STUDY OF RETURN ON INVESTMENT (ROI) FROM THE USE OF FINGERPRINT SCANNERS WITH WINDOWS 10

AUTHORS: GARY ARSTEIN-KERSLAKE, REESE FREEMAN AND HENRY MUESSE
INFORMATION TECHNOLOGY SERVICES BRANCH, CALRECYCLE; JANUARY 2017

ABSTRACT

CalRecycle was probably the first California State organization to fully implement fingerprint scanner technology, which coincided with their upgrade to Windows 10 and Office 2016 in October 2016. By virtue of Windows Hello biometric authentication incorporated into Windows 10, implementation of the fingerprint scanners was fairly straightforward and extremely reliable. An evaluation of customers' use of the technology several months following implementation indicates that it has been well-received and widely adopted. While use of the fingerprint scanners is optional, 58 percent of staff use them on an ongoing basis. Among the three-fourths of staff who tried the technology (i.e., completed setup), 80 percent are still using it. Fingerprint scanner technology is relatively low cost. In order to evaluate return on investment (ROI), analyses were conducted to estimate time savings resulting from the use of the fingerprint scanners. Each login requires about 5 seconds when key-entered, and analysis indicates that users login 6 or 7 times per day. While this amounts to only about 30 seconds per user per day, across an organization with 750 staff, students, contractors, etc., that translates into a cumulative overall 0.5 PY savings annually. Even accounting for the fact that only 58 percent of the staff are using the fingerprint scanners (at the time of the survey in January 2017), and making a few conservative assumptions regarding average salary costs, the fingerprint scanners yield cost recovery within approximately four months and a 200 percent ROI!

PROBLEM/OPPORTUNITY

In October 2016, CalRecycle completed Windows 10/Office 2016 software upgrades for approximately 650 headquarters desktop computer systems. As part of the Windows 10 upgrade planning, an evaluation was conducted regarding the potential implementation of fingerprint scanners to speed up the login process. This is by no means exotic technology since many smartphones, tablets, and laptops allow for the use of fingerprints for authentication. With the release of Windows 10, Microsoft implemented their new "Windows Hello" biometric security as part of the operating system. While fingerprint scanners could be used with prior versions of the Windows operating system, the Windows Hello capability in Windows 10 significantly simplified the process of installing, configuring, and using fingerprint scanners. While fingerprint scanners are well-supported in Windows 10 and potentially can provide important benefits in terms of convenience and security, CalRecycle was not aware of any other California State organization that had adopted the use of this technology.[1]

[1] As of January 2018, to the best of our knowledge, it remains the case that no other California State organization besides CalRecycle has implemented fingerprint scanners organization-wide.

Based on a review of several available fingerprint scanners, CalRecycle selected the K-Byte Biometric Fingerprint Security Reader for testing. The device was very reasonably priced at that time (~$14 each) and, based on testing conducted by a group of approximately thirty IT Services staff, was found to be very reliable and convenient based on feedback from the test group. This was a very moderately-priced project; the total cost to procure the fingerprint scanners for 750 desktops (including remote offices) plus spares was only about $11,000. While the initial reaction from customers regarding the fingerprint scanners was very favorable, a brief study was undertaken several months following implementation to assess whether users continued to use the devices and how they felt about the technology. In addition, an associated analysis was undertaken to determine if there was an obvious way to assess the cost-benefit of the use of these devices for CalRecycle. Note that this assessment excludes costing of the minimal amount of time required to plug in the device and assist users with setting up their fingerprint scanner, if requested.

ASSESSMENT METHODOLOGY

A stratified random sample of approximately one hundred fifty (150) headquarters staff was identified. The sample excluded staff from IT Services and also the small handful of staff in executive positions. To quickly and easily assess their feedback regarding the use of the fingerprint scanners, the survey used the Voting Options feature available in Microsoft Outlook. Each identified survey recipient was sent an email with some explanatory text regarding the assessment along with four response options: “Fingerprint scanner works great!”; “Fingerprint scanner is OK.”; “Don’t use the fingerprint scanner regularly anymore.”; or “Never did set the fingerprint scanner up.”

