Keeping Digital Track:
Applying QR Codes or RFID Tags to a Large Museum Collection

Jesse Kraft, Ph.D.
Resolute Americana Assistant Curator
American Numismatic Society

ICOMON 2023
Kuala Lumpur, Malaysia
November 16, 2023

Today's Topics
How To Track Your Collection

- A major problem facing money and banking museums

- What are QR Codes? What are RFID Tags?

- What are their similarities and differences?

- Which are more useful? For which applications?

- The most optimal solution?
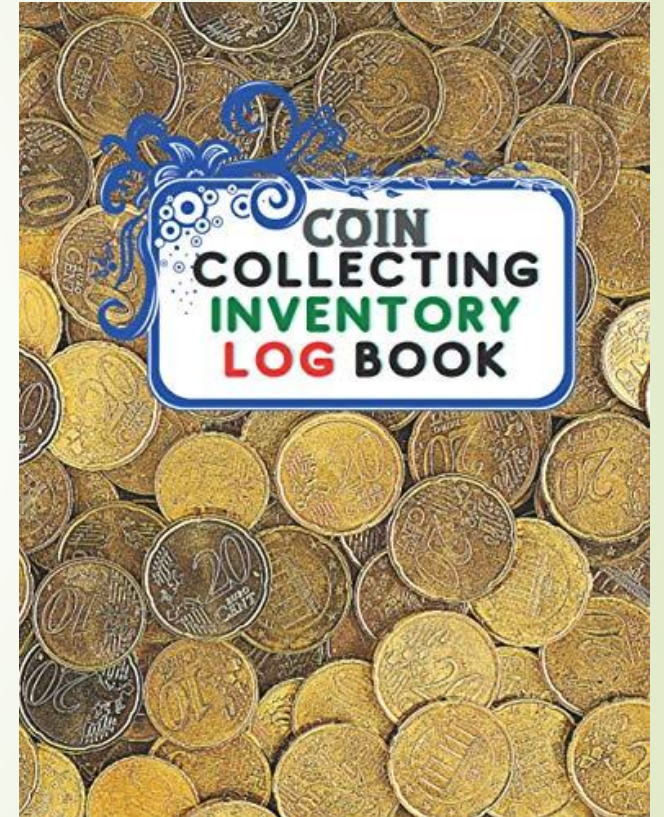
What Do We Have? Where Is It?
A major problem facing money and banking museums

- In Collection Management, keeping track of objects is a major problem faced by many money and banking museums

- With many particularly small objects at hand, just keeping track of the collection can be a full-time job

- For immense collections, traditional methods are not viable

QR Codes
Quick Response Codes

- QR Codes contain data that is scanned by a laser reader and transfers viewable information to it
  - Uses vertical and horizontal components to create a unique pattern
  - Essentially, scanner is a camera that needs to focus on the QR Code
  - Examples include coupon, entry tickets, restaurant menus, museum objects
- Two different types of QR Codes:
  - Static—Information can be altered
  - Dynamic—Information cannot be altered

QR Codes

- Generating QR Codes:
  - Extremely easy to print
    - Can be generated and printed with most computers/printers
    - Takes no more than 30 seconds to scan tag, add object to fixed asset register, affix tag to object/box
    - Can be scanned digitally or manually entered
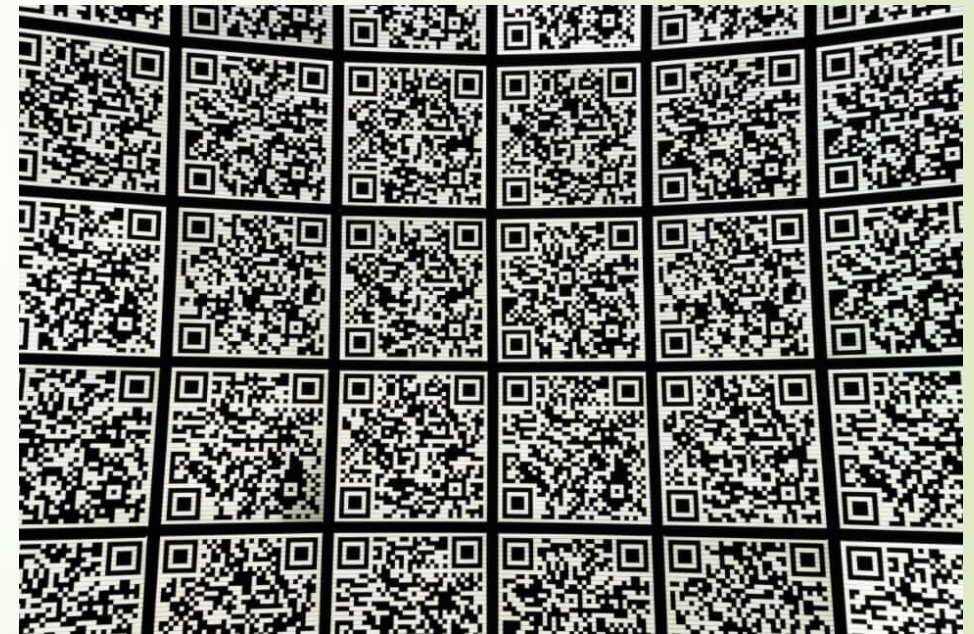
QR Codes

