



Contactless cards: How technology works and how to protect unauthorized transactions using a ‘armored’ card holder

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ABSTRACT

Contactless technology was implemented in magnetic cards to facilitate financial transactions between customers and merchants. One of the problems is that: because it is a technology capable of making payments without the need for a password, many people end up choosing not to use such technology for fear of carrying out transactions without consent. Therefore, this work aims to disseminate the operation of NFC applied to

magnetic cards and a tutorial on how to produce a low-cost “armored” card holder. Therefore, it is important that people are informed about the technology so that they can protect themselves and do not stop using it, facilitating and speeding up their financial transitions and that they do not need to contact the terminal, preventing the proliferation of viruses and bacteria. Digital materials were produced for digital platforms using two animation software addressing the explanation and operation of the technology. An armored card holder was also produced, creating an assembly tutorial, using cardboard, aluminum foil and tools such as scissors, ruler, etc. As a result, 03 shared publications were obtained, these publications took the information to some people who were afraid to use the resource. Therefore, with this work it was noticed that people need to be well informed about new technologies, especially those that facilitate their daily lives. In addition, it is important that science has a language that is more accessible to the lay public, so that it does not fall into superficial, even false, information and end up being held hostage by outdated procedures.

Keywords: Faraday’s cage, contactless, security.

1 INTRODUCTION

It is notorious that technological advances have become increasingly frequent in our daily lives, making the relationship between machine and man irreversible, changing the way in which information is visualized.

Brazil is among the five countries with the largest number of mobile phones in the world (NEWZOO, 2020), due to the facilities that the mobile device provides to its users.

This makes daily life easier, more enjoyable and fun, as well as being a tool widely used in the labor market, changing technological behavior in general and continuously.

NFC (Near Field Communication) technology emerged from RFID (Radio Frequency Identification), was developed by Sony and Philips in 2002, and boosted from 2004, by the NFC Forum, which is conducted by companies such as Samsung, Microsoft, Nokia, Google, Intel and Visa (NFC Forum, 2011).

Over the years this new technology has been offering great support to companies focused on the technological market, such as smartphones of different categories, assisting in the transfer of data using radio frequencies by the approximation between two devices in a short distance, being possible to carry out financial transactions, among other purposes.

In addition to allowing the transformation of objects into encrypted keys and a single access as a security measure, for example, opening a door of a hotel room, by even connecting appliances. More and more tests have been carried out to expand its application in cultural, commercial transport and management areas. (OK, et al., 2011).

Currently some companies have been adhering to a new payment method, in order to facilitate the life of consumers, reducing queues and direct contact with cash, offering security and convenience and speed through NFC technology, also called contactless payment.

Being a common factor among many of them, this technology has become increasingly promising, because it presents important possibilities of carrying out transactions through mobile devices, such as the cell phone, having as its main function the transmission of data quickly, through the approximation.

It offers security in relation to transactions, as there is no need to introduce the card into the machine, avoiding the possibility of cloning and card wear. For each transaction there is a unique and unique encryption code of that transaction, without the possibility and reproduce it, the card does not leave the customer's hand, always staying in your domain. But the risk of fraud is quite common (LORDELLO, 2020).

According to Visa's vice president of products, Percival Jatobá (2021), the advancement of this new technology has not expanded due to the lack of knowledge of the population about it and especially of merchants, not to convince merchants to migrate the means of payments offered to customers to the NFC system.

Thus, it is necessary a broad view of those on the other side of the counter that there is no reason to be afraid of the use of this new technology, which is already consolidating in various parts of the world.

Also, according to Jatobá, for merchants, this transaction represents more speed when it comes to streamlining payment, being a simple system, which does not require more in-depth training, reducing the time and queues in the establishments, being possible to serve a greater number of customers, that is, the customer pays his order only by touching the card on the machine (PDQ terminal - Process Data Quickly) without using passwords. As a security measure there is a maximum value from which one can be carrying out financial transactions (JATOBÁ, 2021).

The realization of payments through approximation is one of the practices that have become increasingly frequent in Brazil, due to its practicality when carrying out transactions without using passwords and without having to insert the magnetic card into the machine.

However, this technological tool has enabled criminals to carry out transactions without the victim's consent, only by approaching the machine (PDQ Terminal) of the victim's card and improperly diverting values from the bank account of these people, being a practice that has become more constant.