To provide some measure of the time savings associated with the use of the fingerprint scanners compared to entering passwords, measurements were needed for the number of times that staff are required to reenter their password on a daily basis (i.e., instances when a Fingerprint Scanner could be used), along with the time required to enter their password.

To get some estimate of the number of times that staff login to their computer each workday, an informal but reasonable approach was implemented involving the use of a tally sheet by seven IT Services staff over a period of several workdays. While this sample size is small and the time period fairly brief, there was fairly good overall consistency in the tally results of the approximate number of logins per workday, as described below. To determine the amount of time required to enter a password, research was conducted to collect data on average typing speeds, and some simple measurements were made using project participants.

RESULTS

The results of the survey of a sample of users are included in the table below. Out of the 150 persons who were sent the survey (via Outlook email voting buttons), responses were received from 84, which is slightly more than half. Of the respondents, almost half (46 percent) indicated that the “Fingerprint scanner works great!” Another 12 percent felt that the fingerprint scanner worked “OK” for them. Importantly, this also implies that this 12 percent of survey respondents continued to use their fingerprint scanner. Taken together, this yields a combined total of 58 percent of staff continuing to use the technology after several months, which is a very solid endorsement of its value for them. If the fingerprint scanners didn’t work well or were inconvenient, they simply wouldn’t use them. There were 14 percent of staff who reported that they “don’t use the fingerprint scanner regularly anymore.” This may be because it is less reliable or convenient for them possibly based on the way they use the fingerprint

scanner, or it could be due to a factor such as the amount of natural oils on their fingers as it seems that the fingerprint scanners are less reliable for persons with naturally drier skin.

Another group of staff, about 27 percent, never did set up their fingerprint scanner. Staff were encouraged to setup their fingerprint scanner, but not required to do so, and it obviously couldn't be set up for them as it required their fingerprint! Assistance was offered, but some staff also may not have been available when IT Services staff were available to assist, and others probably simply did not want to use it, which was OK. But among the 61 respondents who did set up their fingerprint scanner, 80 percent are still using them (i.e., those staff that reported that their fingerprint scanner works "great" or "OK"). Of course, they're not using them because their fun; they're using them because they work well and allow them to login more quickly.

Response Options*	# of Responses	% (w/ rounding)
• Fingerprint Scanner works great!	39	46%
• Fingerprint Scanner is OK.	10	12%
• Don't use the Fingerprint Scanner regularly anymore.	12	14%
• Never did set the Fingerprint Scanner up.	23	27%

N=84 out of 150 persons surveyed

Regarding the time savings resulting from the use of the fingerprint scanner instead of manually key entering passwords, the analysis of login data captured from seven IT staff members indicates an average of 6.4 logins per day. There are various factors that could affect this, but in light of encouragement to staff to lock their systems for security purposes when they step away, plus built-in inactivity timers (lock after X minutes of inactivity), this number seems quite reasonable.

	# of Logins per Day
Person #1	6
Person #2	7
Person #3	6
Person #4	7
Person #5	6
Person #6	6
Person #7	7
Average:	**6.4**

It's also important to provide some estimate of the time required to enter a password. CalRecycle has minimum complexity and password strength requirements that encourages staff to use passwords with more characters and require the use of upper and lower-case characters, special characters, etc. Of course, the time required to enter those approximately 10+ character passwords will differ from person-to-person based on their typing speed, which is also impacted by the use of unusual characters in the password, etc.

For a person who can type 40 words/minute, with an average word length of five characters[2] (plus a space), this would translate to a rate of 240 characters/minute, or about .25 seconds/character. At a rate of 20 words/minute, which is more likely when typing the unusual characters of a password, that translates to about .5 seconds/character. Based on Smartphone "stopwatch" timing of the time required to enter a password in an actual setting, the time measured by a small sample of persons working on this project ranged from .4 to .6

[2] See https://en.wikipedia.org/wiki/Words_per_minute

seconds/character. Since this is consistent with reported times for persons typing at 20 words/minute, we believe the estimate of about .5 seconds/character is reasonable. Assuming an average 10-character password, the time required to enter a password is then 5 seconds.

