Kidnapping a Library

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How Ransomware Taught the British Library to Follow Well-Known Best Practices

Brian Myers PhD, CISSP, CCSK

Experience

- 20 years in software development
- 10 years in information security

Past Positions

- Director of InfoSec, WebMD Health Services
- Senior AppSec Architect, WorkBoard
- Senior Risk Advisor, Leviathan Security

Current Work

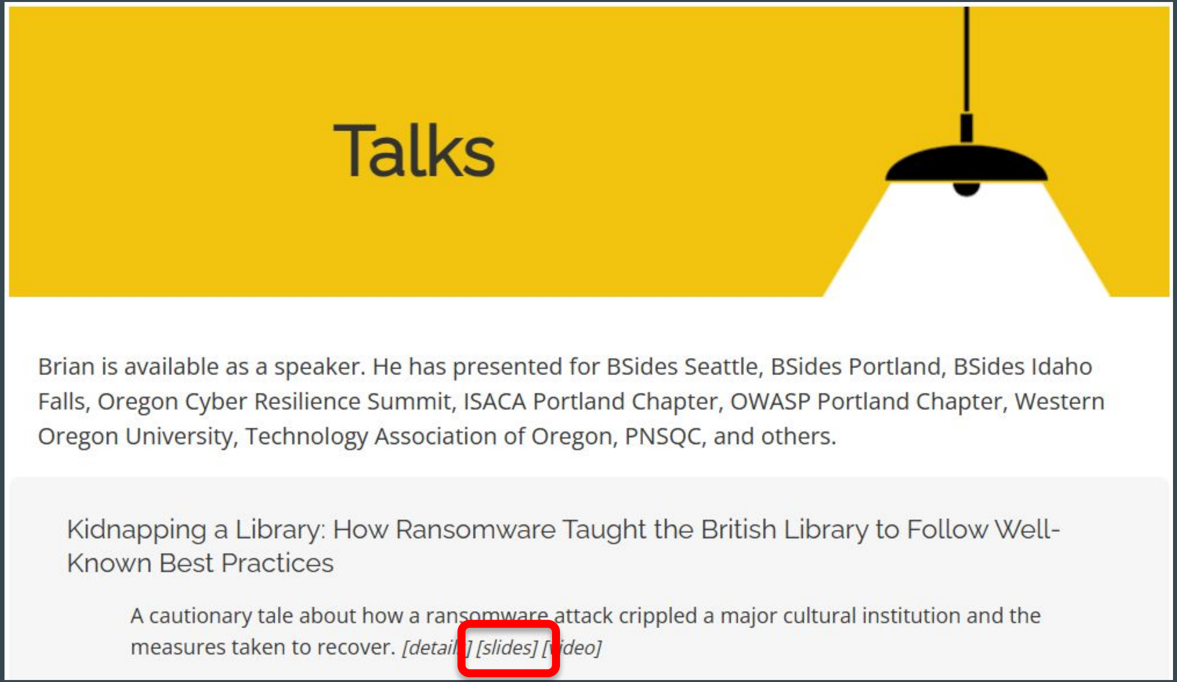
- Independent Information Security Consultant

Volunteer

- Western Oregon University CS Advisory Board
- OWASP AppSec Days PNW (2021-24)

Getting the Slides

safetylight.dev/talks

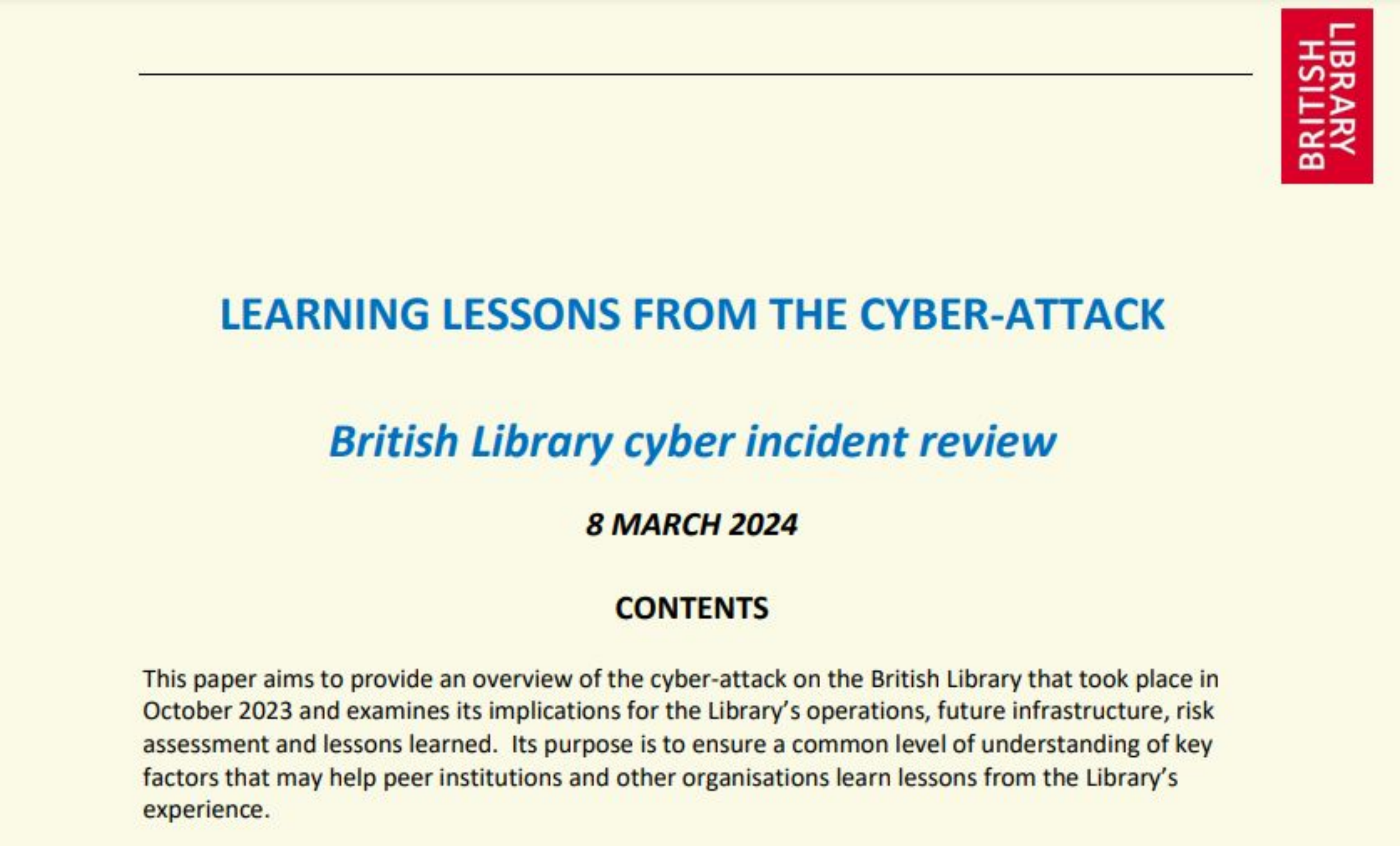


Talks

Brian is available as a speaker. He has presented for BSides Seattle, BSides Portland, BSides Idaho Falls, Oregon Cyber Resilience Summit, ISACA Portland Chapter, OWASP Portland Chapter, Western Oregon University, Technology Association of Oregon, PNSQC, and others.

Kidnapping a Library: How Ransomware Taught the British Library to Follow Well-Known Best Practices

A cautionary tale about how a ransomware attack crippled a major cultural institution and the measures taken to recover. *[details] [slides] [video]*



BRITISH LIBRARY

LEARNING LESSONS FROM THE CYBER-ATTACK

British Library cyber incident review

8 MARCH 2024

CONTENTS

This paper aims to provide an overview of the cyber-attack on the British Library that took place in October 2023 and examines its implications for the Library's operations, future infrastructure, risk assessment and lessons learned. Its purpose is to ensure a common level of understanding of key factors that may help peer institutions and other organisations learn lessons from the Library's experience.