- Limitless data
  - No limit of information that can be linked to them
  - Even directly to a URL
- Durability
  - Can still be read with up to 30% of its data missing
- Measurable results
  - Over time, data can be compared to show any changes

Drawbacks of QR Codes

- Some primary drawbacks:
  - Do not have as many applications as RFID (largely due to need for line of sight)
    - Not a problem if museum does not require mass updates (as would require scanning of multiple object tags)
  - More of a chance for human error
    - Tags can either be skipped, or scanner may not pick it up if working quickly
  - Might require the tag to be affixed to an object
    - Not only unappealing, but potentially damaging to old objects

Limited Access

Misuse of QR Codes

01   02

03   Lack o Awareness

DISADVANTAGES OF QR CODES

04   Quality

05   Security Risks

06

Privacy Concerns

RFID Tags
Radio Frequency Identification Tags

- Instead of laser technology, uses radio frequencies
- Two different types of RFID Tags:
- Active RFID
  - Requires internal power source/battery
    - Affects their size, longevity, and durability, but also gives a larger range
  - Constantly transmits information
  - Allows for fastest, simplest method of updating asset register
  - Good for high-speed applications, like car tolls
- Passive RFID
  - Powered by electromagnetic energy send from RFID reader
  - Do not require battery and could potentially last forever
  - Smaller, more flexible, more durable
  - Smaller scanning range
  - Good for access control, timing, tracking objects, etc.
- Both require microchip (where info is stored, processed), antenna (how info is received/transmitted), and substrate (what holds everything together)

