

## Examining Users' Understanding of Security Failures in EMV Smart Card Payment Systems

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**Abstract**— New credit cards containing Europay, MasterCard and Visa (EMV) chips for enhanced security, and for in-store purchases (rather than online purchases) have been adopted considerably in recent years. EMV supposedly protects the payment cards in such a way that the computer chips in a card referred to as chip-and-pin cards generate a unique one-time code each time the card is used. The one-time code is designed such that if it is copied or stolen from the merchant system or from the system terminal, it cannot be useful for creating a counterfeit copy of that card or counterfeit chip of the transaction. However, in spite of this design, EMV technology is not entirely foolproof from failure. This paper discusses the issues, failures and fraudulent cases associated with EMV Chip-And-Card technology. The work also evaluates people's understanding of these issues and the consequential precautions they take to safeguard their information while using the EMV cards for transactions.

**Keywords**— Chip and PIN Card Fraud, Card Security, Protocol Failure, Card Authentication, Users' perceptions, Payment Risks, Awareness.

### I. INTRODUCTION

For e-payment applications, the underlying intention is to offer customers a safe and easy way to pay online. The purpose of all payment processors is the same; to ensure secure and convenient payments. With this mindset, it is a good idea to have a detailed understanding of all characteristics and technicalities of how several of the online and offline payment methods function in order to avoid pitfalls and make the most effective choice to grow a business or carry out transactions. The main components in the transaction system between a business organization and customers in the online environment include an internet merchant account and a payment gateway. In order to facilitate payment, an alternative payment method such as PayPal can be included to cater for those customers who may not want to use credit cards. Once these pieces are in place, then customers can make purchases from business checkout page by submitting their payment information. The information presented by the customers is then sent to the payment gateway, which encrypts the payment information and shuttles it through the series of payment processors and networks for authorization where the payment is either accepted or declined. The decision whether the transaction is

accepted or rejected is then relayed back to the customer in a short period of time, typically in few seconds.

Another type of payment is carried out by swiping the cards on POS (point of sale) devices of a merchant or retailer. Payment information is taken off from the credit card magnetic strips in order to process the transaction. The magnetic strip often called a magstripe, unfortunately, is not a satisfactorily secured technology as fraudsters can still steal the information from the magstripe and clone a new credit card with the customer information stolen. Subsequently, the fraudsters could use the card for several criminal or fraudulent activities such as shopping. This is why banks and credit card issuers are trying to devise other alternative solutions apart from magstripe credit cards. One of such solutions is the chip-and-pin cards. This type of cards are more prevalent in Europe, although not very common in the US (Barisani, Bianco, & Laurie, 2011; EMVCo, 2011, EMVCo, 2011b; EMVCo, 2011c). Most countries still do not have infrastructures to support the chip-and-pin technology.

The primary difference between the chip-and-pin and magnetic stripe technology is that the magstripe credit cards store all information on the magnetic stripe. In the case of