RENTAL PAYMENT SOLUTION USING HOMEHEY

SELP 695 Systems Engineering Integration project
Advisor: Dr. Karen Miller
By: Abdullah Althinayyan
Date: December 9, 2015
Agenda

1. Background Information
2. Problem Statement
3. Stakeholder’s Description
4. Requirement
5. Proposed Alternatives
6. Analysis of Proposed Solutions
7. Cost
8. Systems Architecture
9. Risk Management
10. Verification and Validation
11. Lean
12. Ethics
13. Conclusion and Lessons Learned
Background Information

The story:
➤ Housing for international students.
➤ Change of scope to rent collecting application.
➤ Choosing the payment gateway.

Problem Statement

There are many online sources to serve as payment methods to be integrated into HomeHey. Each payment method service provider presents unique advantages and disadvantages. Careful consideration is necessary to maximize value and optimize the system. Electronic payments submitted through an online system is a key business aspect of the system and provides a major benefit through generating revenue. Optimizing the system with the optimal payment method will provide HomeHey with competitive advantage.
**Stakeholder's Description**

- **HomeHey**: an application and business owned by myself and a partner where tenants can pay rent and receive services online.

- **Landlords**: individuals, agencies, and small or mid-size companies that manage properties in LA.

- **Tenants**: people who are renting their residence in Los Angeles area.

- **Banks**: any bank in the US that might be used by the customer.
HomeHey's Team

The Team

Riadh Ellouze
Management
UCLA

Ben Yedder
Marketing
UCLA

Abdullah Althinayy
Business Developer
LMU

Ram Chawla
Web Development

Krishna Chawla
Web Development

Faten Tabka
Product Designer
Requirements (Customer)

- The system shall provide a user interface designed for ease of access for customers/users.
- The systems shall include adequate security (security software and hardware/software network firewalls) to prevent external or unauthorized access to sensitive information and protect from threat of hacking.
- The system shall charge not more than $5.00 per rental payment transaction to the end user (adding all fees/rates applied, including flow down of costs absorbed by users).
- The system shall accept customer account data for deposit of rent payments.
- The system shall process payment in a prompt and timely manner before due date.
- The system shall accept payment from a minimum of one bank account and a maximum of three bank accounts per person.
- The system shall offer additional services such as pet care, housekeeping, resident maintenance, car wash and other conveniences on request.
- The system shall automatically import/export data from/to the landlord in plain text, tab-delimited or comma-delimited formats, for integration with QuickBooks and similar accounting/bookkeeping software.
- The system shall provide landlords the function to request additional charges to the tenant if requested.
- The system shall allow landlords to add additional fees on the customer’s rent.
- The system shall be able to operate on all mobile devices, tablets, and computers. (IOS, Android).
Requirements (System)

- The system shall be secure from any hacking potential.
- The rental transactions shall be done with one click payment.
- The system shall not charge over $5 per transaction.
- The system shall not charge the landlord any monthly fees.
- The system shall not require any minimum transactions per a month.
- The system shall accept the customers online banking account information or the bank account number to make a payment.
- The system shall provide the capability for customers to complete a payment in less than two minutes.
- The system shall be able to notify HomeHey and the landlord if the payment is declined immediately.
- The system shall be able to add the HomeHey convenience fee additionally to the rent price automatically.
- The system shall be able to accept payment from all banks in the US.
- The system shall send a confirmation email for the customer after each payment.
- The system shall not charge a subscription fee.
Proposed Alternative Solutions

1. Create a new payment system that only functions for HomeHey.

2. PayPal payment solution.

3. Automated Clearing House (ACH) payments: “Payment Service enables you to electronically collect payments from your customers for either single-entry or recurring payments by directly debiting your customer's checking or saving accounts.”
## Analysis of Proposed Solutions – Customer

<table>
<thead>
<tr>
<th>MoE</th>
<th>New Payment Method</th>
<th>PayPal</th>
<th>ACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>N/A</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Performance</td>
<td>N/A</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Time saving</td>
<td>N/A</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Cost</td>
<td>N/A</td>
<td>high</td>
<td>low</td>
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</table>
# Analysis of Proposed Solutions – HomeHey

<table>
<thead>
<tr>
<th>MoE</th>
<th>Create payment system</th>
<th>PayPal</th>
<th>ACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>N/A</td>
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<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>
The Decision

Based on the MoEs comparison tables above we at HomeHey are going to use Automated Clearing House, because ACH is cost effective and convenient.
Systems Architecture

OV1 - High-Level Operational Concept (Current System)
Systems Architecture

OV2 - Operational Node Connectivity Diagram (Current System)

[Diagram showing the flow from Tenant to Landlord to Verifications to Money Transfer]
Systems Architecture

OV1 - High-Level Operational concept (future system)
Systems Architecture

OV2- Operational Node Connectivity Diagram (future system)

- Tenant
  - Internet
  - Homehey
  - Landlord
Systems Architecture

System of Systems

- Bank Laws
- Tenants
- Maintenance companies
- Competitor applications
- Landlords
Risk and Opportunities Approach

1. If HomeHey is having a decreasing number of users due to a competitor application, then HomeHey has to add more tools to it.

2. If the payment system fails due to a technical issue, then HomeHey has to replace the payment system.

3. If the payment system loses the user’s information due to a hacking attack, then HomeHey has stopped all the authorized operations on the affected users.

