Restaurant Efficiency Decision AI

RED AI

CS410 Fall 2007 Red Team

Feasibility Presentation
Needs Analysis
Restaurant

- Managers
- Staff / Inventory
- Food and atmosphere
- Customers
- Profit Margin
Top 8 challenges of the restaurant
Restaurant Expenses
### Profitability Statistics

1. **A well-run restaurant makes a 3-5% net profit**\(^1\)

<table>
<thead>
<tr>
<th>Profit</th>
<th>Income</th>
<th>Expense</th>
<th>Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well managed</td>
<td>3-5%</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>57-61%</td>
<td>Closed in 3 years</td>
<td>X</td>
<td>Y</td>
</tr>
</tbody>
</table>

2. **About 57-61% of restaurants fail within the first 3 years**\(^1\)

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1. [Top 8 challenges of the restaurant](#)
Problem

Profit = Income - Expense - Waste

Well managed

3-5% X Y Z

Closed in 3 years

57-61% X Y >Z
Deliverable

An Artificial Intelligence (AI) program to manage the efficiency of the restaurant, by analyzing the model of the restaurant and creating smart reports to make managers decisions easier.

RED AI – Restaurant Efficiency (Expert System) Decision AI using backward chaining
The components in the container is what is “in the box”.

The Real World

- Restaurants' DB
- DB Interface
- Manual Entry GUI
- Our DB (mySQL)
- Reports to increase efficiency
- AI

The components in the container is what is “in the box”.
The inference engine is in the box

- Data from DB
- Rules
- Interpreter
- Scheduler
- Consistency enforcer
- Output to report Preparer
Standards we will be measure

• Profit margins
• Turn over table
• Customer satisfaction (through surveys)
• National Restaurant Performance Index
Goals

• Improve efficiency of a restaurant by 1% (or more) each iteration

• Produce a reliable model of a successful restaurant for all restaurants to use
Sustainability and Future

- Monthly subscription service plan
- Tech support
- Algorithm updates
- Port our idea to other domains
  - Retail market
  - Theme park crowd and flow control
Technical Feasibility Study
The only hardware that is part of our project is the server at our HQ.
Software

- DB in mySQL
- AI in Prolog
- DB interface in C++
- Manual GUI in C++
What does it cost?

- Very little HW investment
- All development tools are free
- Time in the coding phase is the only major cost
Schedule Feasibility Study
Time estimates for the project

• Phase I by the end of the spring semester

• Most of our project is software

• Biggest time expense will be in the AI inference engine

• The rule set knowledge gathering will be hard also
Organizational Feasibility Study
What domain experts do we need?

- Back end manager (kitchen)
- Front end manager (serving)
- AI expert Dennis Ray
- Professor Morris as Beowulf Cluster Expert
- Database Dr. Levinstein
Team Interactions

- Weekly meetings
  - IRC chat

- Automate meeting minutes

- Team is assigned weekly topics to research
Competitive Feasibility Study
## Competition Matrix

<table>
<thead>
<tr>
<th>Database Stuff</th>
<th>How it's installed</th>
<th>External Systems</th>
<th>Money Aspects</th>
<th>System Interface</th>
</tr>
</thead>
<tbody>
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<td>Camus</td>
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<td>Quick Seat</td>
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<tr>
<td>Table Swipe</td>
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<tr>
<td>RoboServer</td>
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<td>β</td>
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<tr>
<td>Red Team</td>
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<td>· · · · · · α</td>
<td>· · · · · α</td>
<td>β</td>
</tr>
</tbody>
</table>

**Key**
- Phase I
- Phase II
- Phase III
- Unknown

See links page to view competitors' sites
What makes us better

- No expensive hardware
- Import data straight from the existing restaurant’s DB
- Manual entry as input
- Support and Updates included
- Easy to add additional features
- Low cost price structure
Restaurant
(Them)

Manager

Profit Margin

Staff / Inventory

Customers

Food and atmosphere
Restaurant (Us)

Managers

Profit Margin

Staff / Inventory

Customers

Food and atmosphere
Legal and Risk Feasibility Study
## Risk Matrix

<table>
<thead>
<tr>
<th>Probability</th>
<th>Impact</th>
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<tbody>
<tr>
<td>1</td>
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<td>2</td>
<td></td>
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<tr>
<td>3</td>
<td></td>
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<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### Key

