A Stage-Based Model of Personal Informatics Systems

Ian Li
Anind Dey
Jodi Forlizzi

Introduction

People strive to obtain self-knowledge. A class of systems called personal informatics is appearing that help people collect and reflect on personal information. However, there is no comprehensive list of problems that users experience using these systems, and no guidance for making these systems more effective.

We conducted surveys and interviews with people who collect and reflect on personal information. We derived a stage-based model of personal informatics systems composed of five stages (*Preparation*, *Collection*, *Integration*, *Reflection*, and *Action*) and identified barriers in each of the stages.

http://personalinformatics.org/lab/model

Stages

| PREPARATION | COLLECTION | INTEGRATION | REFLECTION | ACTION |
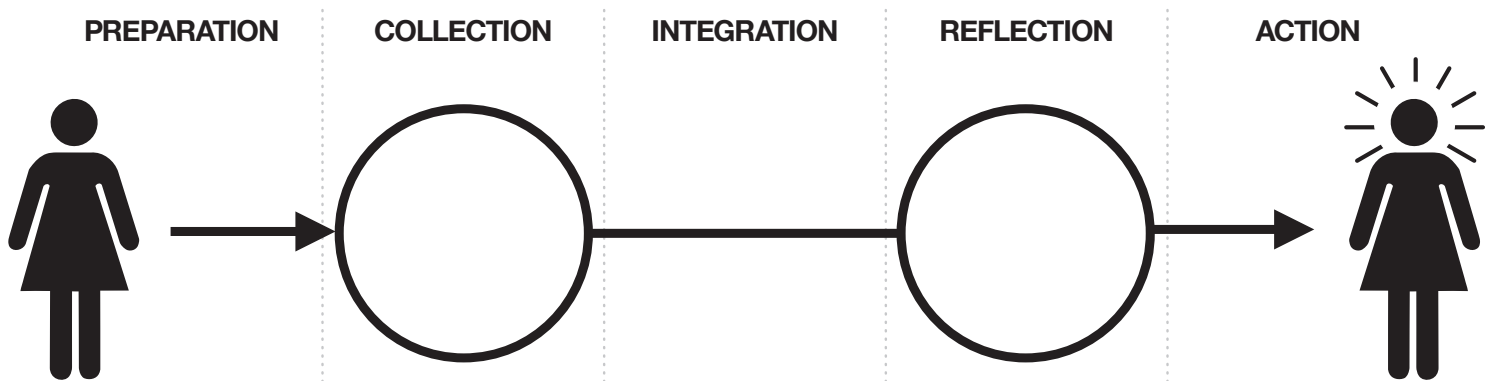
The **Preparation Stage** concerns people's motivation for tracking, identification of what information to track, and selection of what tools to use for tracking.

The **Collection Stage** is the time when people collect information about themselves, such as their inner thoughts, behavior, social interactions, and their immediate environment.

The **Integration Stage** is where the information collected in the Collection stage are prepared, combined, and tranformed for user to reflect on.

The **Reflection Stage** is when the user reflects on their personal information. Users may reflect on the information immediately after recording (short-term) or after several days or weeks (long-term).

The **Action Stage** is when people choose what they are going to do with their newfound understanding of themselves.

Barriers

Preparation Barriers can occur when users choose the wrong information to track or when users select an inappropriate tool that does not satisfy their information needs. These incorrect selections can lead to data loss and wasted time.

Collection Barriers

Tool	"not having ready access to a computer at the time symptoms happen"
Remembering	"Forgetting to record it. Because I am often not at my personal computer."
Lack of Time	"Not difficult, time consuming at times."
Finding Data	"Sometimes life isn't interesting enough to make me want to write it down, other times I can't find any worthy writing material."
Accuracy	"Guesstimating mass of food matching homemade or restaurant foods against database entries"
Motivation	"Keeping up the motivation to do so, finding payback for the investment of time and effort."

Integration Barriers

Transcribing Data	"It'd be neat if I could graph it straight from the website instead of manually typing in the data to a spreadsheet"
Organization	"Collecting is simple. Organizing it takes some time."
Scattered Visualizations	"A bit cumbersome going to so many different sites [for visualizations]"
Multiple Inputs	"Difficult to keep organized because sometimes data are kept in separate places."

Reflection Barriers

Lack of Time	"Having time to go through everything, but that is also one of my biggest pleasures is finding that time."
Visualization	"It's hard to get a holistic view of the data since the time filters are at most one month and I'd like to look at several months at once."
Self-criticism	"It's extremely difficult (psychologically) to look back on my earliest journals. Much of that information is very emotional and innocent."
Interpretation	"Sometimes its very difficult to interpret the media."
Search	"Not too tough. sometimes have to wait while search occurs... but it's a couple minutes at most."
No Context	"Not having an overlay of changes in circumstance."
Sparse Data	"Not enough: My collection of data has been intermittent enough that I don't get good time series."
Data is Not Useful	"It's really not very useful and it's kind of annoying. I mean, I walk a lot. What else do I really want to know?"

Action Barriers can occur among the different ways that systems support this stage. Some may tailor their behaviors to match their goals. Some systems alert users when particular thresholds are met. Some systems provide incentives to motivate users to take action. Most systems do not have specific suggestions on what to do next, which is a barrier to applying understanding of personal information.

Properties

Barriers cascade.

Problems in earlier stages affect the later stages. For example, not selecting the right tool during the Preparation stage may lead to reflecting on incorrect data. Another example is that problems in the Collection stage may lead to sparse data, which may be insufficient for insightful reflection.

Stages are iterative.

Stages are iterative; users will incorporate new data, tools, and processes as they progress through the stages. For example, a user may change the types of exercises she performs. These changes may require new tools, new types of data, and different visualizations. Often times, the user cannot bring their old data along with them. This causes problems because it makes comparing between different types of exercise more difficult.

User- vs. System-driven

Each stage can be classified as user-driven, system-driven, or a combination of both. In a user-driven stage, the user is responsible for the activity in the stage, while in a system-driven stage, the system is. For example, a user-driven Collection stage may require users to record information into a spreadsheet, while a system-driven stage may use sensors to track personal information.

Facets

This property concerns facets of a person's life. Most systems are uni-faceted, collecting only one facet of a person's life (e.g., Mint for financial matters, Nike+ for physical activity). Some systems are multi-faceted, collecting multiple facets of a person's life (e.g., Daytum, your.flowingdata). However, such systems usually present multiple facets in separate visualizations. Many participants expressed their desire to see associations between different facets of their lives.

Design holistically.

This property suggests that the development of personal informatics systems should be approached holistically. Of course, we should take inspiration from different fields to resolve problems within each stage (e.g., visualization techniques from the information visualization community), but development should not focus only on one stage, but consider the whole experience of the user throughout the different stages.

Maintain flexibility.

This property suggests that systems should be flexible to support users' changing information needs. Some examples are support for easy importing and exporting of data and rapid iteration so that users can hone in on the questions they want to answer.

Balance automation and user control.

This property suggests that there are opportunities to alleviate the demands on the user using automation; however, developers should consider the tradeoffs (e.g., inaccuracy of automated tracking and loss of user control.)

Associate multiple facets.

This property opens several opportunities to explore how applications can better support awareness of associations between different facets of life.