THE FUTURE IS NEAR: NFC AND THE SMART WORKPLACE

MAKING ACCESS CONVENIENT AND CUSTOMIZABLE

In a world where efficiency and access are king, why does the workplace lag behind?

In this paper, we imagine the possibilities of a near field communication enabled workplace. Although NFC implementation occurs most often in retail settings, this convenient and customizable technology solution shouldn't be limited to one industry.

NFC can complement a host of workforce asset management activities, from collecting time and picking up schedules, to sending employees important labor or patient information. Let's take a closer look at how it works and how you and your organization could benefit from use.

ACCESS IS KEY

Unlocking a more intelligent workplace requires improving access to data. Organizations and employees need a better way to access important information faster and more frequently. Placing an employee handbook by the time clock as a resource for labor questions is about as convenient as giving your friend Molly a local phonebook to find the best pizza in the city. Today, people *Google* it; today people find answers instantly. There is no *Google Instant* yet for the workforce, but there are ways to access information more effectively.

The next technology to revolutionize the way we work will involve the way we access and exchange data. Organizations need a secure, scalable, and supportable solution for this type of user access and interaction. Organizations using near field communication (NFC) technology could discover a better way to work.

WHAT IS NFC?

NFC is a short-range radio frequency technology where a reader, like a phone or a card, exchanges data with a target, like a chip or tag. It works on inductive coupling, where inductive circuits share power and data when the objects touch or come into very close range. NFC uses existing radio-frequency identification (RFID) standards to transfer a relatively small amount of data almost instantaneously. As carriers integrate NFC technology into more mobile devices, its use will continue to grow. Today, people use NFC to pay parking tickets, log into a PC, or gain entrance into a stadium event.

NFC devices have three main modes or functions:

1. **Card Emulation**. NFC device replaces physical object like a key or smart card and can interact with other RFID devices.
2. **Peer-to-Peer**. Transfers data between two NFC enabled devices.
3. **Reader / Writer**. NFC device reads data from or writes data to a tag or chip.

Smartphones have consolidated many separate actions, like taking a photo, listening to music, browsing the Internet, or making a call, into one device. NFC gives a smartphone the potential to support an even larger set of data sharing applications.

NFC USE FOR WORKFORCE ASSET MANAGEMENT

NFC will not replace back-end time and labor databases or systems, but it can make them more effective. Personalized credentials programmed onto the NFC device dictate user access and interaction, linking users to the data or dashboard they need. Let's imagine an NFC-enabled workplace at General Hospital.

One of the main differences between NFC and RFID is that RFID devices and systems are usually **proprietary and limited to a single system**.

For example, long-range RFID transmitters were often used to track and monitor animals. Tags on animals were linked and limited to a particular transmitter.

As Molly, a nurse, enters her floor she taps her phone to an NFC tag on the wall launching General Hospital's time and attendance application or web portal on her phone. Here she can enter her time, make comments, and monitor items like absences or time off accruals. The new interaction is similar to her old interaction at a time clock, but now Molly can do it conveniently from her phone. Molly could even continue walking down the hall filling out her information and making room for others to tap the tag.

The NFC tag might provide helpful links to Molly, like a reminder of her FLSA rights. If she has questions about her time or pay, she can tap another NFC tag for a searchable or annotated PDF version of the attendance policy or a link that will call the employee help line. Finally, the NFC tag even sets Molly's phone to vibrate, automatically logs her into the Wi-Fi network, and turns off her mobile data. Later in the day, her shift manager can tap the same tag, but will go to a different view or interface where he can review the doctor's note Molly sent to excuse her absences this week. Not only has NFC streamlined many typical "clocking" processes into one convenient interaction, but the new NFC access point also provides valuable information and personalized interaction for both employee and employer.

NFC use is not limited to time and attendance. Instead of posting a weekly paper schedule, Molly's manager could write it onto a centrally located NFC tag. On the way to lunch, Molly quickly picks up her schedule by tapping the NFC tag and launching a download. The background scheduling application might even launch Molly's mobile calendar, prompting her to sync it with this week's work

schedule. If Molly needs to swap shifts, she could do so by using the peer-to-peer NFC functionality between her phone and another nurse's phone.

