Practicum Report

By

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Submitted in fulfillment of the

HIT 5000: Practicum in Applied Health Informatics

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SUMMARY

The practicum in Health Informatics is a means for the students to apply the knowledge gained during the various courses taken throughout the graduate course work, to the real world. Much of the work that I have done for this practicum relates back to the course work done for HIT 5323 (Evaluation of Health Information Systems in Applied Health Informatics) and HIT 5329 (Assessment and Evaluation). The methods used to identify and assess different aspects of healthcare systems and healthcare workflow and the evaluation of health information system can be applied to this practicum project. The learning objective and the expected outcomes from this exercise include learning about the tool itself and studying how effective the tool is to measure user performance. Both the HIT 5323 and HIT 5329 courses were directly related to the activities that emphasized the need for a user-friendly electronic health record (EHR) design. In the usability studies conducted in HIT 5323, we learnt that, if properly designed, an EHR can improve the quality of the healthcare delivered and increase satisfaction of clinicians and patients. For the purpose of this practicum, a small study was conducted for 2 ambulatory physician practices where the TURF tool was applied and efficiency of the users to complete the same task using two different electronic medical record (EMR) software products was compared.

INTRODUCTION

The practicum in Health Informatics at the UT Health School of Biomedical Informatics requires the students to select an area of interest where the knowledge and skills gained during the didactic courses can be applied to real world. I have been an EMR implementation analyst for over four years. Having been through various implementations, I was interested in studying the usability of the various EMR software products that are used in the ambulatory physician practices. With the help of my advisor, Dr. Fenton and the Executive Director of the Gulf Coast Regional Extension Center (REC), Mr. Sam Liong, I was able to finalize the project for my practicum study. The project was to perform usability evaluation for small physician practices using a framework analysis tool developed at UT Health. As a part of my study, I had to offer a minimum of two small practices a no-cost usability evaluation of their work processes using the TURF usability analysis tool. It was necessary for me to learn the TURF usability framework and become familiar with using the tool to apply it to the two practices and gather the needed data to do the analysis.

LEARNING OBJECTIVES AND EXPECTED OUTCOME

The learning objectives for the practicum involved applying TURF usability framework in a minimum of 2 small practices recommended by Gulf Coast REC.

1. Initial objective was to set up TURF framework to study usability evaluation, testing, measurement and design of electronic health record systems.
2. The second objective involved identifying inefficient processes and give recommendations for increasing efficiency at the practices where I was going to conduct the usability study.

The following were the proposed outcomes of the practicum study:

1. Study the TURF tool in-depth using online tutorials and videos found on the TURF website.
2. Under guidance of the REC, apply the TURF usability tool to a minimum of 2 physician practices work processes. The two practices need to be using EHR software.
3. Research the effectiveness of the tool itself and make recommendations to improve the tool. Learn how to use TURF to measure user performance after the training.

TURF FRAMEWORK

The TURF Usability Toolkit has been developed by the SHARPC research group working on addressing the usability and workflow challenges of health information technology (HIT). Per the TURF toolkit website “The National Center for Cognitive Informatics and Decision Making in Healthcare (NCCD) is funded by the Office of the National Coordinator for Health IT (ONC) under the Strategic Health IT Advanced Research Projects (SHARP) Program which supports improvements in the quality, safety and efficiency of health care through advanced information technology”. The TURF tool enables data collection that spans capturing user audio, video and keystroke events when the users interact with the EMR software. The tool assists in detailed annotation using evaluation templates and generates statistical reports to evaluate the data collected at the time of usability testing.

My initial objective was to set up TURF framework, study the tool itself and evaluate the toolkit. I decided to evaluate the toolkit based on two evaluation methods. The first one is a criteria-

based assessment, which is a software evaluation methodology described by Jackson, Crouch and Baxter in their paper 'Software Evaluation: Criteria-based Assessment'. The second evaluation method that I decided to use was Nielsen's Heuristics.

The criteria-based assessment gives the measure of quality in the areas of usability, sustainability and maintainability. The criteria based assessment involves checking whether the software follows numerous features or shows the qualities that are expected of a sustainable software. For the purpose of my study, I focused only on usability, documentation and sustainability aspect of the criteria-based evaluation methodology. The following criteria was used to evaluate the TURF tool usability and sustainability.

