A Systems Approach to Increasing LMU Undergraduate Gym Attendance

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A Systems Approach to Increasing LMU Undergraduate Gym Attendance

by

Timothy O’Rourke

A capstone presented to the

Faculty of the Department of
Systems Engineering
Loyola Marymount University

In partial fulfillment of the
Requirements for the Degree
Master of Science in Systems Engineering

April 26, 2022
A Systems Approach to Increasing LMU Undergraduate Gym Attendance

SYEG 696 Capstone

Timothy O’Rourke
B.S. Mechanical Engineering
M.S. Systems Engineering Candidate
April 26, 2022
Inspiration

1. Important lessons and values:
   - Confidence
   - Patience
   - Happiness
   - Teamwork
   - Body awareness
   - The value in pain
   - Discipline
   - Persistence
   - Health

2. Attendance fall off

3. Desire to ease this personal concern

4. Recognition of nationwide problem

5. Potential business venture
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Acknowledgements

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• Graduate Program Director

John Poladian
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• Director, Campus Recreation and Student Facilities

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• Graduate Program Director and Clinical Assistant Professor of Computer Science

Thank you all for your support!
Purpose

This review is fulfilling a requirement for SYEG 696 (Systems Engineering Integrative Project/Thesis). Ensures a sufficient understanding and mastery of the Systems Engineering process.
Executive Summary

Background:
– >75% of US Adults Don’t Exercise Enough
– Gym, Fitness Center, and Health Club attendance increases aerobic and anaerobic physical activity levels.

Problem Statement:
– Due to lack of motivation, education, and free time, the Burns Recreation Center sees only 20% of LMU undergraduate students daily during academic terms.

Methodology:
– Systems Engineering Methodology will be employed to exercise the identified opportunity.

Opportunity:
– Reduction in cost of healthcare

Recommendations:
– LMU specific mobile app to be developed to motivate, educate, and inspire.
Systems Engineering Methodology will be employed to exercise the identified opportunity.
Agenda

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>75% of US Adults Don’t Exercise Enough

- **53.3%** of adults aged 18 and over **meet** the Physical Activity Guidelines for **aerobic** physical activity [1]
- **23.2%** of adults aged 18 and over who **meet** the Physical Activity Guidelines for both **aerobic** and **muscle-strengthening** activity [1]
Gym Membership is Directly Related to Activity Levels

- Health club membership is associated with significantly increased aerobic and resistance physical activity levels compared to non-members [2]

![Odds ratios of meeting PAG by length of health club membership using total physical activity](image)

- Figure Source: [2]

PAG = Physical Activity Guidelines
Opportunity

Health club members vs. non-members:

- More favorable cardiovascular health [2]
- Reduced risk of developing type 2 diabetes and cardiovascular disease [3]
- Lower odds of obesity and abdominal obesity [2]
- Increased physical activity levels [2]

| Economic Costs of Chronic Diseases and Risk Factors |
|-----------------------------------------------|-----------------|-----------------|
| Disease/Risk Factor | Healthcare Costs | Timeframe |
| Heart Disease/Stroke | $214 Billion [4] | Annually |

Gym attendance may reduce healthcare costs
### National Physical Activity Plan

#### Sectors and Roles

<table>
<thead>
<tr>
<th>NPAP Sector</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and Industry</td>
<td>- Encouragement from Employers</td>
</tr>
<tr>
<td></td>
<td>- Provide facilities and encourage use</td>
</tr>
<tr>
<td>Community, Recreation, Fitness, Parks</td>
<td>- Provides places for active recreation</td>
</tr>
<tr>
<td></td>
<td>- Playgrounds, hiking/biking trails, sports fields, swimming pools</td>
</tr>
<tr>
<td></td>
<td>- Can provide exercise programs</td>
</tr>
<tr>
<td>Education</td>
<td>- Lead role in providing physical activity in education settings</td>
</tr>
<tr>
<td></td>
<td>- Physical education, after-school sports, school facilities</td>
</tr>
<tr>
<td>Faith-based Settings</td>
<td>- Provide places for physical activity</td>
</tr>
<tr>
<td></td>
<td>- Promotion through outreach activities</td>
</tr>
<tr>
<td>Health Care</td>
<td>- Can assess, counsel, and advise on physical activity</td>
</tr>
<tr>
<td></td>
<td>- Can partner with other sectors to promote activity programs</td>
</tr>
<tr>
<td>Mass Media</td>
<td>- Can provide easy to understand messages about health benefits of physical activity</td>
</tr>
<tr>
<td></td>
<td>- Can also promote information about facility locations</td>
</tr>
<tr>
<td>Public Health</td>
<td>- Can take lead in setting objectives and coordinating activities among sectors</td>
</tr>
<tr>
<td>Sports</td>
<td>- Provides organized opportunities for physical activity</td>
</tr>
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<td></td>
<td>- Conducted in a manner that reduces risk of injuries</td>
</tr>
<tr>
<td>Transportation, Land Use, Community Design</td>
<td>- Designs and implements activity friendly routes to everyday destinations</td>
</tr>
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<td></td>
<td>- Can improve access to places for physical activity such as parks</td>
</tr>
</tbody>
</table>

