HIT Policy Committee

Certification/Adoption Workgroup
Usability Testimony
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Colleagues: I thank you for the invitation to speak with you today. I will do my best to concisely respond to your questions and will first provide a short overview of my background to offer some context for my comments.

I am a family physician in a two-doctor practice near Albany, New York. I've also spent the last twenty years working in Health Information Technology and have been privileged to assist in the implementation of Electronic Health Records for much of this time. My undergraduate degree was in Cognitive Science; my senior thesis focused on the subdomain of visual information processing, and I spent the year following college graduation working in a lab where we studied hand-eye coordination and how humans respond to visual stimuli on a computer screen. So it is no surprise that when I entered the world of Health Information Technology, I was drawn toward the study of the user experience and doing whatever I could to optimize it.

As we look back to the advent of health IT, back several decades, in fact, the early users of Electronic Health Records were, not unlike early adopters of computers and IT in general, quite tolerant of quirky user interfaces. Indeed, I've actually argued that these folks preferred a user experience that was somewhat opaque. Why? The "mastery" of a difficult system made them well known as the "expert" and differentiated them from their peers. In healthcare – with the "pecking orders" and status hierarchies that pervade the culture – being regarded as an expert is desirable, so in a funny way, there may have actually been market forces that worked against the design of systems that were transparent and accessible to the rank-and-file.

Of course, all of this has changed over the course of the past two decades, and as software vendors in general have adopted user-centered design principles, so have today's Health IT vendors.

As a software developer in the 1980's, I grew fond of the human interface guidelines that Bruce Toganazzi and his team created – and evangelized – for everyone developing software for the Macintosh. These guidelines provided a framework within which developers were encouraged (yet not required) to build their applications.

> "Will you create a set of mutually exclusive options? If so, use **radio buttons** rather than **check boxes**."
>
> "Creating a **menu**? We suggest that you use the "**File .. Edit**" conventions, as do other applications."

While some would argue that these guidelines constrained innovation, my observation at the time was that they helped developers enormously by creating research-based design **guidance**.

Guidance – not **guidelines** and not **requirements** – was the key to this success.

I can recall lectures that I would give on EHR selection to physicians in which I suggested that "**usability**" was the missing bullet point. Most attendees wondered if I had invented a new word. "Usability? What's he talking about?" The market was not yet ready for this conversation.

At the same time, as a frustrated EHR user in 2004, I authored a now-well known blog post on usability that prompted the president of the company that had developed the EHR I was using to request that I delete the post, as it was costing the company sales. My post highlighted a rather complex workflow that was required for entering blood pressure in which the whole process took roughly 40 seconds. Eighteen months later, I worked for the company.

It isn't a surprise, looking back, that, as a critic of the user experience of the EHR software that we were selling and an advocate for sweeping changes to the user experience, I frustrated or even angered many of the people who had designed it. I was – as a thoughtful colleague once suggested - "calling their baby ugly."

So as I look back on the company I still work for (albeit a few mergers later) – and at the industry as a whole – and then forward to the next several years, I think we have a lot to be proud of and even more to anticipate. Just as the automobile evolved from a rudimentary form of transportation that barely performed the basics of what was possible, EHRs have evolved significantly in only the last half-decade and will continue to improve at what is sure to be an accelerating pace. The Meaningful Use program is, of course, hastening the conversation, and as providers become more experienced in their use of the systems, they will be able to provide a level of useful feedback that is instrumental in our ability to enhance our products.

As a family physician and EHR usability fanatic, I applaud your passion for this important topic, and I am honored to be a part of this conversation. Now, how might we best get this work done together?

Questions you have asked us to consider:

What is current industry practice in testing for usability?

Just as design and software development processes across industries are variable, so are the practices among EHR vendors. I would like to describe a usability design process in use by a vendor **outside** of healthcare first and then draw some parallels to our industry.

I have a good friend who works as a manager of Human Factors for a multinational software company. Her team performs usability consulting, testing and design assistance for product teams across her company. It's an efficient way to ensure that these services are available to those throughout the company, as there are tens of software products in various stages of design at all times, and there simply aren't enough of the Human Factors experts available to be deeply embedded in every single team. What happens within their process is variable and is largely dependent on the maturity of the software, the timeline and the readiness of the software team to think critically about their product.

When the product is young and the team has a long timeline with ample budget, user-centered design becomes a core component of the design process with robust testing and evidence-based design decisions throughout. This is a designer's nirvana, but this is rarely the case. More frequently, the timeline is too narrow, the budget too small or the software difficult to modify due to years of iterations, improvements and enhancements. In this case, the human factors team is never engaged at all. In some instances, the result is similar to the famous "Vermont farmhouse" problem, wherein the foundation that was created never anticipated what was to come.