EVALUATION OF TURF FRAMEWORK

Usability

Understandability	**Yes/No, supporting comments if warranted**
How straightforward is it to understand:	Software is pretty straightforward to understand
What the software does and its purpose?	It is a toolkit to measure usability of EMR systems.
The intended market and users of the software?	EMR software trainers and developers
The software's basic functions?	Capture user interactions while navigating various EMR screens
The software's advanced functions?	In-depth statistical reporting functionality
High-level description of what/who the software is for is available.	No. There is inadequate documentation on the website explaining the audience and purpose of the software
High-level description of what the software does is available.	Yes. There is documentation on the website describing what the software does.
High-level description of how the software works is available.	The Tutorial videos are very good and sufficient to understand how the software works.
Design rationale is available – why it does it the way it does.	No.
Descriptions of intended use cases are available.	Yes. The videos explain the use cases very well

Case studies of use are available.	No

Documentation

Looking at the user documentation, what is its	**Yes/No, supporting comments if warranted**
Quality?	The documentation is only in form of online videos. The quality of which is very good.
Completeness?	The training videos were thorough and complete
Accuracy? Appropriateness? Clarity?	The training videos were accurate, appropriate and very clear
The only desired documentation was a written online help section. It was glaringly missing and would have added value to the TURF website	
Lists resources for further information.	No
Is task-oriented.	Yes
Consists of clear, step-by-step instructions.	Yes
Gives examples of what the user can see at each step e.g. screen shots or command-line excerpts.	Yes

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Sustainability and maintainability

Identity	**Yes/No, supporting comments if warranted**
To what extent is the identity of the Project/software clear and unique both within its application domain and generally?	It is very clear as the TURF tool is very well branded
Project/software has its own domain name.	Yes
Project/software has a logo.	Yes
Project/software has a distinct name within its Application area.	Yes
A search by Google on the name plus keywords from the application area throws up the project web site in the first page of matches.	Yes
Existing trade-mark.	Yes
Project/software name is trade-marked	Yes

Installability

How straightforward is it to:	
Meet the pre-requisites for the software on a target platform?	Very straightforward as this is a free downloadable software
Install the software onto a target platform?	Very easy if you have a Java plug-in installed
Configure the software following installation for use?	No configuration required
Verify the installation for use?	Just like any executable that is downloaded from the internet
Web site has instructions for installing the software	Yes.

The second evaluation method that I used to evaluate TURF tool was Nielsen's Heuristics.

Nielsen's Heuristics

Heuristics	**Did TURF tool pass this criteria?**	
• **Visibility of system status**	The system should always keep users informed about what is going on, through appropriate feedback within reasonable time	Yes
• **Match between system and the real world**	• The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.	Yes
• **User control and freedom**	• Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.	Yes
• **Consistency and standards**	• Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.	Yes
• **Error prevention**	• Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate	Yes

Heuristics	Did TURF tool pass this criteria?	
	error-prone conditions or check for them and present users with a confirmation option before they commit to the action.	
• **Recognition rather than recall**	• Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.	Yes
• **Flexibility and efficiency of use**	• Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.	Yes
• **Aesthetic and minimalist design**	• Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.	Yes
• **Help users recognize, diagnose, and recover from errors**	• Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.	Yes
• **Help and documentation**:	• Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.	It would have been helpful to have an online 'Help' menu with documentation for novice users like me. The only source of help were the online videos.

TURF FRAMEWORK EVALUATION CONCLUSION

The TURF FRAMEWORK was easy to install. It is a software that can be downloaded from the internet with the help of a Java plug-in. After evaluating the software using the criteria-based assessment and Nielsen's Heuristics, one can infer that it meets almost all of the measures described in the two measuring tools. The higher the scores achieved on the rating scale the better the software that is being evaluated. From the scores achieved on both the evaluation criteria, it would be safe to infer that the TURF Framework software has good usability and sustainability and users will find it greatly helpful when trying to use it for assessment of EMR systems implemented in the physician practices.

APPLICATION OF TURF TOOL

Under guidance of the REC, the TURF usability tool was installed on a laptop that belonged to the Gulf Coast REC (GCREC). The Executive Director of GCREC and another GCREC analyst working with the physician practices reached out to the two physician practices who agreed to participate in the small study. One of the practices was using NextGen as their preferred EMR software while the other practice was using Practice Fusion as their preferred EMR software in their respective practices.

In order to have a baseline evaluation criteria, it was decided that I would record the workflow for the E-prescribing feature of both the EMR software. For users to conduct user testing of the respective EMR software at the two practices, the following steps were set up within the TURF software.