Defined by: US Department of Health and Human Services [8]

- **9 Sectors**
- **All sectors encourage physical activity in some variety**
- **No sector is focused in educating people on how to use a gym**
- **Education sector could improve on gym education and motivation**

**Project will focus on education sector**
Why Don’t We Exercise?

Factors negatively associated with adult physical activity include [1,9,10]:

- Too old
- Don’t know how
- Too expensive
- Lack of time
- Low motivation
- Gym Accessibility
- Too demanding/difficult
- Too out of shape
- Being disabled
- Gym is too busy

Project will focus on “Don’t know how” & “Low motivation”
Justifications of LMU Undergraduate Students

Reasons Why LMU Undergraduate Students Don't Visit Burns Recreation Center More Often

- I use a different gym or exercise elsewhere: 7
- Gym is too busy: 26
- Lack of time: 19
- Nobody will go with me: 6
- No or low motivation: 9
- Don't know how to build workout routines: 11
- Don't know how to safely exercise: 5
- Don't know how to use the exercise equipment: 9

"Don’t know how" & “Low motivation” factors are valid issues
LMU Undergraduate Student Gym Attendance

On average during the school semester, how often do you visit LMU's Burns Recreation Center? (please be honest & accurate)

45 responses

- 33.3% visit the school gym 7 visits per week
- 13.3% visit the school gym 6 visits per week
- 13.3% visit the school gym 5 visits per week
- 11.1% visit the school gym 4 visits per week
- 8.9% visit the school gym 3 visits per week
- 8.9% visit the school gym 2 visits per week
- 13.3% visit the school gym 1 visit per week
- 0 visits per week

>50% visit the school gym 2 times or less per week
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*Loyola Marymount University*
Problem Statement

Due to lack of motivation, education, and free time, the Burns Recreation Center sees only 20% of LMU undergraduate students daily during academic terms.

- Objective is to increase undergraduate student attendance to LMU’s gym.

Average undergrad. visits per day [11]:
- ~1300 (~20%)
- 49% male and 51% female

Total undergrad. Students (2021) [11]:
- 6564

Attend the gym at least once per semester [11]:
- ~3940 (~60%)
Scope

**In scope**
- LMU Burns Recreation Center
- LMU Undergrad. Students
- Education NPAP Sector
- Costs
- Factors to address:
  - Don’t Know How
  - Low Motivation

**Out of Scope**
- All other gyms
- Non-LMU population
- LMU Graduate Students, Faculty, and Staff
- All other NPAP Sectors
- Increasing people meeting PAG
- All other negative factors

---

LMU = Loyola Marymount University  
NPAP = National Physical Activity Plan  
PAG = Physical Activity Guidelines
Factors To Be Addressed

Don’t know how to workout at the gym:

- Results in:
  - Feeling out of place
  - Not going to the gym in general
  - Intimidation
  - Not knowing what to do there
  - Need for guide or instructor

Low Motivation:

- Results in:
  - Not going to the gym in general
    - Low energy
    - Ineffective use of time