1. Manual input
2. Invalid / unfeasible ideas
3. Not producing efficient ideas
4. Not enough clients
5. Customers hardware outdated
How we mitigate the high risks

• Manual input
  • Help restaurants implement better infrastructure

• Invalid / unfeasible ideas
  • Allow managers to send feedback on bad ideas so the AI can tweak it itself

• Not producing efficient ideas
  • Collect more data and/or manually tweak AI
How we mitigate the lower risks

• Not enough clients
  • Expand to other domains

• Customers hardware outdated
  • Offer the customer alternatives to show systems that meet their and our systems requirements
Marketing Feasibility Study
Restaurant Industry

- A $530 Billion per year industry
- 65% increase from 1997
- Employees 12.8 million
- Over 900,000 establishments

http://www.restaurant.org/research
Customer

- Restaurant owners
- Restaurant Managers
- 70% eating-and-drinking places are single-unit (independent) operations

http://www.restaurant.org/research
Cost

- Product will cost $75 - $125 a month
  - To hire one new worker at minimum wage is equal to $1,235 per month
- Contracts will be monthly
- Software will only run with current contract (license server)
Marketing mix

• Product:
  • Let non franchise restaurants have a chance with a winning model

• Price:
  • Lower cost than any competitor

• Placement:
  • Many different types of media
  • Target potential customers directly

• Promotion:
  • Offer incentives to early customers
SWOT (Strengths)

- Quantifiable problem
- Solvable with software alone
- Distributable at reasonable cost
SWOT (Weaknesses)

• Difficulty of the AI
• Model will have to evolve
• Reliance on existing customer hardware
SWOT (Opportunities)

• Full-scale integration of ALL existing recorded information in a restaurant

• Improvements of profitability of restaurant

• Never been done before

• Potential for use in other domains
SWOT (Threats)

- Competition
- Low-margin business (restaurants)
- Restaurants unwilling to believe software can improve their business
- Reliance on manager to implement
Our Return on Investment

• Huge ROI
• Due to the demand
• Due to the price
• Due to the little investment needed on our part
Customer Return on Investment

• Large ROI
• Low cost for them
• Increases in all aspects of their business
• Give them ideas they never thought possible
Summary
Is it feasible?
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It is needed
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- It is needed
- Can be technically done
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- We have the time to do it
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- We are better then what is out there
- The risks can be mitigated
Is it feasible?

- It is needed
- Can be technically done
- We have the time to do it
- We are better than what is out there
- The risks can be mitigated
- It is marketable
It is feasible

So let’s do it
Walk Through the Door
Welcome to RED AI Login…
Walk Through the Door
Walk Through the Door

Please Wait
Running AI…
1. Serve liquor  
2. Check on guest more often  
3. Hire 2 cooks  
4. Order more chicken
1. Serve liquor
2. Check on guests more often
3. Hire 2 cooks
4. Order more chicken

The data supports serving liquor because, the customer base is over 80% 21+ and is projected to increase revenue by $4k a week.
Thank you
Sources
http://www.carnussystems.com/carnusFBforecaster.html
http://www.cs.odu.edu/~cpi/cpi-s2002/quick_seat/
http://guestbridge.com/about.html
http://www.foodsoftware.com/Product_0089.asp
http://www.kioskequipmentworld.com/cambro-cvc55.html
http://www.tableswipe.com/default.html
http://www.roboservercorp.com/selfserve.shtml
http://www.news.cornell.edu/Chronicle/03/1.23.03/restaurant.html
http://cqx.sagepub.com/cgi/reprint/40/3/31
http://findarticles.com/p/articles/mi_m3190/is_22_36/ai_86763010
http://restaurants.about.com/
http://www.eposonline.com/lrsfeature.html
http://www.restaurantdiary.com/
http://www.grademygrub.com/algorithm
http://aima.cs.berkeley.edu/.../restaurant-multivalued.lisp
http://www.selfserviceworld.com/article_17646_309_86.php
http://www.freepatentsonline.com/20030088469.html
http://www.hotel-online.com/News/PR2007_1st/Jan07_Carnus.html
http://www.news.cornell.edu/Chronicle/03/1.23.03/restaurant.html
http://cqx.sagepub.com/cgi/reprint/40/3/31
http://findarticles.com/p/articles/mi_m3190/is_22_36/ai_86763010