Agenda

The British Library

The Attack

The Consequences

Lessons Learned

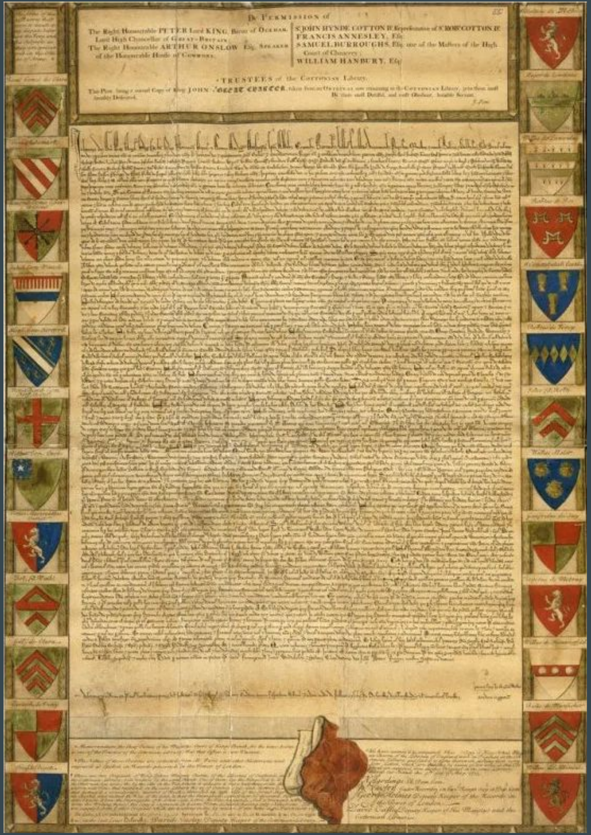
The British Library

History

regularly acquiring disparate collections

1973	British Museum books
1970s	Newspaper Library Patent Office Library
1982	India Office Library
1983	National Sound Archive
2004	UK Web Archive Endangered Archives
2000s	Digitization partnerships
2013	Non-print Legal Deposit Library

Manuscripts and Books



By Permission of

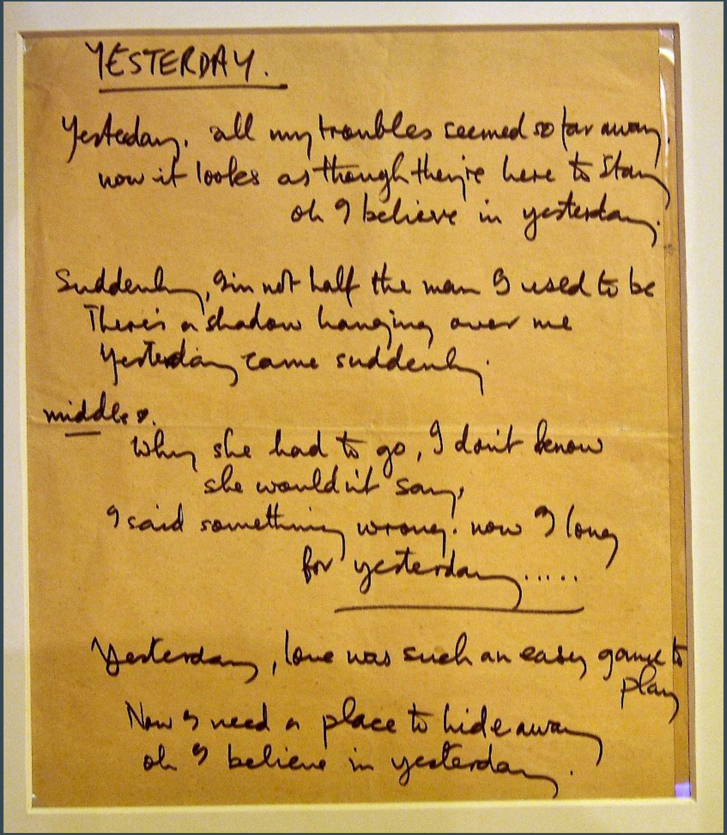
The Right Honourable PETER Lord KING, Baron of Ockham,
Lord High Chancellor of Great-Britain;
The Right Honourable ARTHUR ONSLOW Esq. Speaker
of the Honourable House of Commons.

Sr. JOHN HYNDE COTTON Bt. Representative of Sr. ROBt. COTTON Bt.
FRANCIS ANNESLEY, Esq.
SAMUEL BURROUGHS, Esq. one of the Masters of the High
Court of Chancery;
WILLIAM HANBURY, Esq.

TRUSTEES of the COTTONIAN Library.

This Plate, being a correct Copy of King JOHN's GREAT CHARTER, taken from the Original now remaining in the COTTONIAN Library, is to them most humbly Dedicated.
By their most Dutiful, and most Obedient, humble Servant.
J. Pine

[illegible]



YESTERDAY.

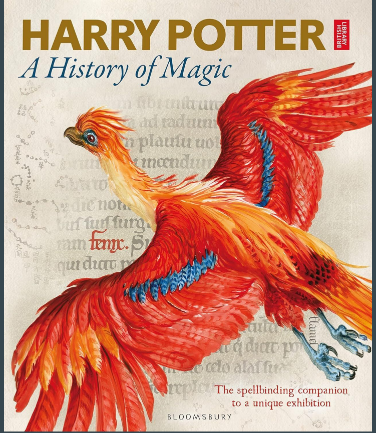
Yesterday, all my troubles seemed so far away,
now it looks as though they're here to stay
oh I believe in yesterday.

Suddenly, I'm not half the man I used to be
There's a shadow hanging over me
Yesterday came suddenly.

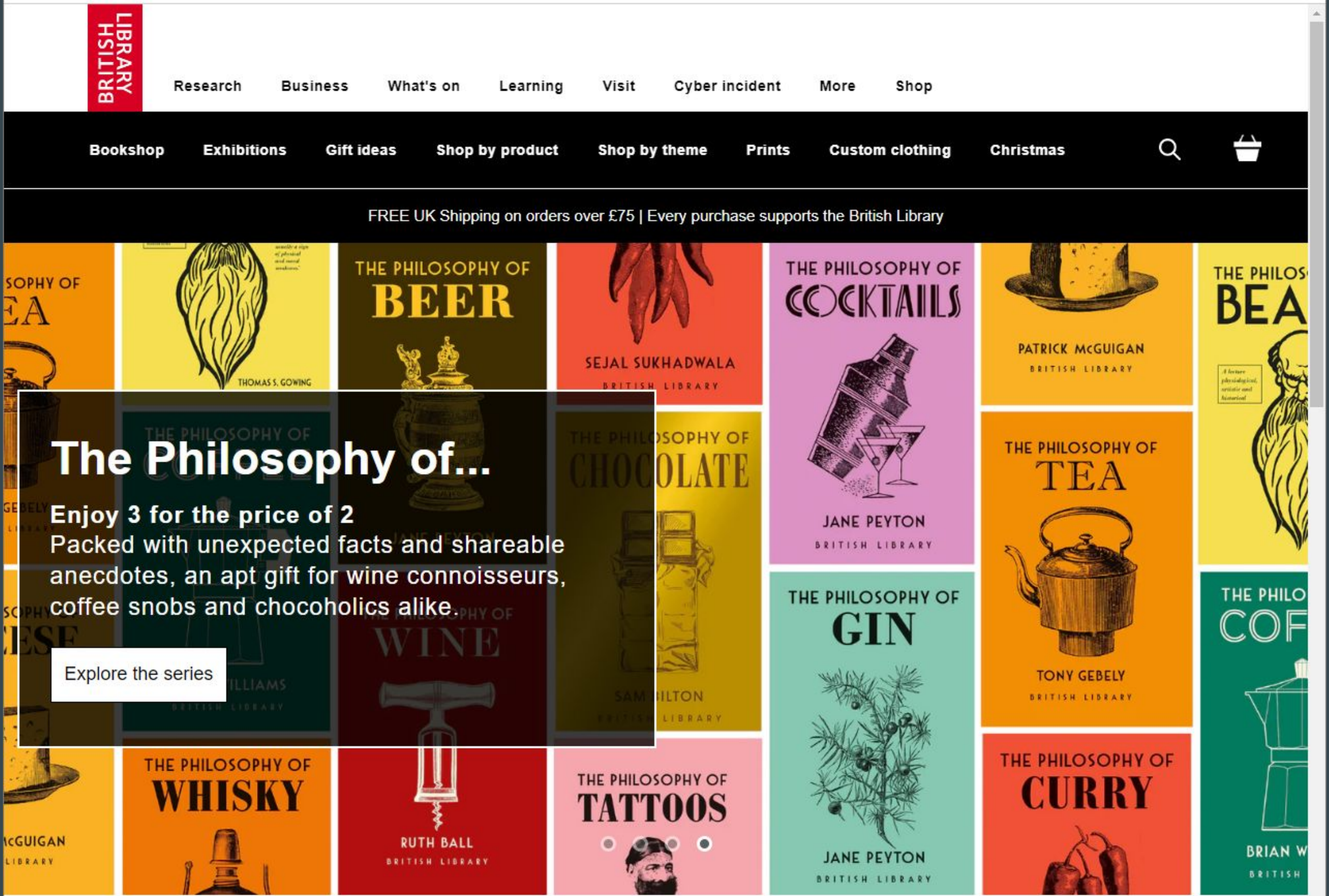
middle 8.