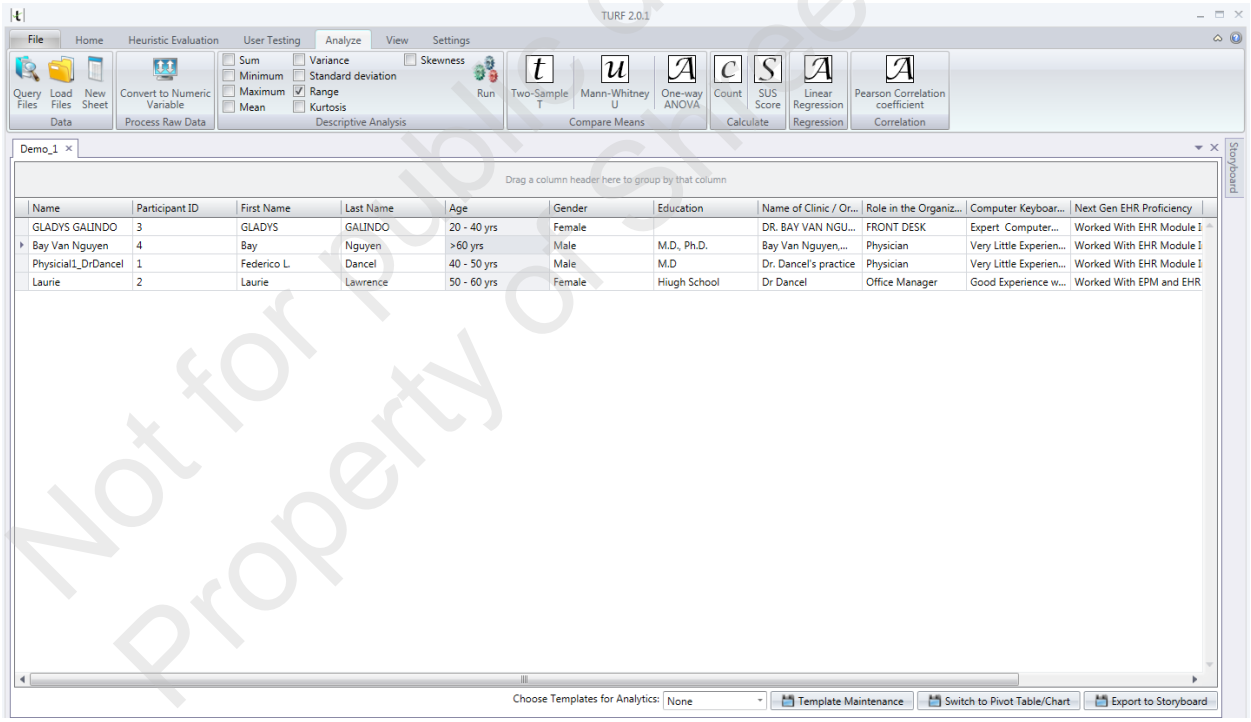
1. Set up two testing projects separately for the two practices.
2. Create folder structures for user data to record the E-prescription workflow in NextGen and Practice Fusion respectively.
3. Create Demographics form and System Usability Survey forms for users to fill out.
4. Set up the Data capture folders so that the users can record the workflow in real time.
5. Set up User Testing forms for the users to complete.
6. Export the User Data.
7. Analyze the data using the statistical tools available in TURF.

With the set up for recording the user workflow ready on the laptop, I was able to visit the two practices with the GCREC personnel. The physicians were asked to open the folders created in their name for recording the workflow and asked to click the 'Record' button in TURF and follow their usual workflow when they e-prescribe a medication using their EMR medication module. After the workflows were captured, the two physicians and their MA's who participated in the study were asked to fill out a System Usability Survey (SUS) so that the SUS scores could be calculated at the end of the study. The user testing analytics was done using descriptive analysis, analysis of the SUS scores, task time comparison, task time and number of steps comparison and creating pivot comparison table to compare the efficiency of the two EMR software.

USER TESTING ANALYTICS

1. Descriptive Analysis

   This analysis compared the Users on the criteria of age, gender, education, role in the practice, computer proficency, EMR software proficiency