Primary Reasons to Stop Gym Membership in the United States 2017

- Too expensive
- Moved / No longer convenient
- Wanted another type of exercise
- I felt out of place
- Could exercise for cheaper elsewhere
- Wasn’t using / going
- Too intimidating
- I met my fitness goals
- Nobody I knew went there
- Lacked amenities
- Too crowded / no parking
- I didn’t meet my fitness goals
- No one there to guide me
- I didn’t like to exercise
- Injury / surgery / other condition
- I didn’t know what to do there

Figure Source: [12]
Stakeholders

LMU Undergraduate Students

LMU Campus Recreation and Student Facilities

LMU Department of Health and Human Sciences

Centers for Disease Control and Prevention

Health Industry

Insurance Companies

LMU = Loyola Marymount University
Stakeholder Analysis

Priority of stakeholder needs is understood

- LMU Campus Recreation & Student Facilities
- LMU Department of Health & Human Sciences
- Health Industry
- Insurance Companies
- LMU Undergraduate Students
- Centers for Disease Control & Prevention
Measures of Effectiveness (MOEs)

- Gym attendance frequency
- Quantity of gym attendees
- Cost per visit
## Proposed Requirements & Verification Methods

<table>
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<tr>
<th>ID</th>
<th>Requirement</th>
<th>Criteria</th>
<th>Verification Method</th>
<th>Pass/Fail</th>
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<td></td>
<td><strong>General Requirements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>The system shall be accessible to all LMU undergraduate students</td>
<td>=0 inaccessible</td>
<td>Inspection</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>The system shall be user friendly</td>
<td>&lt;5 min explanation to understand</td>
<td>Demo</td>
<td>*</td>
</tr>
<tr>
<td>3</td>
<td>The system shall be capable of tracking user metrics</td>
<td>&gt;5 metrics tracked</td>
<td>Demo</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>The system shall protect all user data and metrics</td>
<td>=0 metrics spilled</td>
<td>Test</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td><strong>Educational Requirements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>The system shall provide gym education to all users</td>
<td>&gt;1 education mechanism</td>
<td>Demo, Test</td>
<td>*</td>
</tr>
<tr>
<td>6</td>
<td>Gym education shall consist of 1-building workouts, 2-performing exercises, and 3-avoiding injury</td>
<td>Meets 1, 2, &amp; 3 education types</td>
<td>Inspection</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td><strong>Motivational Requirements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The system shall motivate gym attendance to all users</td>
<td>&gt;1 motivation mechanism</td>
<td>Demo, Test</td>
<td>*</td>
</tr>
<tr>
<td>8</td>
<td>The system shall provide extrinsic incentives to users as means of motivation to attend the gym [16]</td>
<td>&gt;1 material reward available</td>
<td>Inspection</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td><strong>Cost Requirements</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>The system shall be free to LMU undergraduate students</td>
<td>Student cost =$0</td>
<td>Inspection</td>
<td>*</td>
</tr>
<tr>
<td>10</td>
<td>The system shall gain gym visits for a cost of less than $2.00 per visit [13,14]</td>
<td>&lt;$2.00 per visit</td>
<td>Demo, Test</td>
<td>*</td>
</tr>
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</table>

Solution shall be designed to meet all requirements

LMU = Loyola Marymount University

* = Pending
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Identification of Alternatives

Successful solution alternatives shall:

- Address the problem statement
- Comply with system requirements
- Have a positive impact on MOEs
- Remain in scope
- Benefit stakeholders

A trade study will be executed to determine best alternative

MOE = Measures of Effectiveness
LMU Methods

• F45 Training Center [11]  
  – Motivation/Education

• Placard Decals [11]  
  – Education

• Gym Employee Instruction (if asked) [11]  
  – Education

• Weight Lifting Club [11]  
  – Motivation/Education

• Group Exercise Classes [11]  
  – Motivation

LMU Methods will not be considered as potential alternatives
Overview of Identified Alternatives

- **Do Nothing**
  - No action

- **Financial Incentives**
  - Trade $ for attendance

- **Reward motivation**
  - Trade items for attendance

- **Education**
  - Trade education for attendance

- **Mobile App**
  - Combination
Alternative 1 – Rebate Gym Membership Fees

Description:
– After a 50 gym attendance threshold is met, the gym membership fees will be credited back to the student
– Make parents/student sponsors aware for cost savings
– LMU Undergrad. Students pay $85 a semester for the gym