For calculating the time savings of a fingerprint scanner compared to the key entry of passwords, the time required to swipe a finger on a highly reliable scanner is assumed to be negligible. This is reasonable as we also do not attempt to assess the time required to place one's wrists near the keyboard surface or adjust the placement of the keyboard.

Based on measures indicating that the average time required to enter a password and press "enter" is about 5 seconds, and passwords are re-entered an average of 6.4 times per day, then each day each staff member saves about 32 seconds per day by using a fingerprint scanner. Assuming that the total staff in CalRecycle for whom a fingerprint scanner was made available includes contractors and students and similar temporary staff, the total staff with a fingerprint scanner available for their use is approximately 750, so potentially CalRecycle could be saving about 6 hours and 40 seconds of staff time daily. However, since our survey data indicates that only 58 percent of staff are currently using their fingerprint scanner on a daily basis, then the expected average daily cumulative benefit across the organization would be about 3 hours and 52 seconds. To simplify the calculation, let's round this up to four hours cumulative savings per day for CalRecycle.

While four hours of time saved each day across an organization with about 750 staff doesn't seem like much, keep in mind that each staff member (one personnel-year, or PY) works eight hours per day. So, a cumulative savings of four hours per day is equivalent to the saving of 0.5 PY.

To determine the return on the investment (ROI) of the purchase and implementation of the fingerprint scanners, it is necessary to compare the one-time costs to procure the fingerprint scanners (~$11,000) to the cost of the ongoing hourly savings.

To provide a conservative estimate of average hourly staff costs, let's assume that the average annual salary of CalRecycle employees is $50,000, plus 35 percent overhead, and that there are 2,064 work hours per year. The average employee hourly cost is then about $32/hour. Based on the estimate listed above, the cumulative benefit of the use of fingerprint scanners at CalRecycle is about four hours per day. At a cost of $32/hour, the savings from the use of the fingerprint scanners is therefore equivalent to about $120/day. Since the original cost of the fingerprint scanners was about $11,000, this means that the cost of the fingerprint scanners is fully recovered after about 90 workdays, or about 120 calendar days. This translates to a 200 percent ROI, which is obviously excellent!

CONCLUSIONS

Based on the analysis above, the use of fingerprint scanners by CalRecycle has been extremely successful. Compared to many information technologies for which it is very difficult to begin to assess ROI, the use of fingerprint scanners yielded ROI for CalRecycle within four months. That's a 200 percent ROI!

- While use of fingerprint scanners was optional, 58 percent of CalRecycle staff adopted and use the technology.
- Among staff that went through the few steps to setup their fingerprint scanner, 80 percent continue to use it.
- Staff typically login (i.e., unlock their computer) about 6 or 7 times per day, and it takes about 5 seconds per login, versus virtually instantaneous logins with the use of a fingerprint scanner.

- Since each staff member using a fingerprint scanner is estimated to save about 30 seconds per day, across an organization with 750 staff, students, contractors, etc., that translates into an overall 0.5 PY savings annually.
- Even accounting for the fact that only 58 percent of the staff are using the fingerprint scanners (at the time of the survey in January 2017), and making a few conservative assumptions regarding average salary costs, the fingerprint scanners yield cost recovery within approximately four months and a 200 percent ROI!

Fingerprint scanner technology can be very reliable and reasonably moderate cost. Many smartphones, tablets, and laptops now include biometrics such as fingerprints for authentication. A variety of different fingerprint scanners are available. Windows 10, first released in 2015, includes Windows Hello authentication that makes it much easier to incorporate fingerprint scanners and biometric authentication. Users greatly appreciate the convenience of reliable fingerprint authentication. While it may translate into only five seconds saving per login, to users, that's an important five seconds! Organizations not yet using fingerprint scanners and Windows 10 Hello are encouraged to do so and take advantage of the potential ROI offered by this technology.