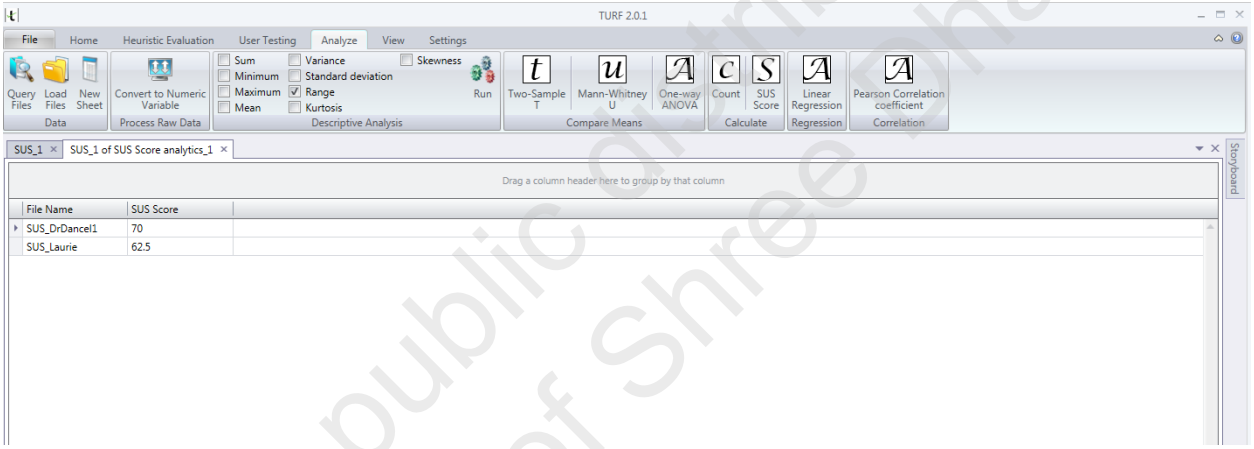


2. Analyze SUS scores

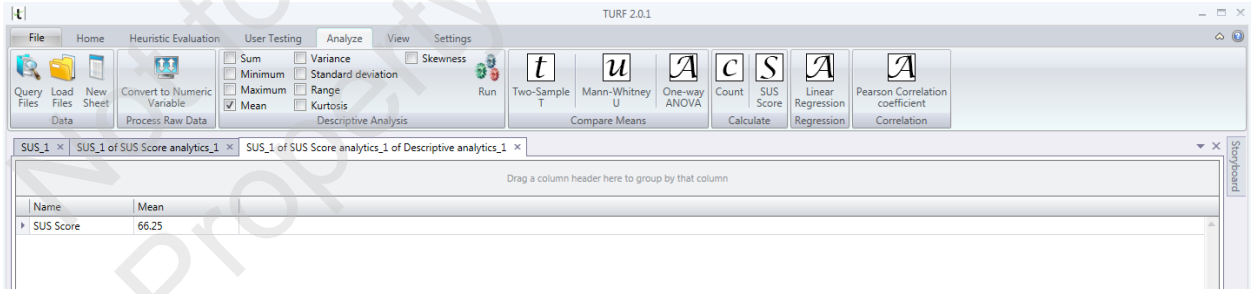
   At the end of the workflow recording each participant was asked to fill out a survey that measured the satisfaction of the user with the software. Using the statistical functionality of the TURF Tool, the SUS scores were calculated and compared for both the EMR software products.

   The SUS score for NextGen was 66.25 and the SUS score for Practice Fusion was 60. Please see the images below to view how the SUS score is calculated using the statistical functionality in TURF.

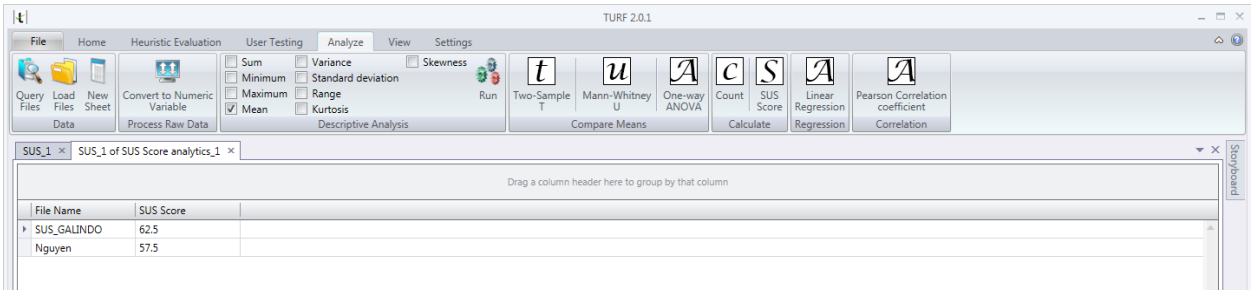
NextGen SUS Scores for the physician and the medical assistant (MA)