The executive director of PROCON-SP, Fernando Capez warns the entire population about the growing number of scams during the pandemic, an increase of about 70% in the number of registered coup attempts. Fraud happens, in most of them, without at least the victim having removed the card from the purse or wallet (PROCON-SP, 2020).

An effective alternative to stop this series of thefts is the creation of an "armored" card holder, that is, an object capable of barring the electromagnetic waves emitted by the machines. It is these waves that allow communication between the card and the collection machine, ensuring total security, blocking any possible fraud by scammers, regardless of where the card is stored, whether it is in the pocket, wallet or purse.

Being a compartment where the card will be protected and charges can only be processed when the card is removed from the protector for use, where no signal wave will contact the card without the owner allowing the transaction. Through this card holder, users can rest easy about scams, because it offers security in this regard, as well as being a way to store your card inside a package avoiding possible losses.

This communication happens because the PDQ terminal (financial transaction machine) creates a short-range electromagnetic field that, when the card enters this region of space, there is the exchange of information between the two, effecting the transaction. To better understand how this technology works, one needs to understand the basic fundamentals of physics.

1.1 THE FIELD AND ELECTROMAGNETIC WAVES

According to Halliday (2010), electromagnetic waves are considered oscillations arising from the electric and magnetic fields, which can propagate in different media, such as in a vacuum and through material media. However, with certain propagation characteristics depending on the medium.

The first formulation on electromagnetic waves was developed in the year 1864, through which it was possible to prove theoretically that an electromagnetic wave perturbation should propagate in a vacuum with the same speed as light. These waves can originate with the oscillations of electric charges, for example when the electron is accelerated.

These waves are classified as to the amount of energy they propagate, and this energy is directly related to the frequency of the wave. For example, radio waves have a low frequency, and therefore carry little energy.

In everyday life, we are constantly being "crossed" by electromagnetic waves of various types: The waves of the Wi-Fi signal of our home, the waves of the signal of the mobile phone operators, the waves of the TV signal, etc., that is, these waves have little energy and, until current knowledge, do not harm our health.

Nussenzveig (2015) says that electromagnetic fields are regions produced by electric charges that interact with other electric charges that 'communicate' through electromagnetic waves.

These waves have the ability to propagate in material media, as was said earlier, but when it comes to conductive materials, the penetration power of these waves (their ability to cross) decreases drastically compared to insulating materials.

This happens because the atoms that make up the metals have free electrons and these free electrons absorb the energy of the wave, making it difficult for this propagation inside the conductor.

The thicker the metal material medium, the more difficult it is for the electromagnetic wave to pass through. In fact, low-energy waves (radio waves, infrared...) are easily blocked by thin sheets made of thickets. Another concept that we must take into consideration is that of the Faraday cage.

1.2 FARADAY'S CAGE

The Faraday cage is a technology developed in the year 1836, by the British Michael Faraday, who sought to prove the effect of electric shielding using metal screens, which is one of the materials of best electrical conduction. This "cage" is intended to prevent the passage of discharges on a conductive surface, thus proving the effect of electrostatic shielding.

This effect of electrostatic shielding is of paramount importance in the development of everyday activities and its application in cars, airplanes and cell phones is essential as a form of security for protection against eventual electrical discharges resulting from natural phenomena such as lightning strikes.

The electrostatic shielding effect occurs when a volumetric body, made of conductive material, is inserted into the region of space where an electric field exists.

This electric field will cause the charged particles of the conductor to rearrange themselves on its surface of that conductor causing the electromagnetic field within that conductor to be zero. The same would happen if the conductive material were only a spherical shell.

It is possible to create a barrier against electromagnetic fields by simply wrapping the electronic device using a conductive material. This will protect you from possible interference caused by external

electromagnetic fields. The principle of the Faraday cage is also used in microwave ovens and mechanisms that have ease in conducting electricity, such as in buildings and high buildings, preventing the electrical discharge, that is, lightning, from harming the bodies inside.

The Faraday cage is an equipment developed with the intention of providing the isolation of the electromagnetic field of a specific place, so that it does not cover other places besides this, preventing the produced field from escaping out of the cage or into it, protecting it, providing an electric shield, that is, it acts on a conductive surface involving a given region of space, barring the entry and exit of disturbances produced from the external electric and magnetic field.

2 MATERIAL AND METHODS

It was proposed to build a type of card holder of low cost, with materials of easy access being possible to be found in the residences, without the need to buy them. This type of card holder that will be taught can be reformulated to be produced in another way, using the creativity of the reader. However, aluminum foil is an irreplaceable material, because it is this material that will protect and shield the card.