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• &lt;$1.70/visit</td>
<td>• No gym education</td>
<td>• Rebate in the form of bookstore credit or tuition credit</td>
<td>• Increase in membership fees</td>
</tr>
<tr>
<td>• Financial motivation</td>
<td></td>
<td>• Increased motivation from parents and/or sponsors</td>
<td></td>
</tr>
<tr>
<td>• 20% increase in gym attendance [13]</td>
<td></td>
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</tbody>
</table>
Alternative 2 – Lottery Based Financial Incentives

Description:

- Every time a student enters the gym, a random lottery will be spun to win a $20 Amazon gift card
- Odds of winning could be defined as 1:100

<table>
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<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• ~$0.20/visit</td>
<td>• No gym education</td>
<td>• Various prizes other than gift cards could be offered</td>
<td>• Not enough attendance could drive up cost/visit</td>
</tr>
<tr>
<td>• Financial motivation</td>
<td>• Not a large financial incentive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 40% increased probability of gym attendance [14]</td>
<td></td>
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</table>
### Alternative 3 – Workouts & Smoothies

**Description:**
- After five gym visits, a free smoothie/protein shake can be claimed

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<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$2.00/visit</td>
<td>No gym education</td>
<td>Could deviate from shakes to meals</td>
<td>Increased cost of ingredients</td>
</tr>
<tr>
<td>Reward motivation</td>
<td>Dietary restrictions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provides healthy nutrition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Alternative 4 – Spin The Wheel

Description:
- Every 20\textsuperscript{th} visit, a wheel can be spun to win school swag/merch
- Swag/merch could range from protein shakers to sweaters

<table>
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<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$2.00/visit</td>
<td>No gym education</td>
<td>Prize variety</td>
<td>Most expensive item won more frequently</td>
</tr>
<tr>
<td>Reward motivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caters to many individuals</td>
<td>Upset users if don’t get desired prize</td>
<td></td>
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</tbody>
</table>
Alternative 5 – Affiliate Trials

Description:

– Every 20\textsuperscript{th} visit, the student could pick a free trial day from a list of local affiliate gyms
– These gyms could consist of rock climbing, kickboxing, CrossFit, etc.

<table>
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<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reward motivation</td>
<td>• Likely expensive</td>
<td>• Partner with local gyms</td>
<td>• No desire for affiliate gyms</td>
</tr>
<tr>
<td>• Gym education</td>
<td>• Travel required</td>
<td></td>
<td>• Affiliates raising prices</td>
</tr>
<tr>
<td>• Time flexible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Caters to many</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Loyola Marymount University
Alternative 6 – Recorded Classes/Workouts

Description:
- LMU gym has workout rooms that host a variety of classes
- During the time slots where no classes are hosted, students could utilize and select prerecorded workouts and classes.

<table>
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<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gym education</td>
<td>• Low availability</td>
<td>• Sign in remotely for virtual classes</td>
<td>• Too much demand</td>
</tr>
<tr>
<td>• Time flexible</td>
<td>• Sanitation concerns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Social motivation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Low cost</td>
<td></td>
<td></td>
<td></td>
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</tbody>
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Alternative 7 – Personal Trainers

Description:

– LMU offers a limited number of personal training sessions free of charge to students per semester
– Students would book their appointments with the trainers throughout the semester

<table>
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<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wholesome gym education</td>
<td>• Very expensive</td>
<td>• Trainers based on specialty</td>
<td>• Pandemics</td>
</tr>
<tr>
<td>• Personalized</td>
<td>• Not effective for everyone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Social motivation</td>
<td>• Shy individuals</td>
<td></td>
<td></td>
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</tbody>
</table>

LMU = Loyola Marymount University
Alternative 8 – Community Specific Mobile App

Description:

– LMU specific mobile app designed to build a local community while incentivizing gym attendance while providing gym education
– Incorporates a point system
  • Points earned via attendance
  • Spent on a variety of options
– Educates how to safely use every piece of LMU gym equipment

<table>
<thead>
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<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive motivation</td>
<td>Expensive development</td>
<td>Many features could be added</td>
<td>Gym redesign requiring app update</td>
</tr>
<tr>
<td>Gym education</td>
<td>User effort required</td>
<td>Could include many incentives</td>
<td>Cyberbullying</td>
</tr>
<tr>
<td>Social motivation</td>
<td></td>
<td>Regulate attendance</td>
<td></td>
</tr>
<tr>
<td>Accessibility</td>
<td></td>
<td></td>
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<tr>
<td>Control cost/visit</td>
<td></td>
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LMU = Loyola Marymount University
Survey Results Factored Into Trade Study

Rank the following from most motivational (1) to least motivational (7).