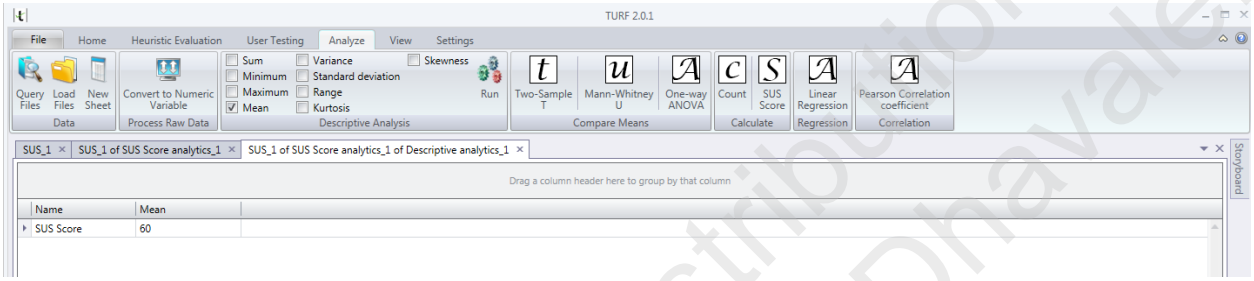
NextGen Average SUS Score



Practice Fusion SUS Score the physician and the MA



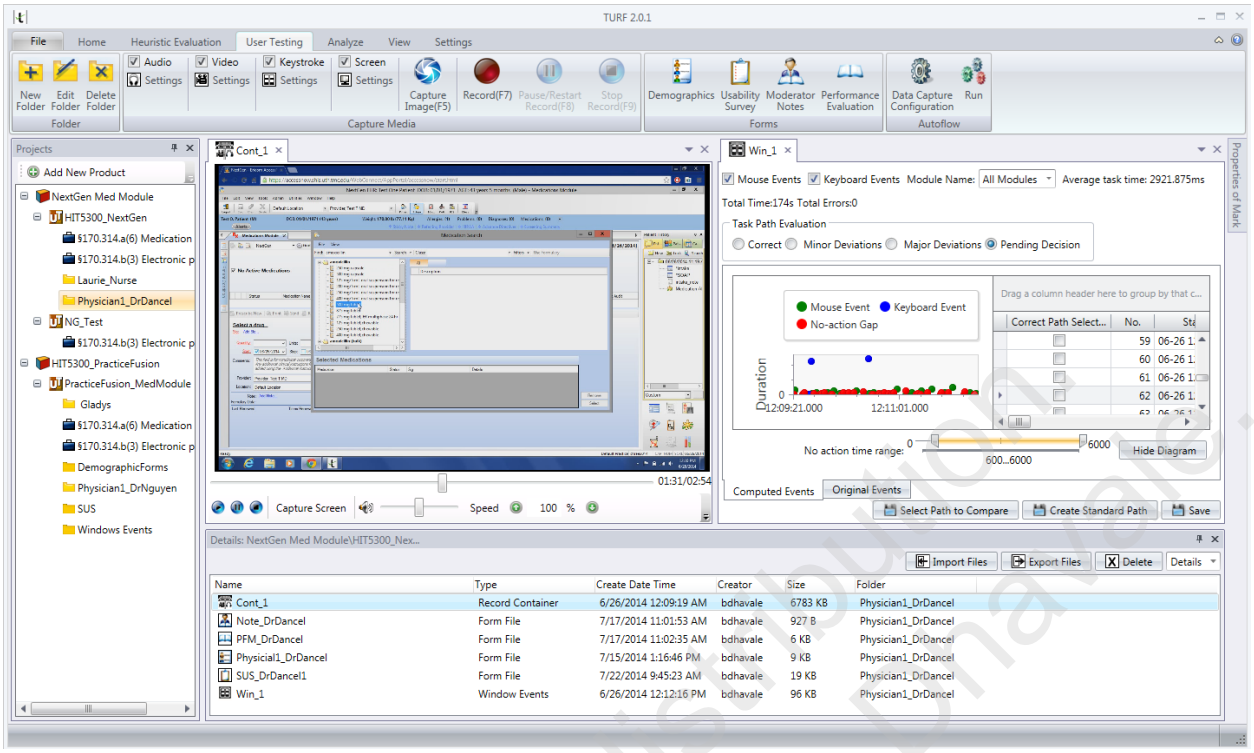
Practice Fusion Average SUS Score



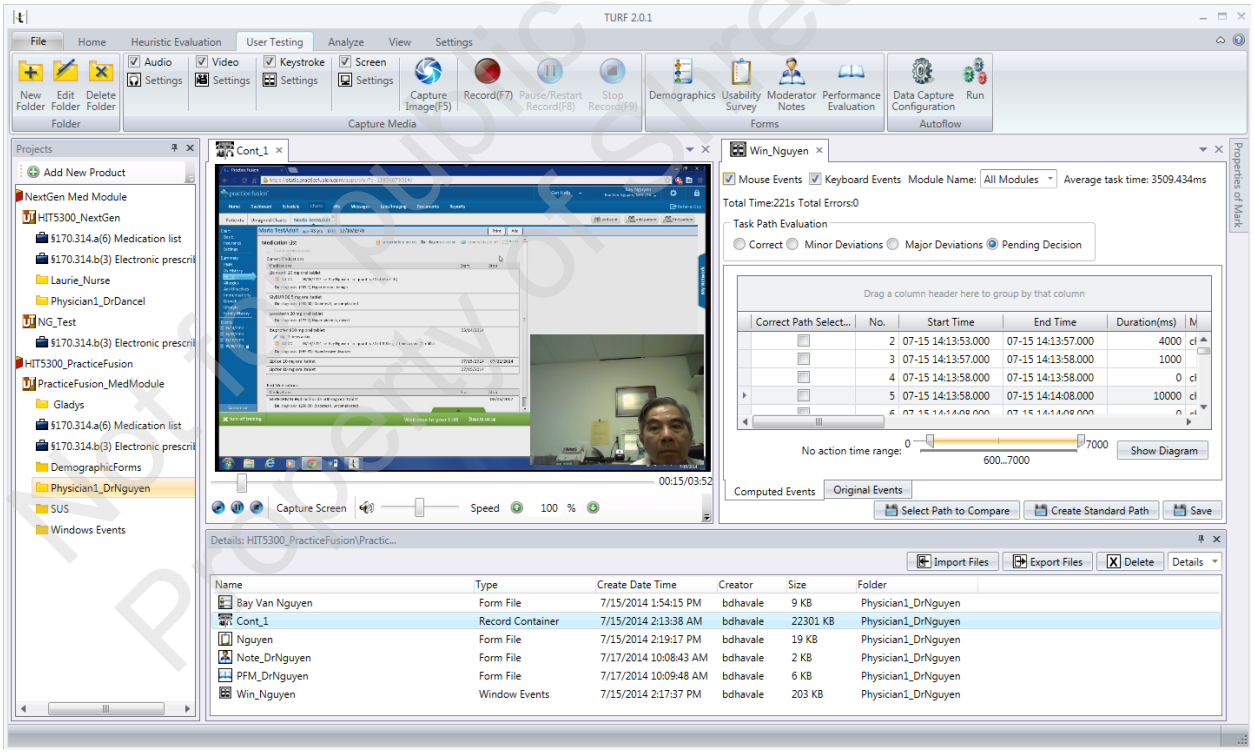
3. Analyze Task Times and Compare Number of Steps

   As the user recorded the clicks in the steps of the workflow, the screen capture utility created a spreadsheet that captured each click as an event. Using this spreadsheet the task times and number of steps were calculated for each