Why she had to go, I don't know
she wouldn't say,
I said something wrong. now I long
for yesterday.....

Yesterday, love was such an easy game to
play
Now I need a place to hide away
oh I believe in yesterday.


HARRY POTTER
BRITISH LIBRARY
A History of Magic
fenix.
The spellbinding companion to a unique exhibition
BLOOMSBURY

NEDCON

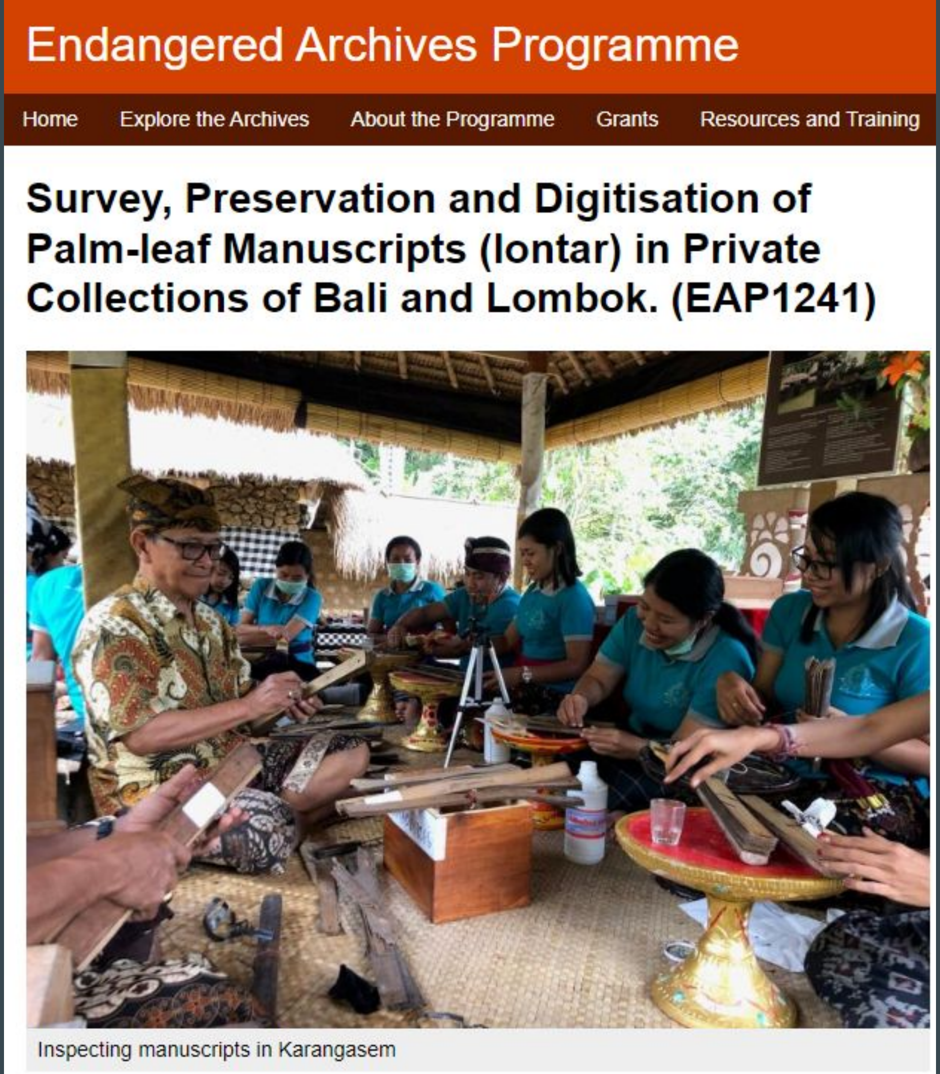


FREE UK Shipping on orders over £75 | Every purchase supports the British Library

The Philosophy of...

Enjoy 3 for the price of 2

Packed with unexpected facts and shareable anecdotes, an apt gift for wine connoisseurs, coffee snobs and chocoholics alike.



Endangered Archives Programme

Survey, Preservation and Digitisation of Palm-leaf Manuscripts (lontar) in Private Collections of Bali and Lombok. (EAP1241)

Inspecting manuscripts in Karangasem

How Big is the British Library?

Printed items	170 million	
Bookshelves	463 miles	+5 per year
Web pages	1.56 petabytes	
Staff	1600 people	librarians, researchers, IT, administrative staff
Annual Budget	£147 million *[$200m]*	2023

What Information Systems Does the Library Have?

Public-facing website

- Online learning materials
- Reader registration
- Digital archive access

Internal network

- Firewalls, terminal servers...
- Office systems: HR, Payroll, Email, file shares...

POS systems on site

- Cafe, gift shop

Collections

- Digital archives
- Online catalog(s)

What’s the Library’s Infosec Program Like?

Firewalls (Sophos XG)

MFA

Incident Response Plan

Risk Register

CIS hardening standards

Routine security assessments

MDM on endpoints

PCI encryption for credit card data

Business Continuity Manager

Corporate Information Governance Group (CIGG)

Security roadmap (plans to address known risks)

Regular risk assessment activity

“Cyber Essentials” assessment passed in 2019

Recently upgraded Terminal Services server

Agenda

The British Library

The Attack

The Consequences

Lessons Learned

The Attack

Rhysida’s Modus Operandi

GAIN ENTRY

- Leverage external-facing remote services *(such as VPNs)*
- Phish
- Authenticate with compromised valid credentials. *(Often lack of MFA makes this easier.)*

LOOK AROUND

- Evade detection by “living off the land.”
- Lateral movement with built-in tools *ipconfig, RDP, PowerShell…*
- Steal data for double extortion

ATTACK

- Inject ransomware into running processes
- Encrypt files, adding *.rhysida* extension
- Create a ransom note PDF with payment instructions
- Delete ransomware

Source: CISA Cybersecurity Advisory, Nov 15 2023

Date	Event
Oct ??	Rhysida gets credentials for a third-party account with access to BL network
Oct 25 (late Tue)	Attacker logs in through Terminal Services
Oct 26 1 AM	Automatic alert investigated; nothing found
Oct 26 7 AM	Further investigation; account re-enabled with new password

“The lack of MFA on the domain was identified and raised as a risk at this time, but the possible consequences were perhaps under-appraised.”

