So You Want to Automate?

A guide for when and how to automate clinical tasks

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Many times, automating tasks can greatly enhance productivity, safety and user experience during interactions with medical devices. For example, converting volume of a prescribed drug into concentration level for infusion is something that a technical system does quite well while a typical user may be error prone for such tasks. However, there are times when design and development teams may tend to automate just for the sake of automation. Thinking all automation is good and the best automation is that which fully performs all tasks may actually result in poor clinical performance and lack of market acceptance. When determining what functionality of the system should be automated, and to what level, consider only automating those aspects of the system that end users:

1) feel should be automated. Assume that end users desire aspects of the system to be automated only if they are willing to lose some or all discretion[1] in completing the task.

2) are not particularly good at performing and which technical systems do quite well. As with the volume to concentration conversion task mentioned above.

This document includes a set of items to be used to evaluate current system automations and to perform front end analysis of proposed automation. It also includes a set of guidelines to be investigated to determine if automation should be used to perform a task and the extent of the automation (fully automated vs. less sophisticated computer aid to enhance or enable user decisions and/or actions.

The following guidelines should be considered when proposing automation.

1) To the extent possible, only automate functions that the end users feel should be fully automated or computer aided. Those for which they are willing to lose discretion.

2) Assure the level and number of functions allocated to the end user form a coherent set of responsibilities, with an overall level of discretion consistent with the abilities and desires of the end user.

3) Avoid automating functions when the anticipated level of performance is likely to result in regular intervention on the part of the end user. That is, once a certain level of discretion is lost, avoid automation where the level of discretion on the end user must

[1] In this case, discretion refers to the extent that a user is in control of the use environment. That is, a task that required the user to have a high degree of discretion is one where he or she has complete control over the outcome. Inversely, a fully automated task allots for a minimum amount of user discretion. Many clinical tasks fall somewhere between these two extremes.

be again increased (level fluctuates over the course of the task). In the case of computer aids (as opposed to fully automated features) a certain level of end user discretion is maintained, but the rule still applies, the computer aid should not increase or decrease the users' involvement during the process.

The following items should be addressed in determining the existence or level of automation.

1) Characterize the functions of interest in terms of whether or not these functions currently require humans to exercise significant levels of skill, judgment, and/or creativity.

2) Determine the extent to which the human involved with these functions value these opportunities to exercise skill, judgment, and/or creativity.

3) Determine if these desires are due to needs to feel in control or achieve self-satisfaction in task performance. Or is an opportunity highly valued due to potential or realized inadequacies of the technology in terms of quality of performance or ease of use.

4) Should the task be completely automated or do the end users desire a less sophisticated computer aid?

Once the level of automation has been determined and implemented…

1) Assure the customer users are aware of the objectives of the automation.

2) Provide training that assists end users in gaining any newly required abilities to exercise skill, judgment or creativity.

3) Assure end users understand the abilities AND limitations of the automation and know how to monitor and intervene appropriately

As with any guidelines, the ones posed here are meant to "get the design in the ball park." To take it one step further, participation of typical users will ultimately result in a design that minimized the risk of use error and optimizes the user experience of the marketed product. Data provided by analytical user centered activities (user profiles, task analysis, use error analysis, etc.) and empirical usability testing with early prototypes during the development process will define many of the design inputs needed for a successful outcome.

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