users. The image below is an example of the screen capture and data created by the clicks in his workflow while prescribing a medication electronically in NextGen followed by an image of screen capture for Practice fusion E-Prescription.

NextGen Events Screen



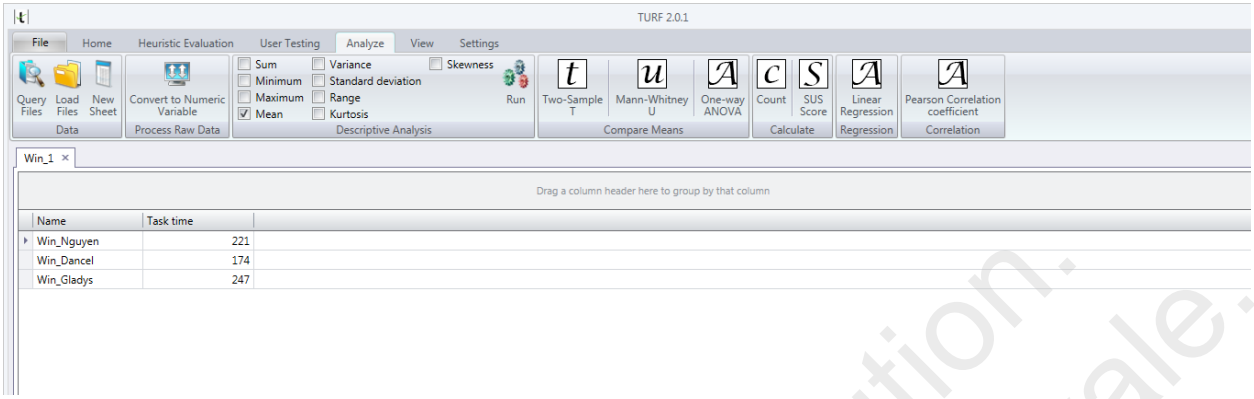
Practice Fusion Events Screen



The screen below compares Practice Fusion and NextGen task time showing that the task of prescribing medications electronically took a little more time in Practice Fusion than in NextGen.