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??	Ransomware runs

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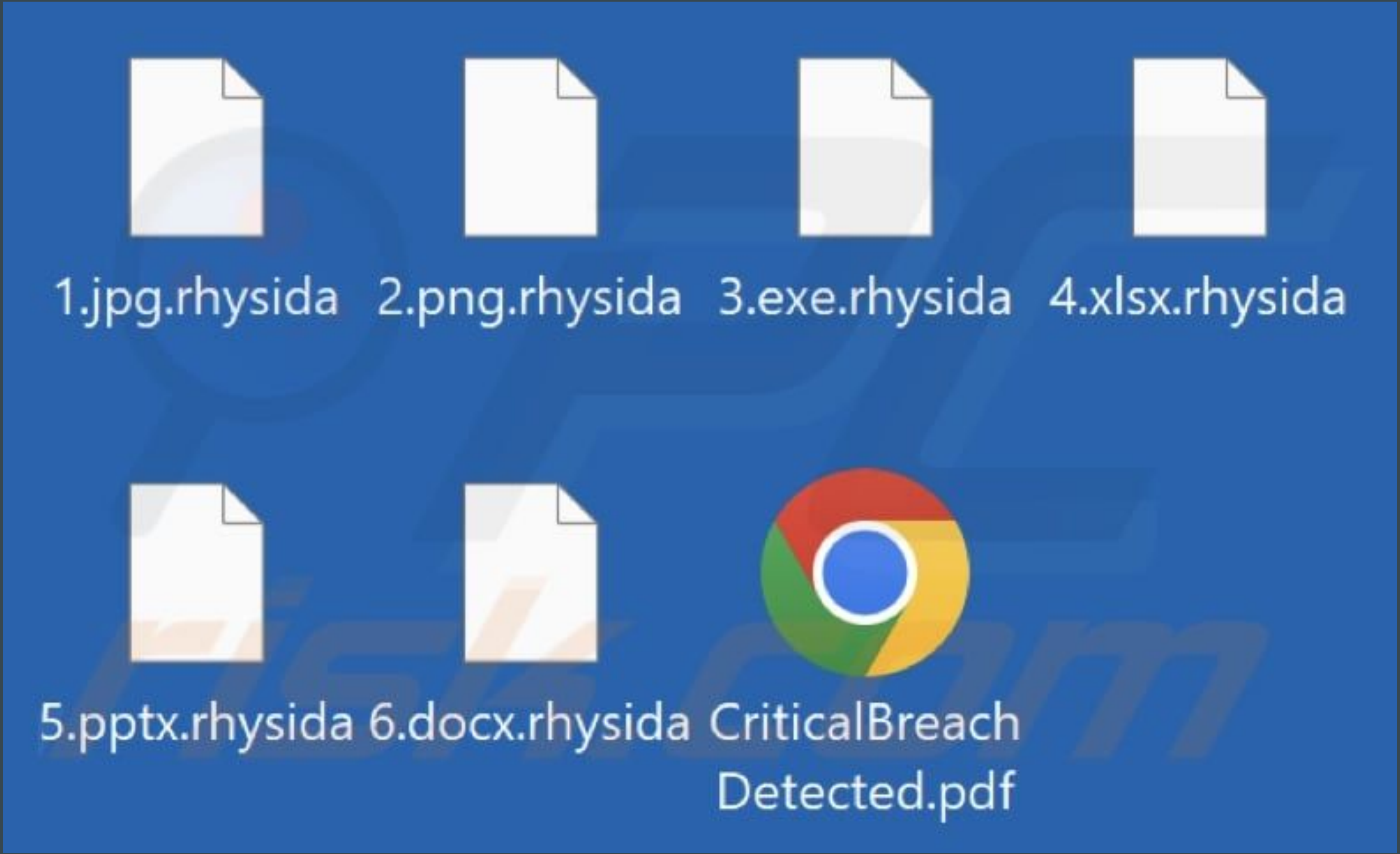
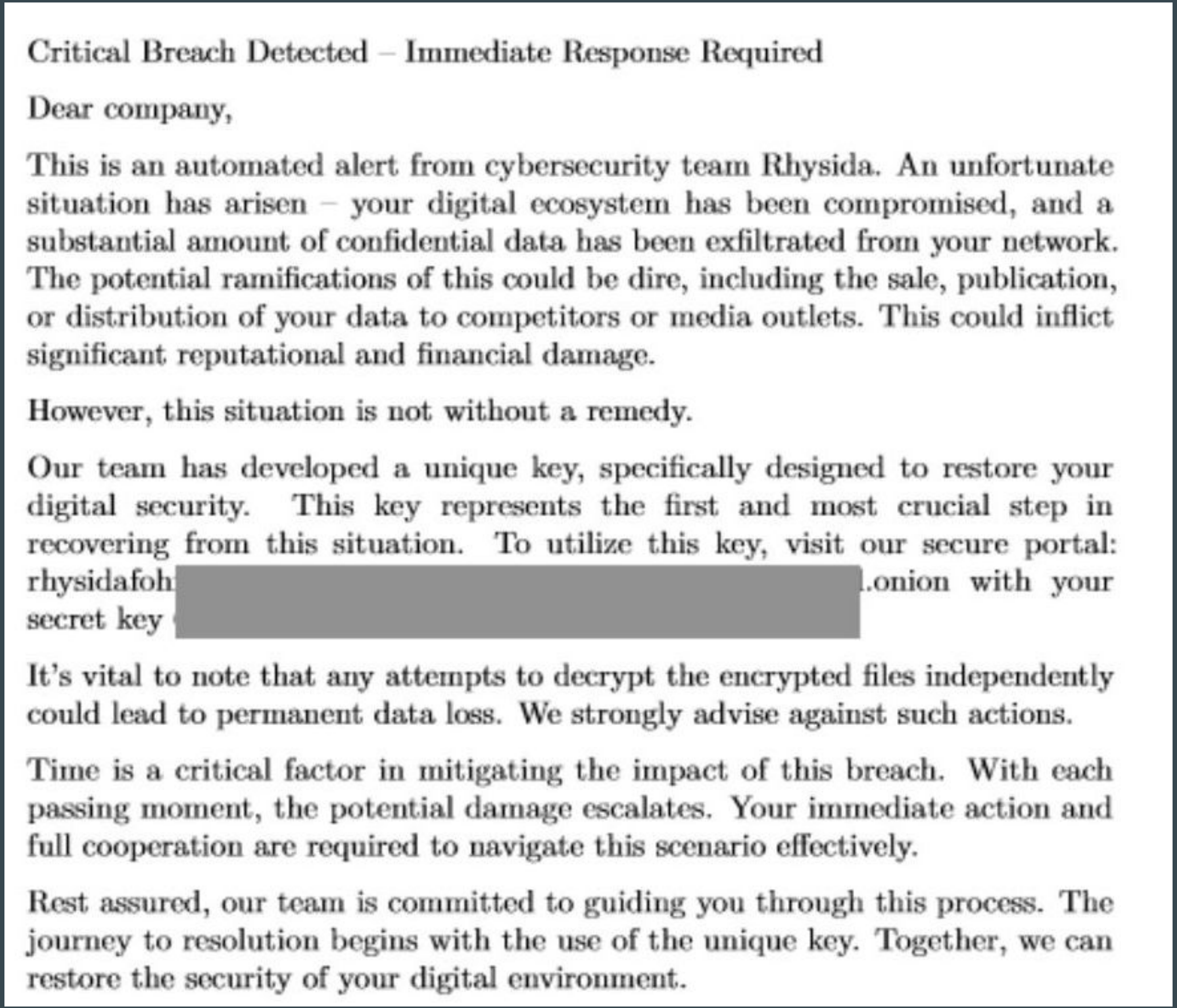
??	Ransomware runs
7:35 AM	🚨 IT Outage. Ransomware confirmed.
9:15 AM	Incident declared; crisis team in communication via WhatsApp

SATURDAY,
10/28/2023
7:35 AM
CRITICAL ALERT ALERT


1.jpg.rhysida
2.png.rhysida
3.exe.rhysida
4.xlsx.rhysida
5.pptx.rhysida
6.docx.rhysida
CriticalBreachDetected.pdf



Critical Breach Detected – Immediate Response Required

Dear company,

This is an automated alert from cybersecurity team Rhysida. An unfortunate situation has arisen – your digital ecosystem has been compromised, and a substantial amount of confidential data has been exfiltrated from your network. The potential ramifications of this could be dire, including the sale, publication, or distribution of your data to competitors or media outlets. This could inflict significant reputational and financial damage.

However, this situation is not without a remedy.

Our team has developed a unique key, specifically designed to restore your digital security. This key represents the first and most crucial step in recovering from this situation. To utilize this key, visit our secure portal: rhysidafoh[redacted].onion with your secret key

It's vital to note that any attempts to decrypt the encrypted files independently could lead to permanent data loss. We strongly advise against such actions.

Time is a critical factor in mitigating the impact of this breach. With each passing moment, the potential damage escalates. Your immediate action and full cooperation are required to navigate this scenario effectively.

Rest assured, our team is committed to guiding you through this process. The journey to resolution begins with the use of the unique key. Together, we can restore the security of your digital environment.

Systems Down. Business Halts.

- Reader registration
- Online catalog
- Book requests
- Access to digital assets
- Deliveries from Yorkshire
- Environmental monitoring
- Phone line
- Network access
- Wifi
- Website
- Exhibition ticket sales
- Gift shop sales

What Exactly did the Attackers Do?

THEFT

- Files from Finance, Tech, and HR departments
- Some personal staff files
- Included contact info for some staff, partners, and customers.

DESTRUCTION

- Destroyed data

  Encrypted files and backups

- “Destroyed servers”

  Aggressively deleted logs and partitions, rendering some servers inoperable and unrecoverable.

The Ransom

> “The UK’s national policy, articulated by NCSC, is unambiguously clear that no such payments should be made [by publicly funded organisations.]”