During her shift, Molly might go to her patient's room and tap an NFC tag to read important updates or notes left by the last shift nurse. If using an authorized device, Molly may even write her own notes to the tag using her smartphone before she leaves. If Molly frequently forgets to take her rest or lunch break, an NFC application might automatically set a context-aware alarm to remind her of her break after a certain period. Molly might even tap a NFC tag in the café when she goes to lunch, verifying that she did take a lunch break. NFC helps organizations achieve a balance between schedule demand and capacity, and makes interactions with the schedule flexible and convenient. They can remind employees and managers of important thresholds and compliance requirements, like meal and rest breaks.

In this future workplace, appropriate, meaningful data is convenient and easy to access. However, before organizations invest in new technology they want to know about security, scalability, and maintenance. Let's discuss NFC's solutions for each.

NFC devices can interact with tags **without interrupting or exiting** current applications and activities on the phone, such as making a call or browsing the web.

SECURITY AND CONTROL

To trigger any action, the user's NFC device must either touch or come into close contact with another NFC object. Although this does not prevent NFC hacks or attacks, it limits the number of unwanted interactions (for example, a non-employee with an NFC enabled device entering the building or an employee picking up a paycheck on an off-day) and makes it very difficult to steal someone's data without their knowledge.

NFC is a way to transfer information similar to other wireless transfer channels like Wi-Fi and Bluetooth. Typically, only a carrier (like Verizon, AT&T, or T-Mobile) can alter the device's NFC properties, such as security. However, NFC's fundamental security advantage is the close proximity transfer. Right out of the box, NFC channels are usually non-secure, meaning anyone may read or interact with them. For example, a retailer makes their NFC tag with weekly specials readable for all customers. Security can be built into the application in other ways. Employers may enhance NFC channel security with PINs, passwords, biometrics, encryptions, one-time passwords emitted from a device, digital certificates, and other authentication tokens.

Controlling access becomes especially important when Molly quits or retires from her job but keeps her NFC enabled device. She might maintain access key to secure areas and information. For immediate restriction, the organization can blacklist her particular credential in the workforce management system database.   When her device tries to tap the tag or log into the system, the system would deny access and may even send an alert to a manager or system administrator. The organization

might also terminate access when Molly's NFC application tries to update the NFC device or application. Removing access from an employee's personal device (used under BYOD policies) is trickier. Clearly define ownership, access, and termination rights in the BYOD policy.

User access with NFC is customizable, allowing organizations to set up access control tokens on chips or devices that restrict or track access to certain areas. These tokens embedded into the NFC chip may have reactive qualities, such as locking or unlocking a door or setting off an alarm, or passive qualities, such as collecting information when an employee crosses a certain threshold. Organizations may also modify these tokens to be context aware and time sensitive. For example, with Molly's particular credential, she cannot access the pharmacy unless a pharmacist is on duty and currently located within the pharmacy. NFC provides real-time, intelligent controls for the organization.

NFC may also make achieving compliance requirements easier. For example, Molly needs a certification to treat particular patients. When she tries to check information on a NFC tag for a restricted patient, the NFC tag would deny her access to that database. A NFC tag might also remind employees of certain donning and doffing tasks based on location like "wash hands before entering the patient ward." Although these might add minimal time to the employee's workday, it could save the employer from a failed compliance fee, malpractice lawsuit, or workplace accident.

Finally, the NFC authentication process helps avoid sharing and duplicating NFC credentials. It is relatively easy to replicate an RFID card because the authentication simply comes from the card; with NFC, authentication comes from the properties of both NFC chip and mobile device. This could be validation of certain digital properties, or even GPS coordinates. It would require thieves to have the exact same combination of NFC chip and mobile device, perhaps even in the same location. Buddy punching, or allowing someone else to clock out for you, would require the employee to entrust an expensive personal device to a co-worker. Relinquishing an essential device for an

NEAR FIELD COMMUNICATION TAGS AND CHIPS

What are they?

NFC tags or chips transmit data to another NFC device.

How do they work?