4. If the payment system adds a service fee due to a policy change, then HomeHey has to reduce its fees.

5. If HomeHey changes that data based from the clouds to hard servers due to regulation changes, then HomeHey has to buy a server to store data.

6. If HomeHey reaches 3000 tenants due to good sales, then HomeHey will receive 500k from an investor.
Risk and Opportunities Approach- after mitigation

1. HomeHey team is continuously working on adding more tools and advantages to the application.

2. HomeHey has a backup database to store all the important information.

3. HomeHey aims to be less dependent on the monthly fee as a main income since the ACH is not going to be free for long time. Therefore, once HomeHey is planning to gain the most of the profits from the additional services and the data screening.
## Verification and Validation

<table>
<thead>
<tr>
<th>Requirement and V&amp;V</th>
<th>Demonstration</th>
<th>Inspection</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>The systems shall be secure from any hacking potential</td>
<td></td>
<td></td>
<td>The system going to be continuously tested, bugs to be fixed</td>
</tr>
<tr>
<td>The system shall be able to operate on all mobile devices, tablets, and computers</td>
<td></td>
<td></td>
<td>the system must be tested on all kind of devices</td>
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<tr>
<td>The system shall make the payment before the due date</td>
<td></td>
<td></td>
<td>The system must be able to handle payment before the 4th of the month</td>
</tr>
<tr>
<td>The system shall able to migrate data from and to the landlord automatically</td>
<td>Both data base (HomeHey, landlords) must be accessible for each other</td>
<td></td>
<td>After completing all the payment steps, the software must be manually tested to insure less than 2 process time</td>
</tr>
</tbody>
</table>
## Verification and Validation

<table>
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<th>Inspection</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>The system shall process payment in a prompt and timely manner before due date</td>
<td></td>
<td></td>
<td>The system must be able to make a payment till the 3rd day of the month</td>
</tr>
<tr>
<td>The system shall automatically import/export data from/to the landlord in plain text, QuickBooks and similar</td>
<td></td>
<td>The system and the landlord must use QuickBooks</td>
<td></td>
</tr>
<tr>
<td>The rental transactions shall be done with one click payment</td>
<td></td>
<td></td>
<td>The system must do the payment within one click on the same website</td>
</tr>
<tr>
<td>The system shall not require any minimum transactions per a month</td>
<td>Any payment system must not require any monthly minimum number of transactions</td>
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</table>
Verification and Validation

'System validation is satisfied upon verification of each of the system elements and validation of the top-level system functions. System validation displays the system’s functional abilities satisfies the operational activities of the user/customer. Verification presents that the “system was built right” and validation presents that “the right system was built.”

➤ in software must of requirements are verified thought testing.

➤ HomeHey has over 800 tenant as December 2015.
Lean (value, waste, creating value with no waste)

- **Current state:**

  Tenant → Cash check → Leasing office → Bank → Verify → Deposit

- **Future state:**

  Tenant → HomeHey → Verify → Deposit
Lean Benefits

• The current systems cost the property managers around 60 hours a month.

• Yearly hours wasted = 60 x 12 = 720 h

• If the landlord is hiring an accountant it would cost around $70,000 per year

• The average hourly rate is $34

➢ Therefore, the rent collection cost is 720h x $34 = $24,480 per year

On the other hand HomeHey is free for the landlords!
Lean- Managing extended organizations by eliminating waste

- Systems Engineering rules in any project are consider as the glue between departments. Thus, as a systems engineer, it is necessary to maximize the cooperation between HomeHey as an application and the organizations related to it. In our case, we consider ourselves as remote teams.

- One key lean principle is elimination of waste. I have applied this to the waste of over-communication that doesn’t add value. To ensure efficiency and eliminate wasted communications, I have developed an efficient communication system for the teams of the project, which include:

  - The car wash company.
  - Laundry.
  - Pet Care Company.
  - Housekeeping and Maintenance Company.
Ethics

Ethics are the core of the whole system, since trust is central the way that customers perceive and interact with the system. Ethical issues that were identified and considered in all stages of the project, from concept to implementation, include:

1. HomeHey should make all the financial information transparent to the users.
2. Maximize security on the user's personal information.
3. HomeHey must respect the regulations.
4. HomeHey should not take an advantage of the bugs or gaps in the banking system.
Comparison

Comparative Advantages:

<table>
<thead>
<tr>
<th>Real Estate Listings</th>
<th>Rent Applications</th>
<th>Tenants Screening using</th>
<th>Rent Collection:</th>
<th>Maintenance request</th>
<th>Home Services Booking</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Credit Report</td>
<td>Social Media</td>
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<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Conclusion

- Identify the system, the stakeholders and the boundaries.
- Problem statement.
- Alternatives.
- Analyzed the alternatives.
- The decision based on the systems engineering processes and tools.

➢ having a business background, my decisions were mainly based to financial factors. However, systems engineering has provided cross-discipline knowledge, combining past knowledge with a new perspective. I know examine things in a broader scope and take a step back to appreciate the bigger picture. I have come to use a wide range of methodologies and objective information to arrive at a solution or decision.


lessons learned

1. Understanding the customer needs is the key to coming up with an excellent solution.

2. Think twice about assumptions because they usually change.

3. The difficult problems are nontechnical, especially involving communications.

4. Do not do short cuts in quality because the problems will come back and force you to fix them later.

5. Think as a system engineer. Consider both the technical and the business aspects.

References

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- Systems arch. Class notes
- Lean thinking class notes
- Advance Systems Engineering class notes