with the overall TiVoToGo experience from installation to use. Through a series of questionnaires to our alpha, beta, and early-access populations, we identified that a primary issue was transfer speed. As a result, we prioritized engineering fixes to improve this area. However, we determined that even with transfer speed issues, subscribers found TiVoToGo easy to use and were very satisfied with the feature overall.

In addition to following up on TiVoToGo, we also assessed users' perception of video quality and performance. In a diary study, users recorded and rated the video quality of the programs they watched for a week. We then analyzed their in-home viewing and ratings to evaluate video quality. While video quality seems like the ideal issue to study in a lab setting, subscribers' television sets, cabling, and setup configura-

tions are all different. As a result, this diary study has become a standard step in our release process so that we can understand what our subscribers are experiencing in their homes. Similarly, we conduct cross-sectional studies on subscribers' perception of performance on common TiVo DVR tasks after every release.

Step 6: Following release, measure and use satisfaction

After releasing a feature, we continue our research by measuring use and satisfaction. We monitor customer feedback through customer support and user forums and measure subscriber satisfaction through surveys. In addition to the narrowly focused research questions on a specific feature, we also investigate broader issues, such as ways to improve our out-of-box experience, what are the most frequently used features of the TiVo service and why, and a host of other questions.

As TiVoToGo is released to subscribers, we work with customer support and track any issues reported in calls. We are in the process of preparing two subscriber surveys, one that is narrowly focused on TiVoToGo use and satisfaction, and another that is more broadly concerned with subscriber satisfaction in general. And once enough units have the new software to ensure privacy for the ten thousand boxes we randomly sample, we will begin examining the logs to understand how our subscribers use TiVoToGo.

Conclusion

TiVoToGo is a recent example of how TiVo identified unmet user needs and developed a product design based on user feedback. In our quest to deliver home-entertainment products that everyone in the household will use, we relied on the principles of user-centered design to keep us on track. **UX**

ABOUT THE AUTHORS



Elissa Lee, Ph.D., is the manager of User Research at TiVo. In this role, she helps team members define, manage, and conduct research. Prior to joining TiVo Inc., she served as the head of Human Research at the Casio U.S. Research and Development Center where, for three years, she developed user-centered research and innovation processes to guide and inform the development of connected devices. She can be reached at elissa@tivo.com.



Margret Schmidt is the director of User Experience at TiVo, where she manages interaction designers, researchers, prototypers, and graphic artists who create interfaces for the TV, PC, Mac, and web components of the company's business. Over the four years she has been at TiVo, she has changed the design process to accommodate strong design leadership and to create buy-in with stakeholder groups. She can be reached at margret@tivo.com.

Elissa and Margret will be presenting "Making User-Centered Design Work at TiVo" at UPA 2005 in Montreal this June.