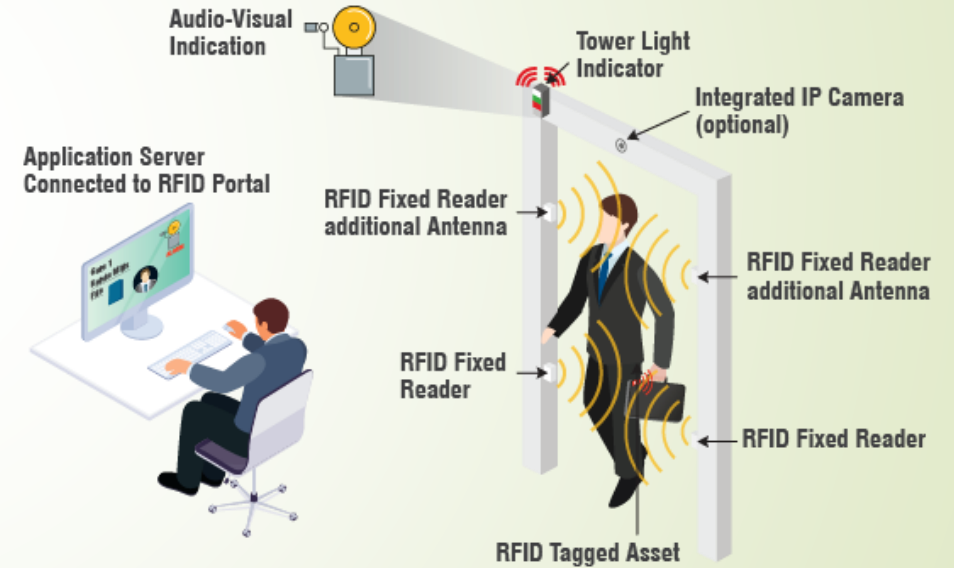Passive

Active
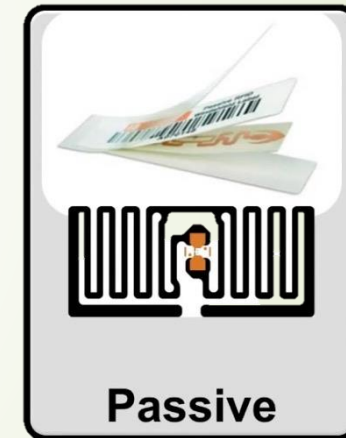
Benefits of RFID Tags
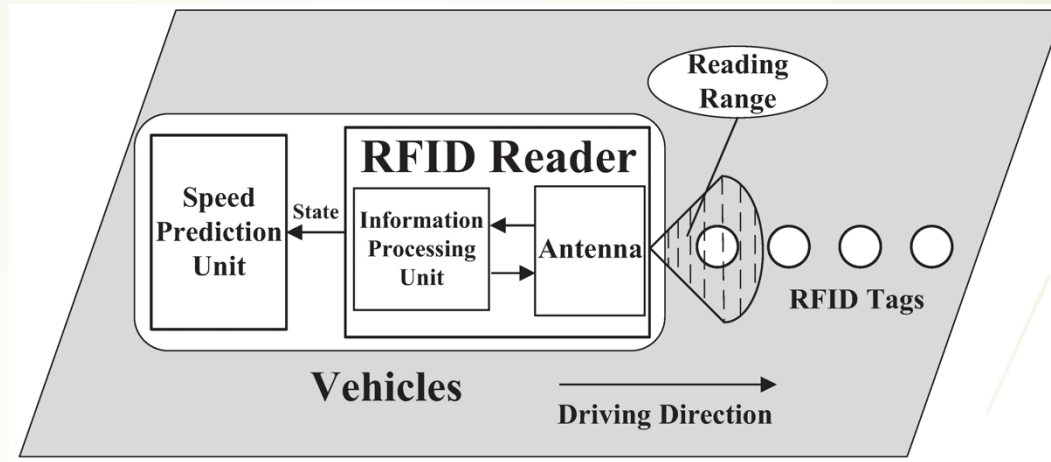
- Speed:
  - Can walk into a room, press a button, and know exactly what assets are present
    - While QR Codes might take 0.5 seconds, RFID are a fractions of the time
  - Can be scanned through surfaces and multiple objects scanned at once
- Repeated Uses:
  - While the information on QR Codes can only be uploaded once (i.e., "read-only"), info can be erased and updated over and over again (i.e., "read-write")

Benefits of RFID Tags

- Real-Time Data
  - Allows for better management and security of objects
  - Allows for better security of collection
  - Only those with permission are granted access to information (both to individuals and those within a given radius of scanner)
  - Automated nature of RFID Tags minimize human error

Drawbacks of RFID Tags

- Cost:
  - Tags can range from cheap to expensive, depending on whether active/passive, range, etc.
    - "Cheap" = US 5¢ – 10¢ each
  - Scanners can be expensive
    - Perhaps as much as US $3,000+
    - May require more than one, depending on application
- Infrastructure:
  - Scanners may require dedicated reader that requires Bluetooth in order to communicate with scanner (further expense)
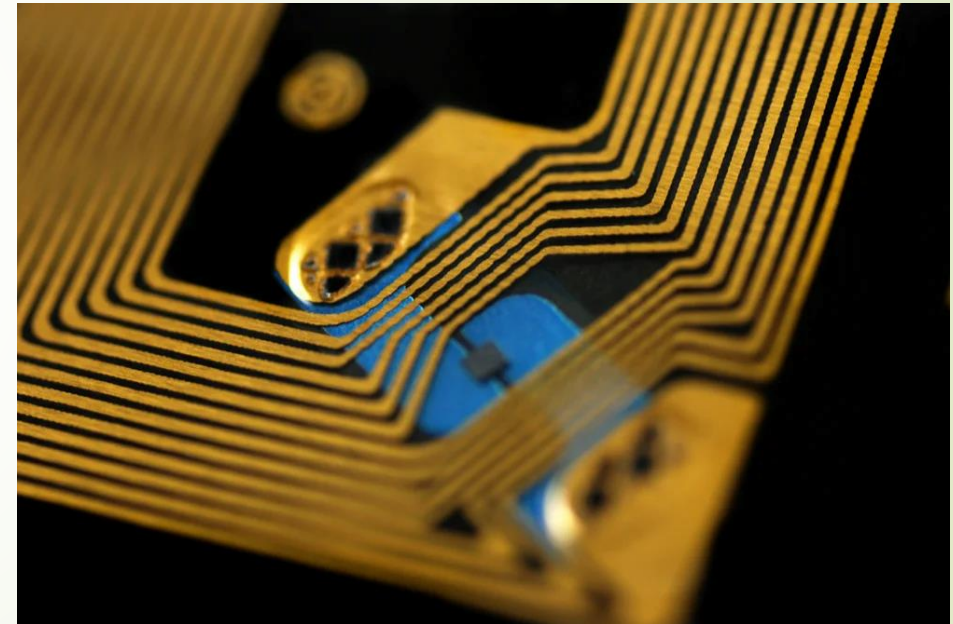
Differences between QR and RFID?
At a Glance

➡ Very similar purpose and usage

|	QR Codes	RFID Tags
Cost	Cheap	Expensive
Size	Small but visible	Larger but hidden
Usability	Needs to be scanned	Just needs to be relatively close
Information	Changed manually	Real-time
Durability	Durable	Less durable
Generation	Can print at office	Must be ordered
Locating	Object must be present	Can only sense the presence of tag
Scanability	Smart phone friendly	Requires dedicated scanner

Which to Use?