Please use the following descriptions for reference:

A - Rebate of gym membership fees after meeting attendance threshold
B - 1% chance of winning a $20 gift card upon every visit
C - LMU providing limited personal training sessions
D - Receiving a free smoothie/protein shake every 5th visit
E - Spin the wheel to win school swag/merch every 20th visit
F - Having access to recorded classes and workouts
G - Earning a free trial day at nearby popular gyms every 20th visit

Most
2nd
5th
4th
3rd
6th
Least
# Evaluation Matrix (AOA)

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Measures of Effectiveness</th>
<th>Weighted Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attendance Frequency</td>
<td>Total Attendees</td>
</tr>
<tr>
<td></td>
<td>WF = 1</td>
<td>WF = 3</td>
</tr>
<tr>
<td></td>
<td>U</td>
<td>W</td>
</tr>
<tr>
<td>1) Rebate Gym Fees</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2) Lottery Based</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3) Free Smoothies</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4) Spin the Wheel</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5) Affiliate Trials</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>6) Recorded Workouts</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7) Personal Trainers</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8) Mobile App</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Alternative 8, Mobile App, should be selected**

WF = Weight Factor  
U = Unweighted Score  
W = Weighted score (WF*U)  
AOA = Analysis of Alternatives
Evaluation Results (AOA)

WEIGHTED SCORE VS. ALTERNATIVES

The path forward will be a community specific mobile app

AOA = Analysis of Alternatives
Agenda

- Acknowledgements
- Purpose
- Executive Summary
- Methodology
- Background
- Problem Statement
- Scope
- Stakeholders
- Measures of Effectiveness
- Requirements & Verification
- Identification of Alternatives
- Recommended Alternative
- Solution Architecture
  - Implementation Plan
  - Verification & Validation Plan
- Risk Management
- Ethical Considerations
- Conclusions & Recommendations
- Further Research
- Learning Outcomes
Solution Architecture – Operational View

- **Free Education**
- **Recorded Workouts**
- **Instructional Videos**
- **Safety Tips**
- **Workout routines**

**Online Community**
- Support
- LMU Gym
- Earn Points

**Mobile App**
- Visit Gym

**Earned Motivation**
- Spend Points

**Non Gym Going Students**

**Gym Going Students**

Loyola Marymount University
Solution Architecture – Systems View

Mobile App

Education Section
- Recorded Workouts
- Instructional Videos
- Safety Tips
- Workout Suggestions and Routines

Community Section
- Forums
- Gym Partner Finder
- Community Rules

Motivation Section
- Points Earned
- Catalog to Spend Points
- Option to Donate

Metrics Section

Settings Section
- Account
- Options
- Privacy & Security
- Notifications
Solution Architecture – Data View

Front End
- Education
- Community
- Motivation
- Settings
- User Input
- User Viewing
- Users

Business Logic
- Controls
- Services
- Data Access
- Views

Back End
- Database
- Provide Data
- Return Data
- Request for Data

Metrics
# Implementation Plan

## Opportunity for computer science capstone project at LMU

<table>
<thead>
<tr>
<th>Stage</th>
<th>Month</th>
<th>Year</th>
<th>Status</th>
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<tbody>
<tr>
<td>Concept</td>
<td>1-2</td>
<td>2-3</td>
<td>Green</td>
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<tr>
<td>Development</td>
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<td>4-5</td>
<td>Not Started</td>
</tr>
<tr>
<td>Implementation</td>
<td>6-7</td>
<td>5</td>
<td>Not Started</td>
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<tr>
<td>Utilization and Support</td>
<td>8-9</td>
<td>6</td>
<td>Not Started</td>
</tr>
<tr>
<td>Retirement</td>
<td>10</td>
<td>7</td>
<td>Not Started</td>
</tr>
</tbody>
</table>

Loyola Marymount University
Verification Plan

• Verification can be completed via various methods.
  – Test
  – Analysis

• Analysis can be completed before product has been built.

