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# Evolution of Mobile Payment: Ancient to Present

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## Payments in the Past:

- One of humanity's earliest form of payment was "mobile" – livestock.
- 700 BC: Precious metal coins were first used in 700 BC in ancient cities along the Mediterranean,
- 960: Paper money first appeared in China in 960.
- 1887: Credit cards were mentioned in the 1887 novel "Looking Backward" by Edward Bellamy.
- 1921: The first "charge card" was issued in 1921 to customers of Western Union.
- 1958: The first modern credit card by a third-party bank was the Bank Americard in 1958.
- 1977: In 1977, it changed its name to Visa.

## Keywords

- Payment System
- Mobile Payment
- Apps
- NFC
- HTTP

## Mobile P2P Transfers

- Payment Occurs On: Consumer's Device
- Data Stored on: In a PCI-Compliant environment
- Purpose: Bank Transfer
- Examples: PayTM

## Near Field Communication (NFC)

- Payment Occurs On: Consumer's Device
- Data Stored on: On Phone
- Purpose: Purchasing Goods
- Examples: Samsung Pay, Apple Pay

Mobile payments are evolving fast – who knows how we'll be paying next!

## Cybercrime Case Study

### Detection and Validation

In one particular instance, a customer contacted the Chief Information Security Officer with a difficulty

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## The Early Years: Text and RFID:

- 1997: Coca Cola first introduced mobile purchasing in 1997. Customers could send a text message to select vending machine to purchase their drinks.
- The same year, Exxon Mobile introduced contactless payment with the Speedpass.
- A payment device using RFID could be clipped to a keyring and swiped to pay instantly at the pump.

## Mobile Payments Today:

- Types of Mobile Payment

### In-App Payments

- Payment Occurs On: Consumer's Device
- Data Stored on: On Phone
- Purpose: Purchasing Goods
- Examples: CCD, Starbucks

## Online Payment Services

- Payment Occurs On: Consumer's Device
- Data Stored on: In a PCI-Compliant environment
- Purpose: Purchasing Goods
- Examples: Flipkart, Amazon, VISA checkouts, PayPal

## Bluetooth Low Energy (BLE)

- Payment Occurs On: Consumer's or Merchant's Device
- Data Stored on: In a Mobile Payment account
- Purpose: Purchasing Goods
- Examples: Paypal's Beacon

## Mobile Point of Sale (MPOS)

- Payment Occurs On: Credit Card Reader / Merchant's Device
- Data Stored on: No
- Purpose: Purchasing Goods
- Examples: Shopify

involving payment price manipulation, that had recently made transaction using the known vulnerability within the application and payment gateway.

The victim's concern wasn't just that the products amount (price) are being manipulated of a selected vendor but the opposite vendors were also in peril of comparable compromise.

### Problem Reported

- The problem reported was of the payment price manipulation where the victim could buy any product of a selected vendor at the minimal cost. The vulnerability was as follows:
  - The hacker ordered a product and captured the request before it hit the payment gateway.
  - The original price value of the merchandise was Rs. 600.00 and therefore the hacker tampered the worth value and entered Rs. 6.00 and forwarded the HTTP request.
  - The hacker was then redirected to the bank payment page with the ultimate price to be paid as Rs. 6.00
  - The hacker successfully placed the order for just Rs. 6.00 vis-à-vis the first price of Rs. 600.00

### Investigation Approach

This was an easy attack yet a critical vulnerability and this happens when the worth isn't validated back by the server. it's a priority that also such simple loopholes exist and developers misses the validation of the worth.

In investigation, the response doesn't always only involve the analysis of digital evidence. In many of our cases, we discover that traditional investigative techniques are

even as important as, if no more so, than data obtained from the newest forensic tools.

In this case, interviewing the CTO, CFO, Risk Team proved integral in determining how the payment manipulation had been taken. By interviewing key employees, we were able to concentrate on the system and therefore the application used for the particular vendor that had the vulnerability.

### Response and Investigation

Shortly, after initial notification, we arrived onsite at the victim's office and set about interviewing the key stakeholders. We began by working with the appliance team liable for the event of the appliance that was the main focus of the cyber investigation. In comparing features listed by the threat actor on their payment gateway, the investigating team identified several key details that appeared a twin of the attack vector.

After determining that it absolutely was possibly that the appliance code had a vulnerability which allowed the system to be compromised. Our first request was for the names of these employees who worked on the appliance.

A digital forensic examination of the CTO, CFO, Risk Team, Application Team systems and associated logs (firewall and application) provided evidence of a breach associated, which were resident on its system.

### Remediation and Recovery

With the chain of event clearly laid out, the victim then turned toward remediation. There was nothing it could do to recover the lost investment, but this victim was sure it didn't want to travel through this a second time. Especially with social threats, we discover that even the foremost mature organizations can fall victim to data theft. We provided many recommendations, starting from easy wins to more robust and involved

solutions, which the victim worked into its current security posture.

Some secure steps which will be taken to stop against such reasonably attacks were recommended:

- Always validate the worth back by the server.
- Pull the worth from database and check whether it's an equivalent price.
- Refrain from sending amount in http request rather send only the merchandise ID.

Social threats are hard to defend against, even when an honest security plan and style is in situ, so recommended the victim to adopt robust monitoring solutions to spot the first signs of attacks and compromise. Anti-Virus, Intrusion Detection Sensors, Log Monitoring were all available however they weren't used effectively. Anti-virus was installed on all the organizational assets however the updates weren't monitored regularly. We recommended having a centralized solution in order that updates can be extended across the organization.

### Lessons Learned

Some of the measures a company can go for reduce the impact may include, but not limited to:

- Comprehensive and Clear Information Security Policy
- User Education through training and awareness programs
- Active monitoring of systems and alerts
- Periodic audits to visualize policy compliance

Security controls are often enhanced with strong and mutual authentication combined with a sturdy identify and access management program.

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### Annexure I

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<https://www.slideshare.net/RyanCarleton/verizon-data-breach-digest-2016>

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### Reviewers Comment

**Review 1:** As the Cybercrime is a rising concern for Information Security specialists. Learn cybercrime management best practices in several areas, including advanced tenacious intimidations, phishing, threat intelligence and unified threat management.

**Review 2:** Through the emergent use of Mobile-phones and feast of high-speed 3G/4G networks system, there has been a gradual changeover of social interaction, commercial transactions.

**Review 3:** These exploitations are committed by a designated group of offenders. Unlike crimes using the computer as a tool, these crimes need the technical information of the perpetrators. As such, as technology changes, so too does the nature of the crime.



### Editorial Excerpt

The article has 20% plagiarism which is accepted as per the norms and standards of publication for the magazine. The author has modified the paper as per reviewers' comments and editorial boards suggestions. The comments related to this manuscript are noticeable related to the theme "Evolution of Mobile Payment" both subject-wise and research-wise. If there has been one reliable theme concerning the development of payments, it's that we favour expenditures that are convenient and transactional. These preferences began to take shape in the early 20th century with the introduction of the charge card. After blind reviewers and editorial boards' remarks the article has been finalised to publish and categorise under "View Point (VP)" category.

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