Systematization of Password Manager Use Cases and Design Paradigms

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Goal: Guide the Creation of User Studies

1. Identify understudied use cases
2. Identifying competing design paradigms that should be compared in user studies
What We Did

• Evaluated 33 password manager implementations
  • 12 desktop managers
  • 11 iOS managers
  • 10 Android managers
What We Did

• Extracted and prioritized use cases
  • Essential, recommended, extended

• Identified design paradigms for each use case
  • In existing tools
  • In the research literature
  • Unique to this paper

• Conducted cognitive walkthroughs as a first look at usability
  • 8 managers
  • 17 tasks covering all essential use cases
In This Talk

• Just the highlights
  • Understudied use cases
  • Gaps in the identified design paradigms
  • Interesting results from the cognitive walkthroughs

Read the paper for the full systematization and usability results
Essential Use Cases
Use Cases

(E1) Setup manager
(E2) Register credential
(E3) Update credential
(E4) Remove credential
(E5) Autofill credential
(E6) Manually enter credential
(E7) Generate password
(E8) Sync credentials
(E9) Lock manager
(E10) Unlock manager
Setup Manager

Steps
1. Find and download
2. Install
3. Set up an online account
4. Configure initial settings
5. Setup up a recovery mechanisms (rare)

Challenges
• A lot of steps, especially for non-browsers
  • Could lead to drop off if user interest is not sufficiently high
  • Makes it difficult to explore options
• Unclear what to do after setup is complete

Research is needed to smooth out the setup process
Register Credential

• Easy to register credentials
• Unless the same credential is used by two domains
  • Common authentication backend
  • Improper implementations of single sign-on
• Less than 20% of managers support credential linking
  • Poor usability
  • Leads to warnings of duplicate passwords
• Hard to use when available
Credential Link in LastPass

- Open My Vault
- Recently Used
- All Items
- Add Item
- Generate Secure Password
- Security Dashboard
- Account Options
- Log Out: scott@ruoti.org

- Account Settings
- Share Center
- Emergency Access
- Manage Family
- Advanced Options
- Help
Credential Link in LastPass
Credential Link in LastPass

Research is needed to design more usable linking paradigms
Manually Enter Credentials

- Users often need to enter credentials by hand
- Borrowed computer
- TV
- Game console
- IoT device
Manually Enter Credentials

• Entering generated credentials can be difficult
  1. Difficult to distinguish characters
     • Nearly no support on desktop
     • Some support on mobile
  2. Hard to input using the device's input method

Research is needed on modality-aware password generation
Recommended Use Cases
Use Cases

(R1) Audit credentials
(R2) Modify settings
(R3) Recover access
Audit Credential

What is a credential audit?
• Evaluates the security of passwords
  • Weak passwords
  • Reused passwords
  • Compromised passwords

What are its limitations?
• Difficult to find
• Overwhelming
  • Especially on first use
• Includes false positives
• Missing design paradigms
  • Identify unused credentials
  • Prioritize recommendations

We need user studies of credential audits
Recover Access

• Losing access to a password manager is catastrophic
• Recovery mechanisms are necessary
  • Manager only as secure as the recovery mechanism
• Most managers do not have strong recovery mechanisms

Research is needed on long-term recovery mechanisms
Extended Use Cases
Use Cases

(X1) Migrate manager
(X2) Share credentials
(X3) Manage identities
(X4) Store sensitive data
Share Credentials

• Sharing credentials is commonplace
  • Netflix
  • Social media

• Poorly supported
  • Between password managers
  • With non-users

We need user studies of credential sharing
Conclusion
Conclusion

- Most use cases are either unstudied or understudied
- Nearly no research has compared the strengths and weaknesses of design paradigms
- Lots of exciting research to be done in this area!

Our systematization is aimed to help jump start this research