• Test, demonstration, and inspection begins once the product has been procured and implemented.

• Verification artifacts will be created and stored.

All artifacts will be delivered to customer at completion
Validation Plan

• With stakeholders, conduct a formal review to ensure all objectives and goals have been fulfilled
  – If action items arise:
    • Incorporate feedback or adjudicate
    • Iterate validation review with stakeholders

• The scope of the validation plan review is dependent on
  – The life cycle
  – Progress within cycle

• Validation may be completed on:
  – The full system
  – A system element
  – An artifact (ConOps, prototype, etc.)
  – Delivered system

ConOps = Concepts of Operations
# Risk Management

<table>
<thead>
<tr>
<th>Risk ID</th>
<th>Description</th>
<th>Impact</th>
<th>Probability</th>
<th>Mitigation Plan</th>
<th>Mitigated Impact</th>
<th>Mitigated Probability</th>
<th>Expected Status</th>
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<tbody>
<tr>
<td>A</td>
<td>Security breaches</td>
<td>5</td>
<td>3</td>
<td>Adequate encryption algorithms</td>
<td>5</td>
<td>1</td>
<td>Yellow</td>
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<tr>
<td>B</td>
<td>Unsustainable user growth</td>
<td>2</td>
<td>3</td>
<td>Only support LMU users</td>
<td>1</td>
<td>1</td>
<td>Green</td>
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<tr>
<td>C</td>
<td>App designed for multiple platforms</td>
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<td>5</td>
<td>Computer science capstone students</td>
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<td>5</td>
<td>Yellow</td>
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<tr>
<td>D</td>
<td>Poor UX/UI Integration</td>
<td>4</td>
<td>3</td>
<td>Internal reviews with experts</td>
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<td>2</td>
<td>Green</td>
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<td>E</td>
<td>Injury liability</td>
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<td>Waivers, exercise review, training</td>
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<td>2</td>
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<td>F</td>
<td>Cyberbullying</td>
<td>3</td>
<td>3</td>
<td>Zero tolerance policy</td>
<td>2</td>
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<td>G</td>
<td>Pandemic</td>
<td>4</td>
<td>1</td>
<td>Offer at home workouts</td>
<td>3</td>
<td>1</td>
<td>Green</td>
</tr>
</tbody>
</table>

All risks are planned to be effectively managed
Risk Burndown Cube

- Red = Critical
- Yellow = Watch
- Green = Managed
Ethical Considerations

Four Core Moral Principles [19]:

- **Autonomy**
  - Respect privacy and confidentiality rights
    - Protect all user data

- **Beneficence**
  - Engaging in actions that provide benefits to others
    - Inspire gym attendance to all for health benefits

- **Non-Maleficence**
  - Avoiding actions that would cause harm to others
    - Properly educate and protect users

- **Justice**
  - Equality of access and diversity
    - Maintain fair access to entire LMU undergraduate population

LMU = Loyola Marymount University
<table>
<thead>
<tr>
<th>Agenda</th>
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<tbody>
<tr>
<td>Acknowledgements</td>
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<td>Purpose</td>
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<td>Executive Summary</td>
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<tr>
<td><strong>Conclusions &amp; Recommendations</strong></td>
</tr>
<tr>
<td>Further Research</td>
</tr>
<tr>
<td>Learning Outcomes</td>
</tr>
</tbody>
</table>

Loyola Marymount University
Conclusion and Recommendations

1. LMU Undergraduate students are not attending the gym due to:
   – Time constraints
   – Lack of education
   – Lack of motivation

2. Mobile App solution will increase student gym attendance
   – Motivates through incentives and community support
   – Educates through videos, tips, and community support

3. Recommend LMU:
   – To put more focus into persuading gym attendance
   – To invest in gym tailored mobile app development
Further Research

1. App development opportunity for LMU Computer Science Capstone project

2. Roll out trial phase
   – 50 students
   – Assess impacts and results

3. Based on results of trial phase
   – Consider improvements
   – Consider other solutions to address the “too busy” factor
     • Change of school policy
     • Change of class schedules
     • Addition of time slots that students register for