Tags can be programmed with readable data or command information. Interacting with them requires an NFC-enabled device like a smartphone.

What do they look like?

Image from NFC Forum

How much do they cost?

You can buy personal tags online for about $1 each. Be sure to download an NFC programming app for your smartphone.

How are they mounted or installed?

Tags often work like stickers. Their adhesive backing and flexible texture allow them to be placed on a wall, on a car dashboard, or on a bedside table.

extended period is inconvenient and risky. The employer may also set up other security settings to verify the user's identity before actually interacting or exchanging data.

SCALABILITY AND FLEXIBILITY

NFC tags have a finite amount of memory, so they cannot store large amounts of data locally. However, this is not a necessarily a limiting factor. The real value comes from immediate and appropriate access, like forwarding employees to the right self-service application, or reminding them of important announcements, like a change in the attendance policy. NFC tags are rewritable, meaning that their function can completely change if needed. If no one uses the NFC tags to access their schedules, simply reprogram them for another function. These factors make NFC widely scalable.

Data accessed by a NFC device is typically stored and encrypted in the cloud. If complex tasks are required, the tag instructs an NFC device to perform the function. For example, when an NFC tag captures an employee's time and location data, it might also send a message to the database to crosscheck that real-time data with stored schedule data in the cloud. If NFC functionality needed Internet access to complete its function, devices can store the captured data locally on the user's device and then upload it once it makes a connection to the network.

Some NFC technologies even allow Molly access when her phone battery dies. When a smartphone "dies," the battery is not necessarily depleted. If the NFC credential is still active in the phone, the remaining energy on the battery can support the data transfer between device and tag. Again, mobile phone carriers typically decide whether to enable this functionality, but it is possible. This solution would increase usage by limiting excuses and abuses.

SUPPORT AND MAINTENANCE

NFC devices and tags do not need hardwiring, batteries, or even much wall space. Devices and tags interact via inductive coupling where they share power and serve as portals between applications or information. Moving, adding, or replacing tags and chips requires only minimal reinstallation costs and efforts because they do not affect other systems. Individual tags are inexpensive ($1 or less each), so if tags break or become compromised, they are easy to replace. Unlike paper barcodes or Quick Response (QR) codes, the NFC technology does not require particular lighting to read and it is more resistant to environmental wear and tear.

Obstructing an NFC tag involves placing an object over the tag, like metal, that could short circuit the device. However, these attacks are easily spotted. NFC tags are small and not obstructive, so organizations can place them for convenience and access without upsetting the present workplace aesthetics. Organizations can place NFC tags and chips wherever necessary—in a doorway, in a hallway, or even at an employee's desk—making them easily accessible for all employees.

The NFC devices and objects themselves do not require software, although background systems for security, program interfacing, and other control processes may be used. The NFC bypasses the need for its own software by launching separate programs and applications to fulfill required actions. Unlike QR codes, NFC object interaction does not require an Internet connection or a full battery. Molly would not even need to unlock her phone.

Employees may regularly forget badges and swipe keys, but it is less likely than they will forget their personal device or smartphone. Employees may turn off their NFC detection functionality, but the organization can counter this with policy incentives. For example, managers might dock a performance point for each uncorrected occurrence of not following procedures.

CONCLUSION

Near Field Communication is not a superfluous functionality or trendy feature; it is a tool with the potential to revolutionize the way people access virtual and physical objects. As society and technology creep closer towards the integration of physical and virtual worlds, NFC serves to bridge the gap. Virtual data can be helpful in a variety of physical situations from recalling a daily task list or syncing personal and work schedules.

Access is a fundamental element of human society, and is controllable, scalable, and maintainable in the workforce. Access is about right time, right place, and right person. It determines entry, action, and even knowledge. In a world with faster, more frequent communication, NFC and access controls help organizations turn a vast ocean of data into a rushing stream of meaningful information.

"Imagine a world in which every single person on the planet is given free access to the sum of all human knowledge. That's what we're doing."

Jimmy Wales, one of the founders of Wikipedia. Quoted in Robin Miller "Wikimedia Founder Jimmy Wales Responds." *Slashdot* (2004-07-28)

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