NextGen : 174 seconds

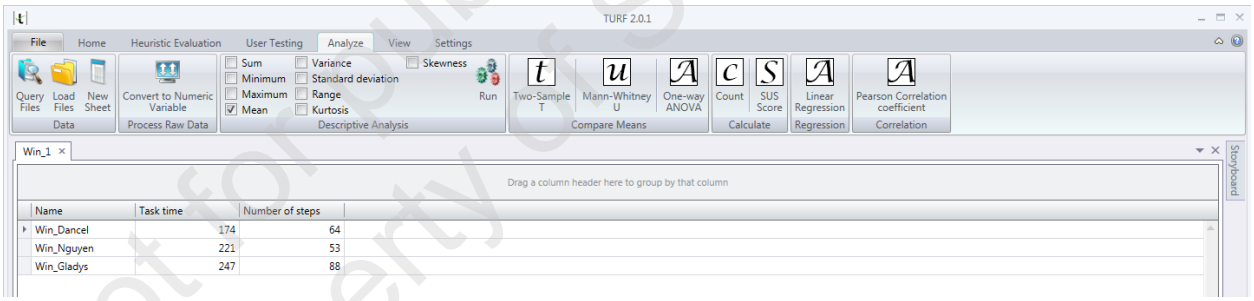
Practice Fusion: 221 seconds



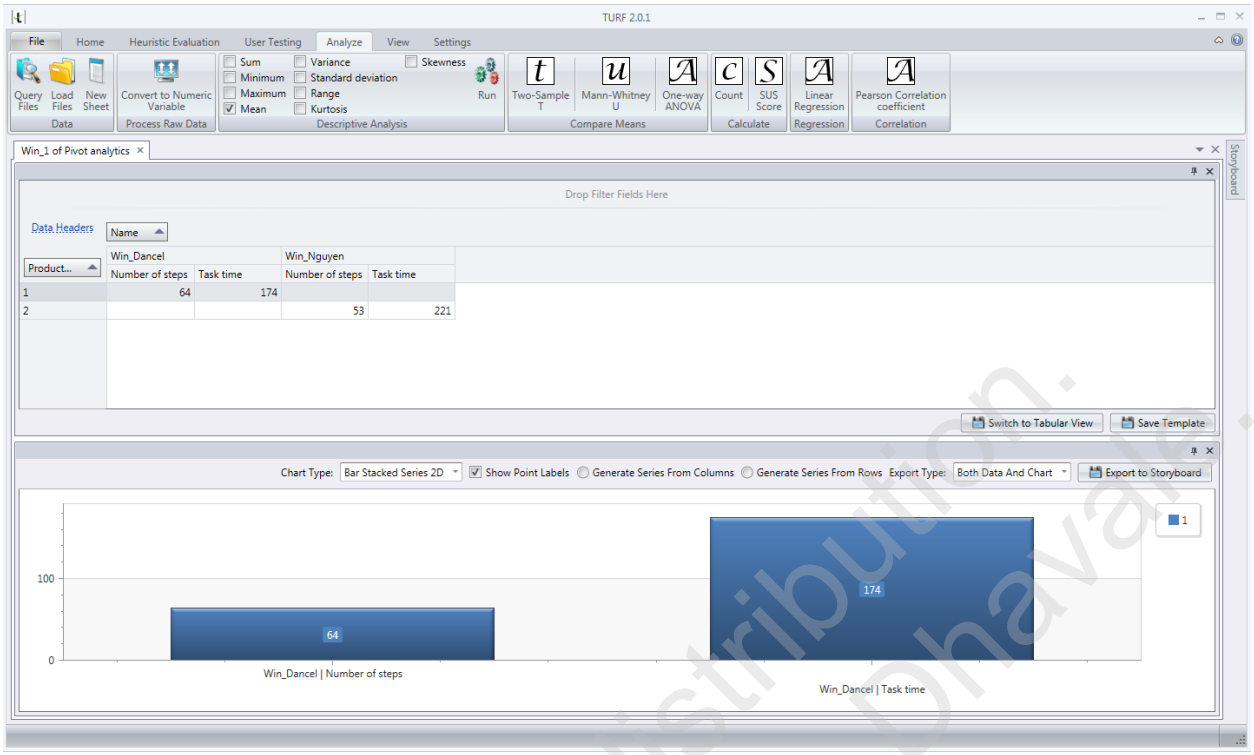
The screen below compares Practice Fusion and NextGen task time and number of steps comparison.