Health Information Technology has very similar challenges to what my friend experiences within a different market space. Both small and large software developers have an existing software platform, existing user interfaces (which are familiar to thousands of users), fixed budgets and tight timelines. So, what is current industry practice?

In truth, current practice varies by company and even by product. Larger companies tend to have a human factors team or at least a person focused on usability, whereas smaller companies may use consultants or not even have any dedicated resources. At Allscripts, we employ a Director of User Experience, and he has several people who work closely with him from across the company: specialists in graphic design, interaction design or usability testing. We also employ usability testing consultants on a regular basis to develop and implement formal testing programs.

Most companies that develop and implement Electronic Health Records also have active customer communities, as well as processes through which they accept and prioritize requests for design changes. It is certainly true that current customers are often a very good source of ideas for real-world design improvement ideas. At the same time, however, responding reactively to customer requests can sometimes get a product team in trouble, and it's very important that product teams take a thoughtful and deliberate approach to customer suggestions and concerns by working hard to identify the **problems** that customers are having rather than simply implementing design requests that are popular. For example, an enthusiastic customer may request "a button here so that I can do X faster." However, if the company's usability experts re-state the need as "I want to do X faster," the design team may find that a button is not the best method of solving the customer's problem. There may indeed be a better solution that the customer had not considered. Product teams who have adopted **user-centered design processes** rarely make such a mistake as to implement a product change without such thoughtful review, but I suspect that such processes are in place within only a small number of vendor product teams industry-wide.

Finally, I'll offer the comments of a usability consultant who has observed the activities of several Health IT vendors from the inside:

> "There is still a great deal of education that needs to be done in the industry regarding usability. Many vendor organizations are immature in terms of their understanding of and practices regarding usability (see http://www.himss.org/content/files/HIMSS_Promoting_Usability_in_Health_Org.pdf for more about usability maturity models in healthcare IT). Many vendors still think of usability as a subjective component of their products, and they solicit feedback regarding usability with inappropriate methods that rely only on subjective data. More mature vendors are employing human factors methodology to benchmark the usability of legacy products, to

identify opportunities in new product development, and to guide the design and development of new product development.

Buyers of systems may not realize that usability is directly tied to workflow. For groups that are moving from paper to electronic for the first time, they may not fully **understand** and do not easily **accept** that workflows are categorically different in the electronic world. Some Human Factors experts make the pitch that the software should be designed in a manner that the user's workflow does not and should not change, and at one level this is correct. But as we see the changes required in evolving from paper to electronic medical records, this just is not the case at all." - J.B., Usability Consultant

What is current industry perspective for designing systems to ensure usability?

I'll quote an Allscripts colleague to begin this section, as I think that he sets the tone rather well:

"I can't speak for the rest of the industry, obviously, but we are doing formal and rigorous usability testing of our core products. Our position, really, is that there is no excuse for **not** doing usability testing. We've discussed the potential issues with this, the first being that it is not necessarily indicative of an **actual use** environment. It's a necessary compromise. With rigorous testing, one is giving up realism to track issues quantitatively. So we are currently biasing our usability testing to be more difficult (as if the user has had no or little training, performs no repeat tasks, etc.) to ensure that we are making the key workflows as intuitive and easy-to-use as possible. I'm as guilty as anyone of arguing the methodology, the value, the realism, etc. But the fact of the matter is you still need to do it, and we are. And everyone should." -A.S., Director of Human Factors

The key is to have the right skills, do the research, and ensure that innovation is protected. In fact, if the EHR industry as a whole ends up having to comply with a list of proscriptive functional criteria, it will cripple system usability for the next 10 years. Actually, we saw some of this in the certification criteria for Stage 1. For example, in the domain of Clinical Decision Support, while the Standards Final Rule improved on the IFR by referring to "notifications" rather than "alerts," the method with which Clinical Decision Support is currently defined still remains too specific because it attempts to define HOW the EHR should facilitate such processes rather than the WHAT needs to be solved. Flipping that around to focus on the WHAT rather than the HOW would preserve the autonomy of the industry yet maintain a set of core capabilities that would satisfy certification requirements.

At the core of our shared mission in this domain is the equation of **usability** and **safety**. For Health IT, the lens through which we should view usability is one of safety (first) and efficiency (second) rather than common misconceptions: EASY, FAST or BEAUTIFUL.

- Usability does not always mean EASIER. EHRs are complex systems – they cannot and should not always be simple.

- Usability does not always mean FASTER. EHRs can and should slow users down where necessary. For example, "autocomplete" functionality, which was initially designed to make menu selections easier and faster, are now a common source of selection errors (and certainly not just in an EHR). Mis-typing a word in a paragraph on my iPad is a tolerable error, but mistyping a medication, dosage or diagnosis in my EHR is not, and the

system should call upon the provider to think through certain elements of its use.