- Depends on Application

- Because of cost, if QR Codes can handle the task, opt for it

- If cost is not an issue, and large numbers of objects must be tracked (especially with distance involved), perhaps RFID is what you may need

- If the quick retrieval of information is all that is needed, QR Codes should be good

- If rapidly evolving information is required, RFID Tags might be more suitable

Thank you!

- Questions?

- Comments?
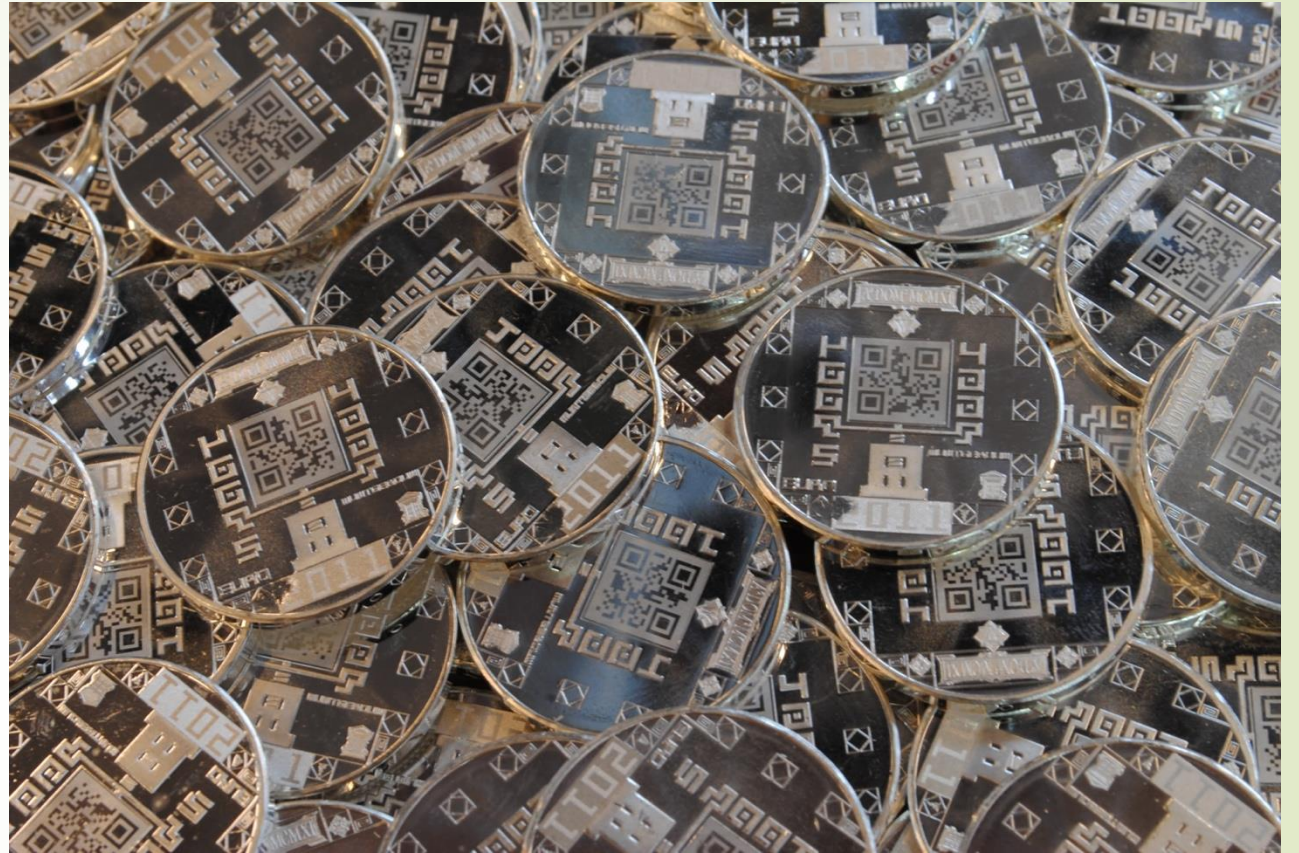
- Jesse Kraft, Ph.D.
  Resolute Americana Assistant Curator
  American Numismatic Society
  jkraft@numismatics.org

- ICOMON 2023
  Kuala Lumpur, Malaysia
  November 16, 2023