Sat Oct 28	Systems down
Mon Nov 20	Rhysida puts 10% of stolen data up for sale (20 BTC / $750,000)
Mon Nov 29	Rhysida dumps the remaining stolen data

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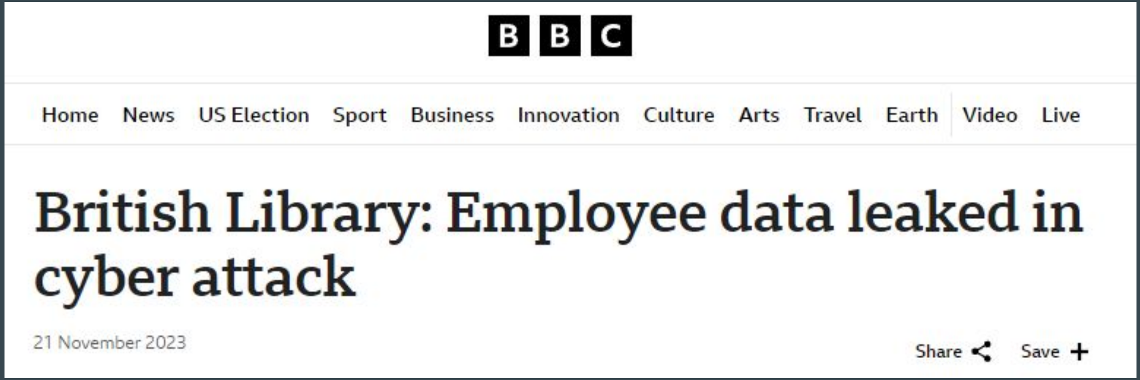
Recovery

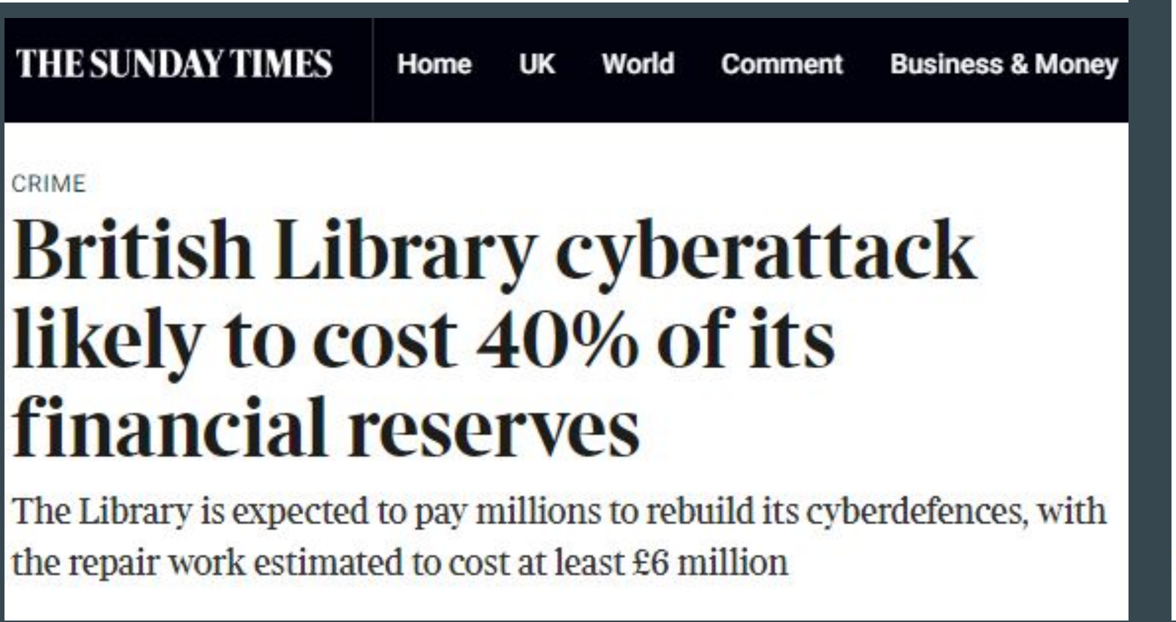
Sat Oct 28	Systems down
Mon Oct 30	Library re-opens in “a pre-digital state” Confirmed that all onsite backups were encrypted
Wed Nov 1	All corporate desktop/laptop use ceases
Wed Nov 15	Public statements: • a ransomware attack has occurred • personal data of users and staff was stolen • still determining full extent of the attack
Jan 2024	Some online catalog access restored
Mar 2024	50% of online catalog access restored



BBC
Home News US Election Sport Business Innovation Culture Arts Travel Earth Video Live

British Library: Employee data leaked in cyber attack

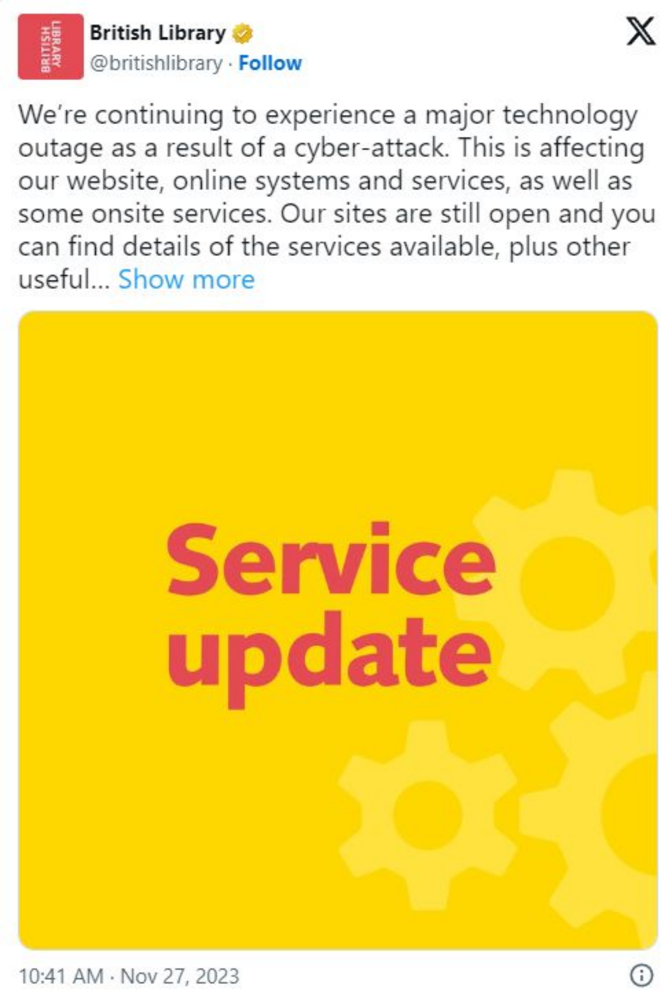
21 November 2023



CRIME

British Library cyberattack likely to cost 40% of its financial reserves

The Library is expected to pay millions to rebuild its cyberdefences, with the repair work estimated to cost at least £6 million