Materials and tools needed

- 14x10 cm of cardboard, or cardboard, or roll of toilet paper (the choice of raw material will depend on each user).
- 14x10 cm of aluminum foil (to make the coating of the raw material previously used).
- 14x10 cm of paper for coating the inner part
- 18x12cm for coating the outside of the card holder, which can be used (fabrics, EVA, TNT, paper contact, among others).
- Scissors.
- Glue (white glue/Silicone/hot glue/double-sided tape).
- Materials to decorate.

Figure 1: Materials used in the production of the card holder.

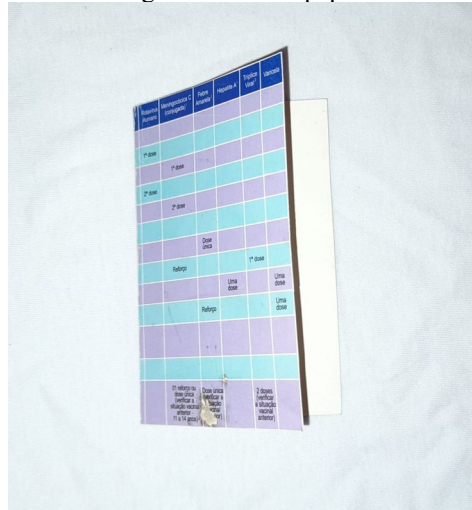


Source: IFSertãoPE, 2022.

2.1 PROCEDURES NECESSARY FOR THE CONSTRUCTION OF THE CARD HOLDER

For the construction of the card holder, fold all the papers in half, joining the smaller sides:

Figure 2: Folded paper.



Source: IFSertãoPE, 2022.

Take the aluminum foil and cover the entire outside of the cardboard, use the glue so that it is perfectly glued:

Figure 3: Card holder coated with aluminum foil.



IFSertãoPE, 2022.

The outside should be covered with the type of paper chosen for external coating, glued on the aluminum foil. On the inside glue the inner lining.

At the bottom inside of the card, make a horizontal cut in the width of the card, only in the inner coating. This will serve to hold the card inside the card holder. After this process, the user will be able to decorate the exterior according to their tastes.

Figure 4: Card holder ready.



IFSertãoPE, 2022.

Figure 5: Type 2 of the card holder.



IFSertãoPE, 2022.

3 METHODOLOGIES

The images were produced using Canva, an online graphic design software using its infographic creation tool. The images and figures were taken from the program itself, which provides a bank of figures. In the end, images were exported as an archive to be shared on social networks.

The video referring to the theory and explanation of NFC was produced using "Video Scribe", an animation creation program. The video with the tutorial of mounting the card holder was filmed with the cell phone itself and edited with video editing program. The two videos were edited to be in the 720x1080 screen ratio, that is, mobile screen format (vertical), because the main sharing network would be "Instagram", social network for sharing photos and videos and this network, in its great majority, are accessed by smartphones.

The files produced can be viewed at the following link: (https://drive.google.com/drive/folders/1npjtWnuPm_1uIxSUfygQNM_H9yM0iW5F?usp=sharing)