- Usability does not mean BEAUTIFUL. Great design is not decoration. Indeed, some argue that great design is "user obvious" and therefore barely noticeable, whereas decoration is distracting and unnecessary.

"[Good design] is not rocket science. It's social science – the science of understanding people's needs and their unique relationship with art, literature, history, music, work, philosophy, community, technology and psychology. The act of design is structuring and creating that balance." – Clement Mok

What are the biggest usability challenges being experienced?

Research. Sometimes there really IS a "right answer." However, as any basic scientist knows, the path from question to answer may be decades long and may end up somewhere very different from what was initially expected. Software usability research remains in its infancy, and Health IT software usability research – with the exception of a very small number of participants (most of whom are in this room today) – is nearly unheard of. As more applied research defines best practices, the industry will be well-positioned to better understand and incorporate optimal design.

Education. We all need to learn more about how best to solve these problems, and coalescence of usability and patient safety must be and can be optimized with data, model, theories and research methods from behavioral science. There is not one "right answer" here. Rather, there is a set of best practices, innovative thinking and appropriate guidance that can and will lead this industry forward.

Timing/Certification. With certification requirements defining a thorough set of required functional capabilities – and development teams working feverishly to meet these requirements – the industry is challenged to find the **patience**, **rigor** and **maturity** required to carefully design software revisions and the enhancements necessary to fully integrate modern design processes into each development cycle.

History. Renovating the aforementioned Vermont farmhouse must be done carefully and slowly. Even with the best architects and craftsmen, the revisions will be limited by the foundation, the technical infrastructure and the vision of the original architects. Sometimes, it's necessary to re-do all of the plumbing just to install a new Jacuzzi tub. It is likely that this will take longer than anyone wants, but rewards come to those who do it right.

Additionally, as our industry evolves and disrupts itself, we will see many cases where completely new systems leapfrog "legacy" implementations. In other cases, SOA "middleware" may permit abstractions and replacements of user interfaces, thus leaving the "tried and true" backbones in place. The complexity of such projects can't be understated.

Geography. Local customizations of software can/will/should always be possible, but how far do we let them go? How "customized" can an EHR be? As we look at other domains, it is clear that if one gives the user *too* much flexibility, safety can be compromised. I can only modify my car SO MUCH until it will fail inspection because it is no longer safe according to the State. Similarly, any significant modifications that I make to my home need to meet local building

codes, and so on.

Likewise, despite market pressure to develop infinitely customizable EHRs, our industry has recognized that there can and should be limits to the scope of this customization. In the case of a sophisticated customer, lots of customization may be appropriate or even necessary. Consider a large hospital with an IT staff that may even include expert designers and developers. In such a setting, a flexible system would be optimal and the vendor might not need to be engaged to satisfy local expectations. On the other hand, consider a small practice in which there is limited technical resource. A very flexible system in such a setting would actually be overwhelming to the user – hard to manage, difficult to maintain, and a challenge for the vendor to support, ultimately making it unsafe to use. No matter how well the "stock" screens, forms, and templates were designed by the vendor, if the customer makes their own adjustments without careful guardrails, the end product can be very difficult to use. Balancing the market expectations for "flexibility" with the need to create and maintain these guardrails is one of the biggest challenges of the next half-decade in this industry.

What voluntary steps can industry take to improve usability?

The Health IT industry – like any other industry – has an obligation to assure that our products are as safe as possible, and it is in the context of patient safety where it is clear that the industry will take an active, voluntary and collaborative role. The Electronic Health Records Association – the trade association for health IT developers – has a very active Patient Safety Workgroup that is working hard to collaborate within and beyond the EHR vendor community to define and evangelize best practices.

In addition, purchasers of Electronic Health Records are becoming increasingly aware of usability – both the word and its meaning. Indeed, products with a great user experience solve important problems for their customers. More and more, the obvious problems focus on implementation challenges (i.e. "How much training is required?") while the safety and workflow issues become apparent after the sale is made. As buyers become more sophisticated, we will see market forces reward vendors who see beyond "decoration" and produce systems that are appropriately designed and in such a way to truly add value to the user. This will, of course, be a voluntary set of steps that will require no government incentive or oversight because the market will make it abundantly clear.

Finally, the Health IT vendor community has an interest in working collaboratively with consumer organizations, provider organizations (our customers!) and government agencies to exchange as many ideas as possible on this important topic. It is impressive that the EHR systems have improved as much as they have in the past few years, yet most would agree that we are not yet at the point of perfection (an attribute we share with other software industries). There are components of this shared learning that can and should be done together, and there are components that each competing health IT developer needs to do alone.