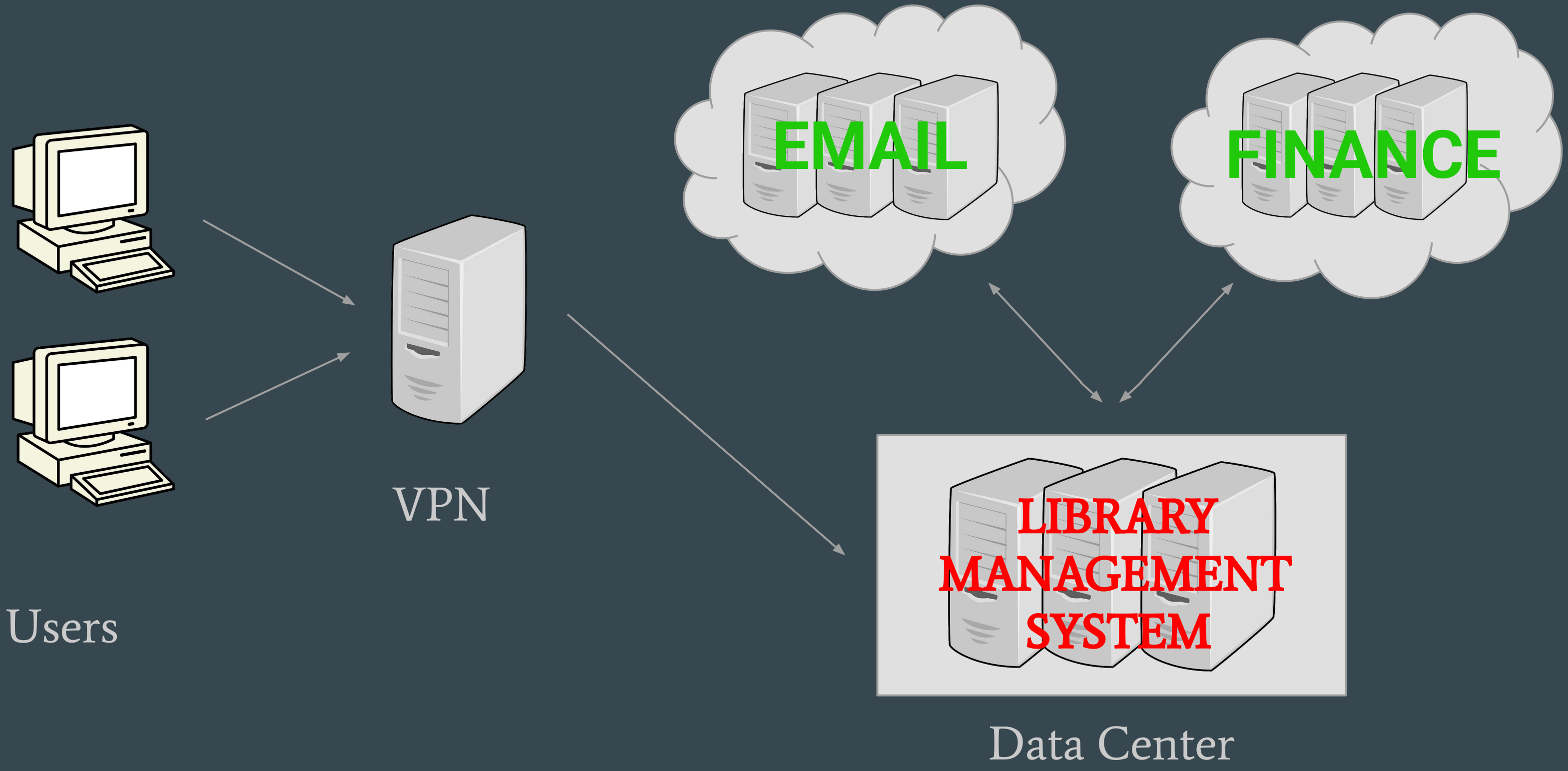
British Library
@britishlibrary · Follow

We're continuing to experience a major technology outage as a result of a cyber-attack. This is affecting our website, online systems and services, as well as some onsite services. Our sites are still open and you can find details of the services available, plus other useful... Show more

10:41 AM · Nov 27, 2023

"What we did have to think about constantly was storytelling and narrative and communication with our stakeholders, with our staff, with our board – everyone we work with in the British Library...”

Which Systems Were Most Affected?



Legacy Systems Couldn’t be Restored Because:

- No longer supported by vendor

- Can’t function on new infrastructure

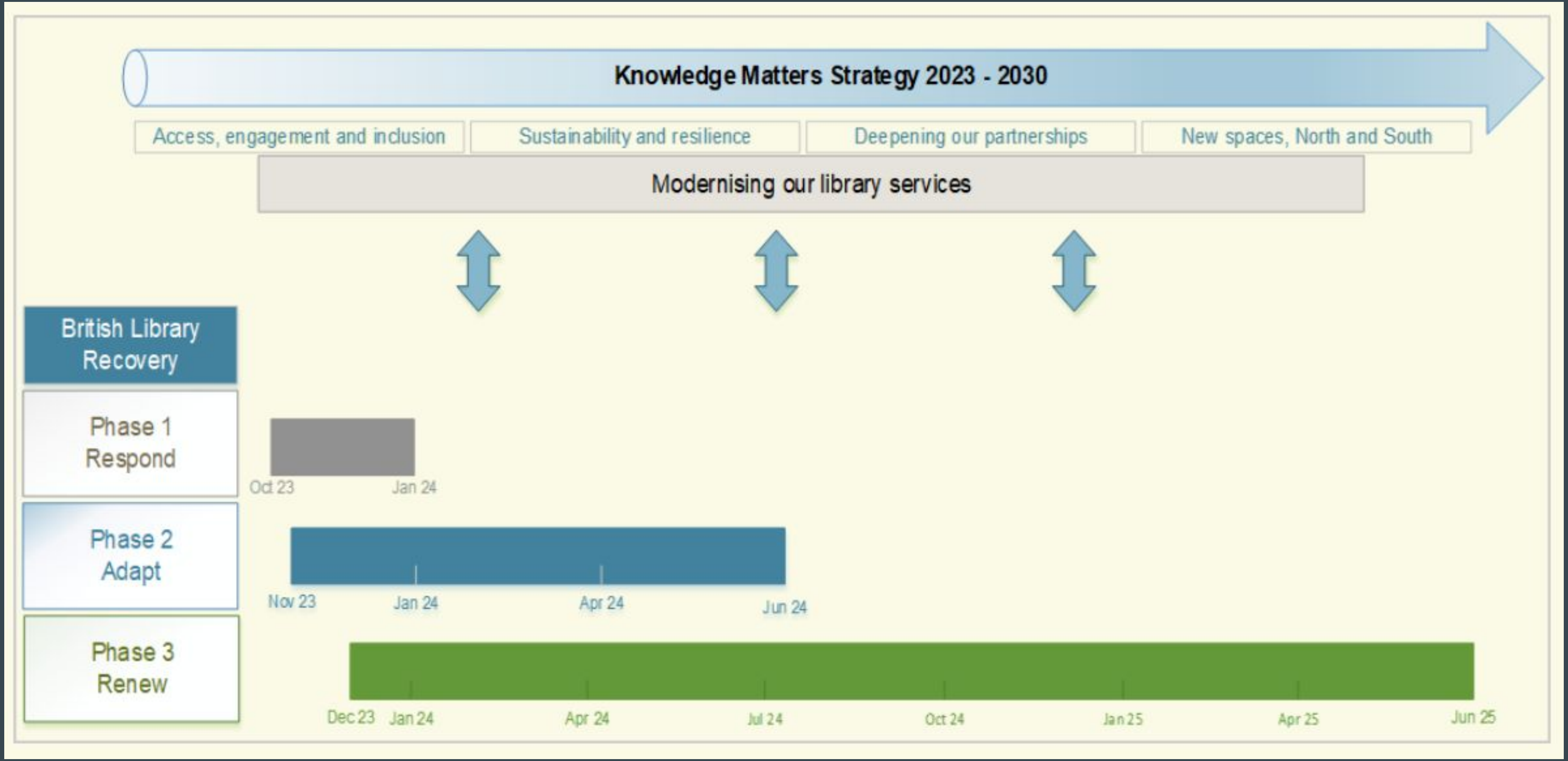
“The destruction of servers has had the most damaging impact on the Library.

While we have secure copies of our digital collections, we lack viable infrastructure on which to restore it.”

March 2024

- Access to only 50% physical collections; even staff access is limited
- Website down
- Digitization activity paused
- Digital collections still being brought back
- No access for researchers to journals, databases, theses…
- “Print legal deposit” received but not processed
- Failing terms of Sound Heritage grant because access is down