4 RESULTS AND DISCUSSIONS

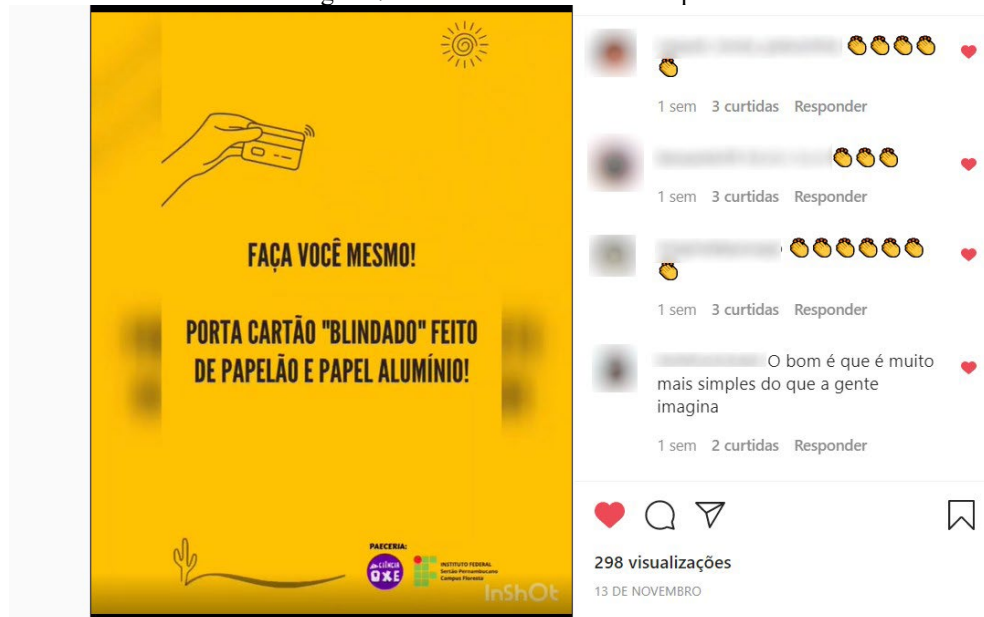
The present work was published in partnership with the @cienciaoxe Instagram page that corresponds to a scientific dissemination project of UNIVASF - Federal University of the São Francisco Valley. This partnership provided a lot of reach of the publications, as well as contributed to the scientific dissemination of the page. The disclosures took place in three stages: the first stage was disclosed through cards (images) entitled as "payment by approximation: What is it? How it works and how to protect yourself." The post got a lot of repercussion on the network with 157 likes, 15 comments, 17 saves, 13 shares, reaching 837 accounts, totaling about 1080 impressions. In the second stage, the publication was released with the video entitled: "Payment by approach: What it is, how it works and how to protect yourself". Through the content presented found the following interactions: 207 views, 31 likes, 4 comments, 1 save, 21 shares. Overall, 583 accounts were reached, reaching about 695 impressions. Finally, a Publication of the tutorial of the production of the card holder in video "Do it yourself" with 295 views, 35 likes, 5 comments, 4 saves, 4 shares. Totaling 975 accounts reached and 48 interactions with the content. Overall, the publication garnered 1324 impressions.

Figure 6: Comments on the publication of the cards.



IFSertãoPE, 2022.

Figure 7: Comments on the tutorial publication.



IFSertãoPE, 2022.

We can analyze some relevant comments in a qualitative way. Let's start with the comment made in the first post (Cards) by user 'A': "I loved knowing more!! I confess that I was always afraid to use this technology, but with the pandemic I ended up surrendering. Thank you." This comment shows that this person already had some knowledge about the technology, but was afraid to use it and claims that this publication brought him more information about NFC. We can note that user 'A' was encouraged to use this technology during the COVID-19 pandemic and that she probably felt more comfortable using such technology after reading the information shared by this work through this first publication.

A second comment made by user 'B': "I liked it. He didn't know he had a way to protect himself." He humbly confesses that he was unaware of any method of protecting this technology. This comment can be generalized, in a speculative way, to a large part of the population, because people end up not knowing methods of protection of new technologies inserted within society.

Another comment is made by user C, but made in the third post (card holder assembly tutorial): "The good thing is that it is much simpler than we think". It brings the observation that many people believe that you need sophisticated or very technological materials and tools to protect yourself and that in fact you can use low-cost and easily accessible materials.

5 CONCLUSIONS

When analyzing the data, it was possible to observe that the posts obtained a lot of repercussion in social networks, the users showed interest in knowing more about the subject, achieving the objective of the work in carrying out the sharing of this technological information with the community,

providing the use of technologies that facilitate the daily lives of people. Even more so in the current global public health scenario, with the spread of the COVID-19 virus, in which the use of this technology decreases contacts between people indirectly, by reducing the touch of possibly infected people in payment terminals (machines) in financial transactions, decreasing the spread of this and other viruses and bacteria. This work can be continued, with other actions in this area, improving the security of this NFC technology in magnetic cards, not only with the improvement of the card holder or other form of physical protection, but also improving the very technology that still sins in this aspect.

The title of this topic should be bold and left-aligned. Do not leave a line separating the title from the text. Start the text with a 1.0 cm indent from the left margin. Present the main conclusions in short sentences, separated by paragraphs. Do not use this section to summarize the results (which has already been done in the Summary), but to highlight the progress and applications that the work provides. Emphasize the limitations that persist, presenting, whenever appropriate, suggestions for future work. Leave a blank line after the text of the conclusions.

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