What does the industry see as the government's role?

Let's consider this question within the context of the categories of "big challenges" that I outlined above. If the government's role is to collaborate with the private sector as a representative of the public interest, we would expect government involvement to be optimal in cases where **efficiency is enhanced** and **progress** toward perfection is **accelerated**. So let's consider each category to find the optimal role for government.

Research. HHS, NLM, AHRQ and NIST have each funded research on Health IT usability, and I would agree that these efforts should continue with special emphasis on how to apply this research to real-world workflows, products and implementations. I would challenge representatives of the government focused on this area to not only ensure consistency in their own work – coordination between the agencies of the government – but also to find ways in which bridges might be made between academic research initiatives and real-life applications.

Education. Government support of education in all domains is a well-established accelerant. While public schools are an obvious example of government education, there are hundreds of other endeavors in which the public good is well-represented by the government's support of broad campaigns (nutrition, bicycle safety, immunizations, etc.) or through focused conferences or publicly-sponsored events, training materials, web content or training. In the domain of Usability, there are many opportunities to create educational materials, conferences, web resources, etc., to educate software providers, community leaders, patient advocates, patients, and, of course, care providers. The work that NIST has started – and the excellent resources provided on http://www.usability.gov – are a fantastic start, but we need to keep the momentum going and resist the temptation to shift gears, as articulated above, from **guidance** toward **guidelines** and **standards**.

Timing/Certification. The government should not include "usability" as a component of certification but rather should understand that user-centered design is a component of an optimal software development process. This does not, either, mean that certification should require vendor attestation to specific design processes, as this would not be universally appropriate. Consider the case where a legacy product is being revised – with a narrow temporal window – in order to meet certification requirements right away and meet the needs of the providers counting on delivery of the updated product. The development team in such a scenario wouldn't have the time to do all of the thorough, iterative usability design and testing work necessary. While they may very much want to use such processes, it simply wouldn't be doable because some things cannot, as a point of fact, be accelerated. Nine women – as the saying goes – can't have a baby in a month. Therefore, certification criteria need to acknowledge that such temporal pressures exist and may interfere with optimal design processes if they impose strict market requirements on the industry.

While we may assess the quality of healthcare by reviewing both **process** and **outcome** measures, I am concerned about the current interest in the development of such outcome measures for EHR usability. While I would agree that there might be some objective measures that could be informative to consumers, I am nonetheless concerned that there remains too much to learn about both the definition and measure of usability in this industry for any such assessment to be made a component of EHR certification in the near term.

For these reasons, I would suggest that government not make any attempt to incorporate usability assessment into certification. Rather, as a stepping-stone toward our shared goal of perfection, I would suggest that NIST and ONC work to offer **guidance** to the industry, so that we can learn together and better understand together what processes are associated with the best outcomes.

History. The government should recognize that we are not creating completely new products. This is an evolution of an industry, and while improvements are possible and of course necessary, government cannot and should not impose new requirements in a misguided attempt to accelerate the migration from existing technologies to newer ones. Evolution can and will occur. Revolution, conversely, would compromise safety.

Geography. Variation in practice patterns, provider expectations, and local cultures should be anticipated and understood, and this is more true in healthcare than in almost any other industry given the geographical disparities in both care and health IT adoption we see demonstrated year after year. Again, education is government's role here. The current projects with Regional Extension Centers and Beacon Communities are good examples of government efforts to support and educate care providers. I would challenge you to consider how might the government leverage **additional** channels (Social media? Medical Societies? Residency programs?) to expand these educational projects and assist both customers and industry.

One pixel makes a difference.

In 1986, as a student at Hampshire College in Amherst, Massachusetts, I designed a cognitive science experiment as part of my thesis to determine if people could recognize an object on a computer screen more quickly with – or without – context. The prevailing theory at the time was that "objects are objects" so if the brain saw something, it could be identified just as quickly regardless of the context. To the contrary, however, my experiment demonstrated that by varying the location of only ONE PIXEL on a computer screen, a user's ability to identify another object could be reduced or enhanced. If the pixel adjustment caused an image to "make sense" (eg, represented the nose of a schematic face), the image was easily recognized and recalled. If not, though, the users had to look at the image for nearly double the time in order to properly distinguish it.

I'm proud to be part of a company and an industry that has made deep investments in usability research so that we are able to make the best decisions possible in order to optimize the usability of our solutions – so we can get **every pixel right**. These are thrilling times for those of us who have been beating the "usability drum" through the years, as the train has finally left the station and we are starting to build steam. Thank you again for inviting me to participate, and I look forward to the next steps in this process.

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