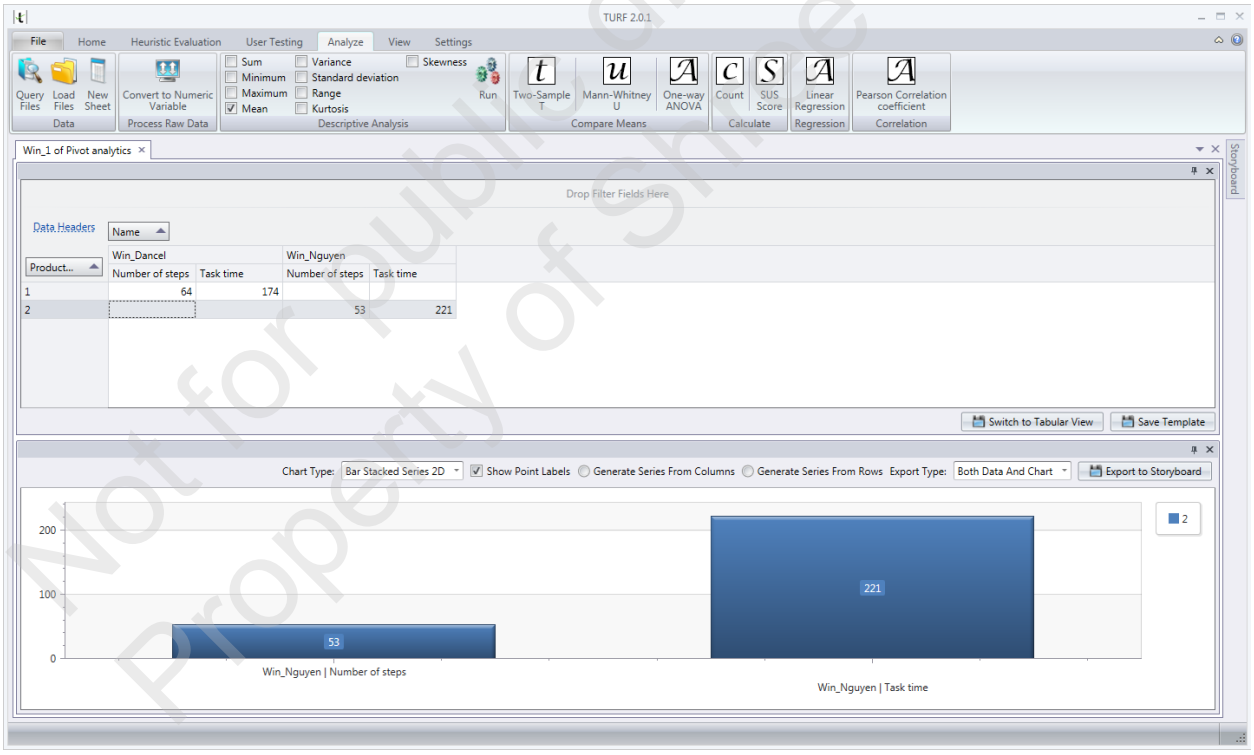
The number of steps taken to prescribe a medication in NextGen was 64.

The number of steps taken to prescribe a medication in Practice Fusion was 53.



The pivot comparison table shows comparison between number of steps and task time for both the physicians using two different software products doing exact same task.





CONCLUSION

Descriptive Analysis and SUS scores:

After analyzing the demographic data gathered for descriptive analysis it was observed that there is a direct correlation between age and level of computer competency and use of the EMR software. The average age for office staff was 20 – 30 years, while the average age for the physicians was 50 – 60 years. The office staff had a high school diploma but were comfortable with using computers. The physicians were not very comfortable using the computers. In spite of this disparity in demographics, the average SUS score for both the softwares is 66.5 for NextGen and 60 for Practice Fusion.

Comparison of Task Time and Number of Steps:

Both the practices completed the exact same task of prescribing a medication electronically.The number of steps taken to prescribe a medication in NextGen was 64 while in Practice Fusion it took 53 steps to complete the same task. In NextGen the users were able to complete the taks in an average time of 174 seconds while in Practice Fusion it was 221 seconds.

The TURF tool was very useful to record the workflows of two different software products. Using the statistical utility in the software we can compare and contrast the ease of use of both products. The TURF tool can be useful while conducting initial studies when physicians are trying to decide upon an EMR product to buy for their practices. It can also be used as an evaluation tool for training pursposes. In a classroom training, after the staff is trained to perform certain tasks TURF can be used to evaluate proficiency of the users. It can be also used to find stopping points in the workflow. It is a user-friendly tool and can be implemented for various different areas of usability studies.

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CONTRIBUTORS

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