4. Go through solutions with the customer to develop requirements

5. Scale up app solution for use at:
   – Other universities
   – Gym-chains (LA Fitness, Planet Fitness, etc.)
   – Clubs
Learning Outcomes

• Systems engineering methodology is effective, and can be used on any problem of adequate size
  – Inspiration to pursue entrepreneurial ventures and employ the SE methodology

• Frequent reviewer feedback is important for creating a sound package

• Data gathering is difficult
  – Surveying & Research
    • Good quality data
    • Access
    • Rules

• Difficult to please everyone

• Creating and sticking to a schedule
Questions?
List of Acronyms

• AOA = Analysis of Alternatives
• ConOps = Concepts of Operations
• LMU = Loyola Marymount University
• MOE = Measures of Effectiveness
• NPAP = National Physical Activity Plan
• PAG = Physical Activity Guidelines
• SE = Systems Engineering
• SYEG = Systems Engineering Course Code
• U = Unweighted Score
• UHC = United Healthcare
• UI = User Interface Design
• UX = User Experience Design
• W = Weighted score (WF*U)
• WF = Weight Factor
Scholarly References

[1] Centers for Disease Control and Prevention, National Center for Health Statistics, National Health Interview Survey (NHIS)


Backup
Project Schedule

Required project steps can be completed on schedule.
Alternate Justifications – Survey Results

• I don’t know how the whole recreation center works
• People there can be uncomfortable to be around
• Lack of specific gym equipment
• 6 times a week is adequate for rest
• On the soccer team, so I go when we have off days or done with practices so how often I go depends on my soccer schedule
• I don’t like feeling like people are looking at me
• The gym is way too small and too many people are there
• Commuter student, too involved to plan consistent workouts around traffic/homework
• I'm trans and feel unsafe in gendered spaces at the rec center

Less popular justifications exist – hard to address everyone
Alternative 1 & 2 Research

Rebate gym membership fees if attendance threshold is met:

- 20% increase in gym attendance [13]
  - Major American university
  - Reimbursed $75 if 50 visits in six month period was met

- Insurance (Aetna, UHC, Affinity)
  - Reimburse up to $200 to members who attended the gym 50 times in a six month period [13]

Lottery based financial incentives as reward:

- 40% higher probability of freshman male gym attendance [14]
  - Large Midwestern university
  - 1% chance at winning lottery of $20 with every visit

Financial incentives are effective in increasing gym attendance
Alternative 3, 4, & 5 Research [16]

- Extrinsic rewards are a positive motivating factor
  - Competition
  - Social Environment
  - Physical Appearance
  - Rewards

- Men respond better to:
  - Competitive gamification of rewards
  - Social Environment

- Women respond better to:
  - Working towards discounts, free smoothies, etc.
  - Social Environment

Physical rewards are less motivational than social environment
Mobile apps are considered effective in gym exercise guidance [17]

### Alternative 6, 7, & 8 Research

<table>
<thead>
<tr>
<th>Teach How to Build Workouts</th>
<th>Teach How to Perform Exercises</th>
<th>Teach How to Avoid Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Personal Trainers</td>
<td>• Personal Trainers</td>
<td>• Personal Trainers</td>
</tr>
<tr>
<td>• Exercise Apps</td>
<td>• Exercise Apps</td>
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</tr>
<tr>
<td></td>
<td>• Sports</td>
<td>• Sports</td>
</tr>
<tr>
<td></td>
<td>• Gym Classes</td>
<td>• Gym Classes</td>
</tr>
<tr>
<td></td>
<td>• Videos</td>
<td>• Videos</td>
</tr>
</tbody>
</table>

Mobile apps are considered effective in gym exercise guidance [17]
Research Plan

LMU Undergraduate Survey
- Gym use frequency
- Education Sources
- Motivation Sources

LMU Gym Metrics and Statistics
- Interviews
- Gym Staff
- LMU Gym Director

Identification of Alternatives
- Journals/Papers
- Books
- Institutional Websites
Attendance rate of adult gym members in the United States 2017

- <1x per week: 12%
- 1x per week: 16%
- 2-3x per week: 48%
- 4x+ per week: 23%

Figure Source: [15]