Recovery Plan



Knowledge Matters Strategy 2023 - 2030

Access, engagement and inclusion

Sustainability and resilience

Deepening our partnerships

New spaces, North and South

Modernising our library services

British Library Recovery

Phase 1 Respond

Phase 2 Adapt

Phase 3 Renew

18± months

Time to Complete Service Recovery

$7.5 - $9 million

Direct Cost

40% of the British Library's financial reserves

Other Harms and Indirect Costs

hard to quantify

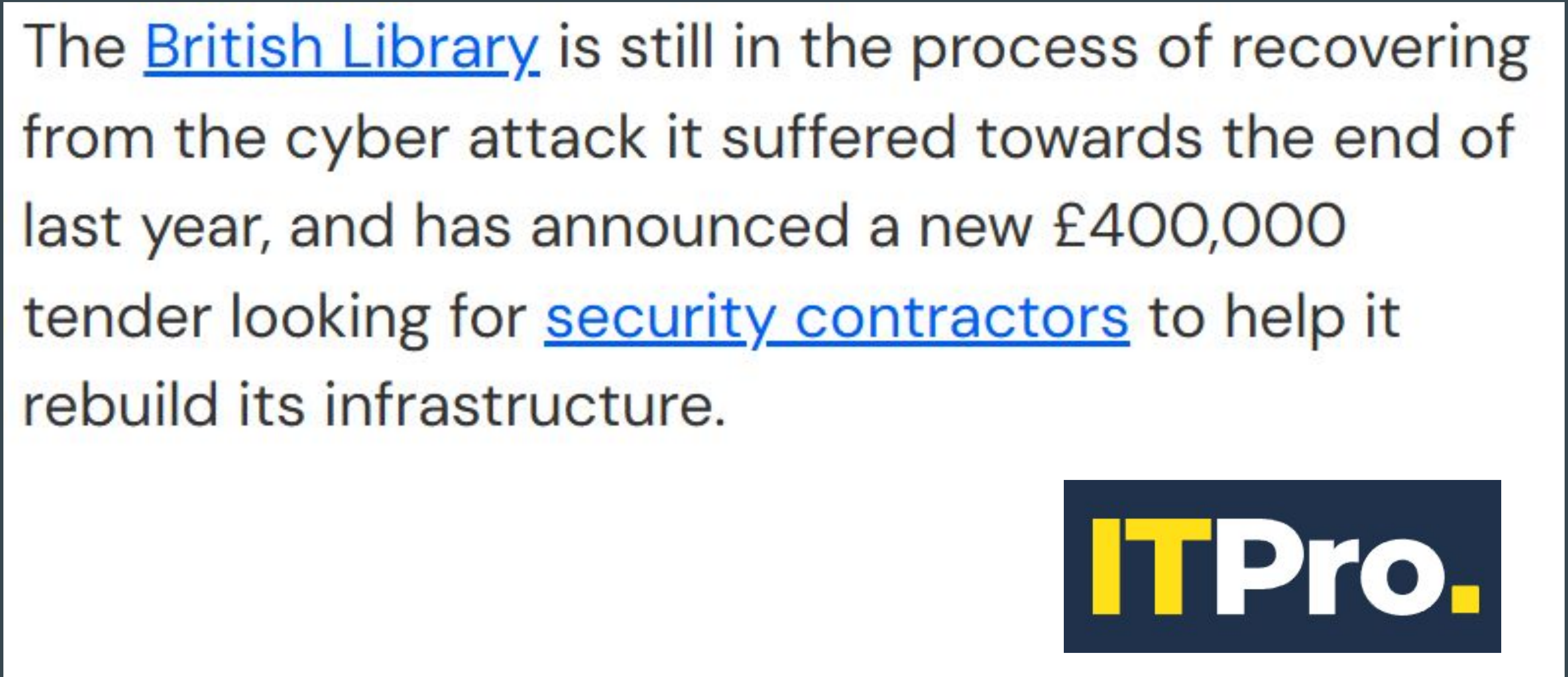
The Library

- Service disruptions
- Large work backlogs
- Loss of efficiency
- Grant requirements failed
- Reputational damage

Library Customers

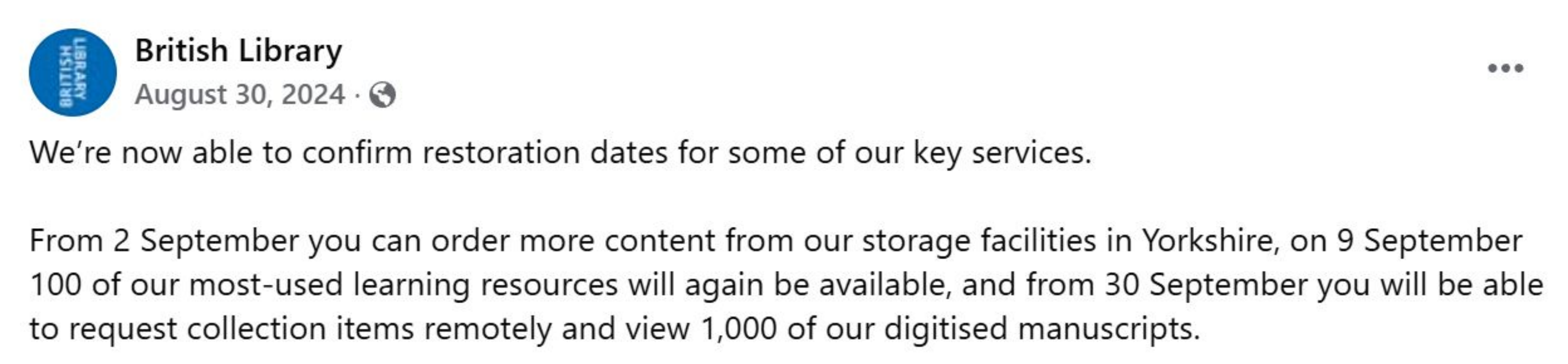
- Academic research blocked
- Suspended fellowships
- Business research blocked
- Delayed payments to authors
- Privacy risks

Aug 2024



The British Library is still in the process of recovering from the cyber attack it suffered towards the end of last year, and has announced a new £400,000 tender looking for security contractors to help it rebuild its infrastructure.

Aug 2024



British Library

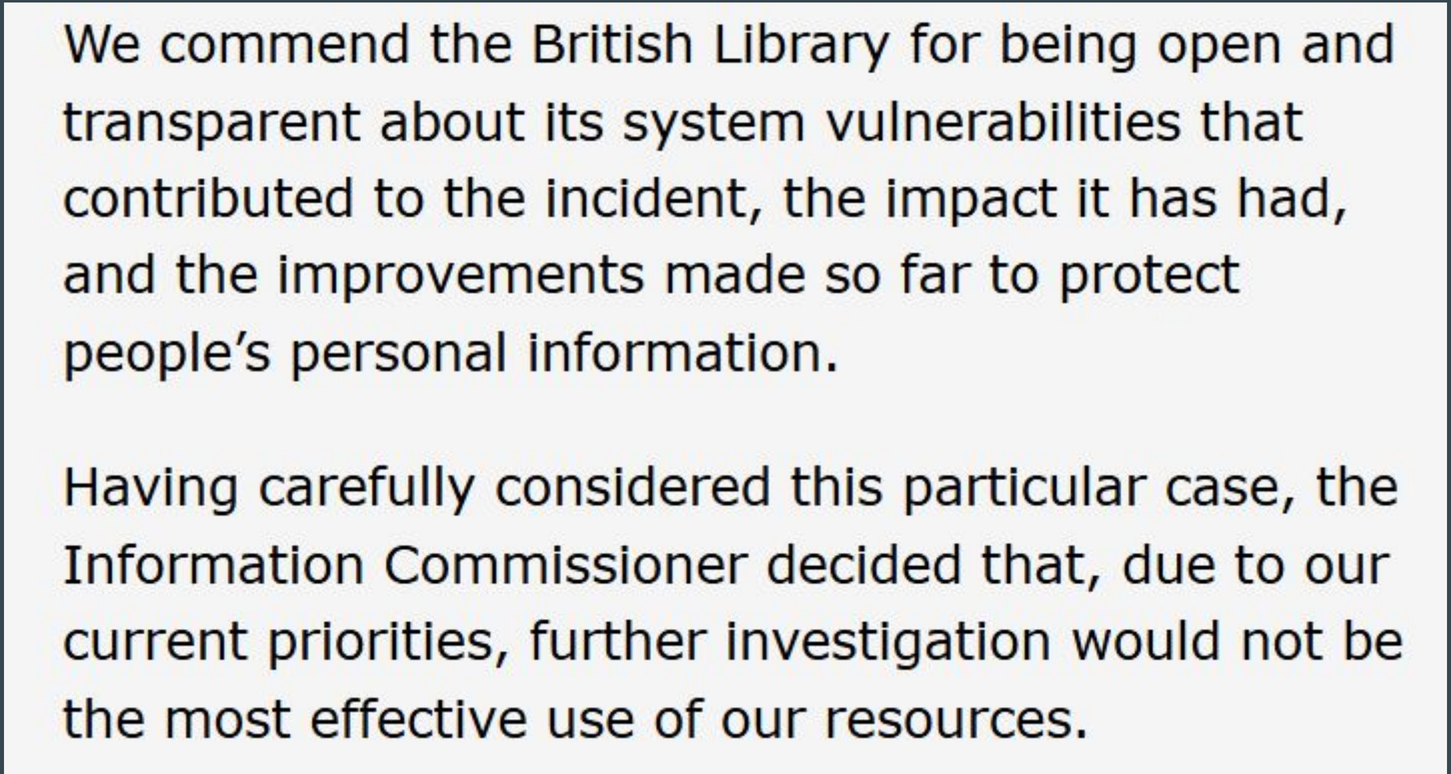
August 30, 2024 ·

We’re now able to confirm restoration dates for some of our key services.

From 2 September you can order more content from our storage facilities in Yorkshire, on 9 September 100 of our most-used learning resources will again be available, and from 30 September you will be able to request collection items remotely and view 1,000 of our digitised manuscripts.

April 2025

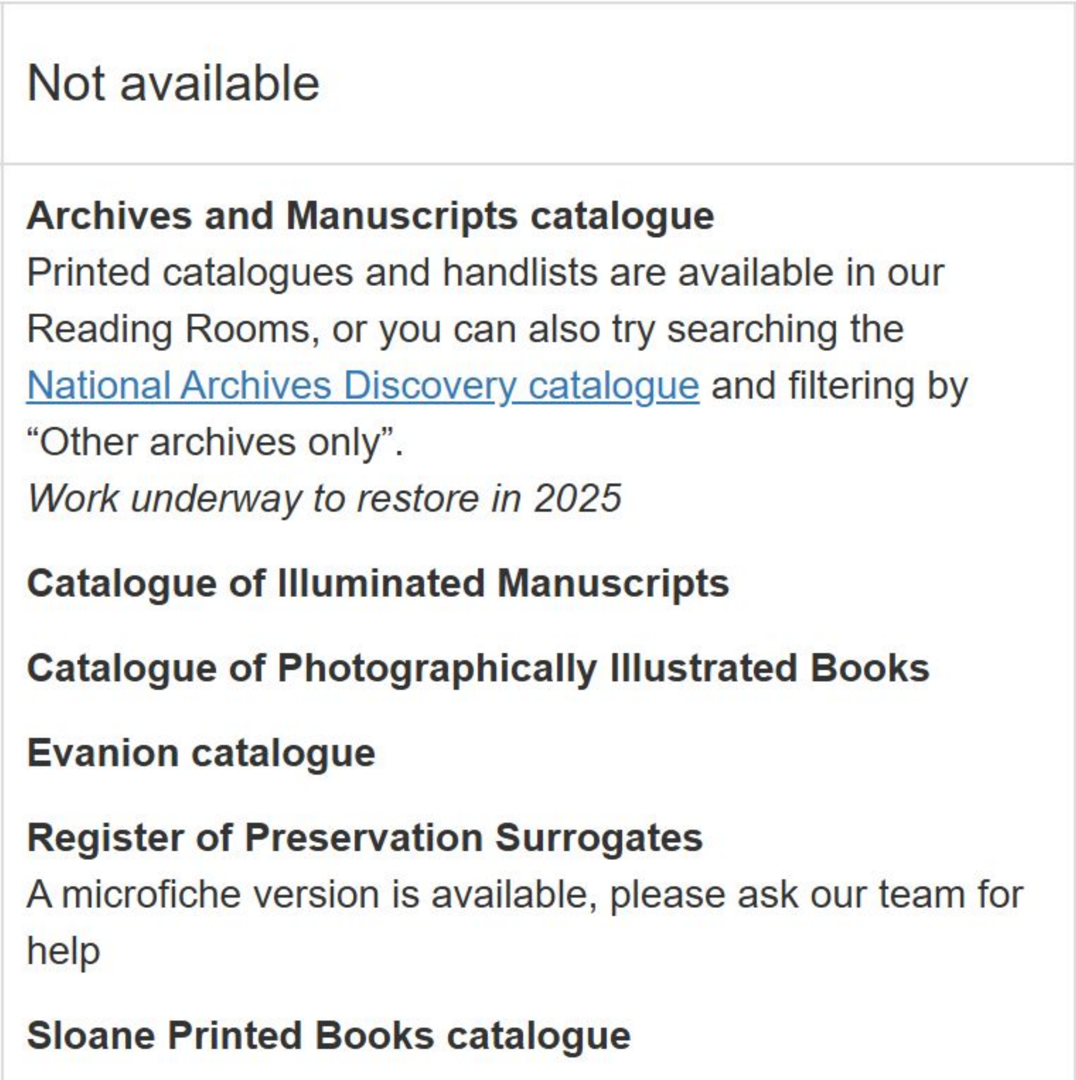
ico.
Information Commissioner's Office



We commend the British Library for being open and transparent about its system vulnerabilities that contributed to the incident, the impact it has had, and the improvements made so far to protect people’s personal information.

Having carefully considered this particular case, the Information Commissioner decided that, due to our current priorities, further investigation would not be the most effective use of our resources.

Current State: October 2025



Not available

Archives and Manuscripts catalogue
Printed catalogues and handlists are available in our Reading Rooms, or you can also try searching the National Archives Discovery catalogue and filtering by "Other archives only".
Work underway to restore in 2025

Catalogue of Illuminated Manuscripts

Catalogue of Photographically Illustrated Books

Evanion catalogue

Register of Preservation Surrogates
A microfiche version is available, please ask our team for help

Sloane Printed Books catalogue

Agenda

The British Library

The Attack

The Consequences

Lessons Learned

Root Cause

- Complex network topology failed to contain/restrict attacker activity
- Older applications rely on manual ETL processes for data transfer, increasing the volume of customer and staff data in transit on the network through unsecured processes
- Legacy infrastructure is the primary contributor to the length of time that the Library will require to recover.

Lessons Learned

1. Enhance network monitoring
2. Retain on-call security expertise
3. Fully implement MFA
4. Enhance intrusion detection
5. Implement network segregation
6. Practice comprehensive business continuity plans
7. Maintain a holistic view of cyber risk.
8. Manage systems life cycles to eliminate legacy technology.
9. Prioritise remediation of issues arising from legacy technology
10. Prioritize recovery alongside security.
11. Increase cyber-risk awareness and expertise at the senior level.
12. Regularly train all staff in evolving risks.
13. Manage staff and user well-being in incident plans. Deeply upsetting to staff and users whose work is disrupted and compromised.
14. Review acceptable personal use of IT. Allowing personal use of network storage increases attack intrusiveness for staff members.
15. Collaborate with sector peers.
16. Implement government standards. Review and audit often.

#	Item	NIST #	NIST Name
1	Enhance network monitoring	SI-4	System Monitoring
2	Retain on-call security expertise	IR-7	Incident Response Assistance
3	Fully implement MFA	IA-2	Identification & Authorization
4	Enhance intrusion detection	SI-4	System Monitoring
5	Implement network segregation	AC-4	Information Flow Enforcement
6	Practice comprehensive business continuity plans	CP-2	Contingency Plan
12	Regularly train all staff in evolving risks	AT-2	Literacy Training & Awareness
16	Implement government standards. Review and audit often	CA-7	Continuous Monitoring

#	Item	NIST #	NIST Name
8	Manage systems life cycles to eliminate legacy technology	SA-3	System Development Lifecycle
9	Prioritise remediation of issues arising from legacy technology	SI-2	Flaw Remediation
10	Prioritize recovery alongside security	CP-10	System Recovery and Reconstitution

#	Item	NIST #	NIST Name
7	Maintain a holistic view of cyber risk	RA-3	Risk Assessment
11	Increase cyber-risk awareness and expertise at the senior level	PM-1 PM-9 RA-1	Program Management Risk Management Strategy Risk Assessment Policies

🚩

#	Item	NIST #	NIST Name
13	Manage staff and user well-being in incident plans	IR-4	Incident Handling
14	Review acceptable personal use of IT	PL-4	Rules of Behavior

Remediation Actions

INFRASTRUCTURE

- Rebuild legacy servers.
- Segment network
- Embrace the cloud.
- Provide robust and resilient backups.
- Enhance on-premise MFA capabilities
- Enhance privilege access management (PAM)

MANAGEMENT

- Clear policies, procedures, and SoPs
- Standardization in development
- Compliance with mandated standards
- Stronger and more embedded governance structures

New Risks Acknowledged

- Increased risk from new attackers from having publicly fallen victim
- Cultural change: risk that desire to return to normal business quickly will compromise plans for change
- Risk of inadequate staffing for cyber-security and cloud engineering
- Lack of understanding of complicated legacy systems may inhibit pace of recovery or lead to sub-optimal decisions. (need informed diagnosis; visionary planning; and good management objectives)
- Risks of failure to understand and account for risks in new (cloud-based) infrastructure

“Substantial disruption of attack creates an opportunity to implement significant structural changes in ways that would otherwise have been considered too disruptive to countenance.”

Never let a good crisis go to waste.

Resources

- Learning Lessons From the Cyber-Attack (British Library)
- British Library Annual Report and Accounts 2023/24
- #StopRansomware Guide (CISA)
- SentinelOne's explanation of Rhysida ransomware

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