Project Deliverable E-Presentation

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Agenda

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Benchmarking

Target Specifications

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Decision matrix

Feasibility Study

Initial Project Plan

Client Meet #2 Feedback

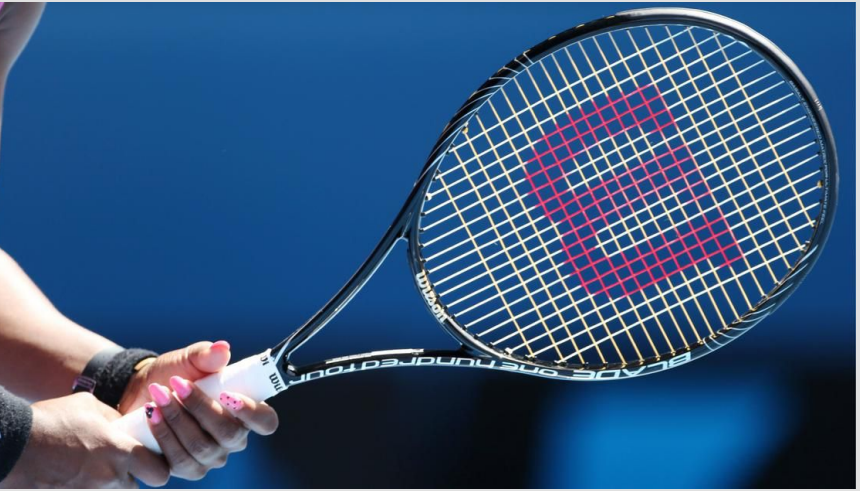
Development of Prototype

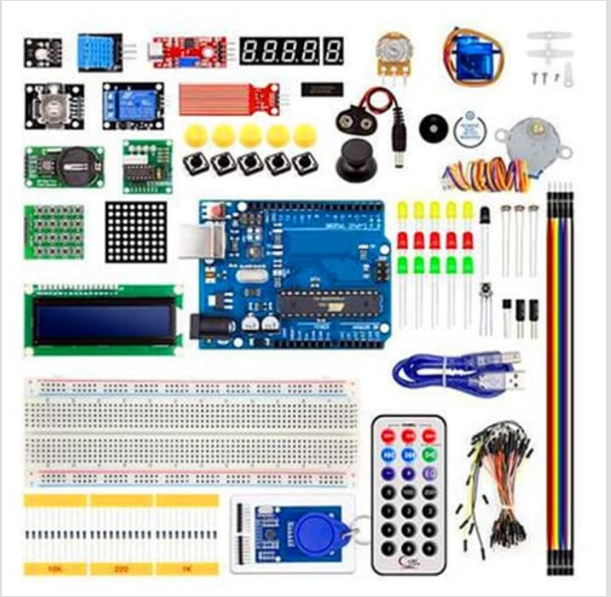
Current Prototype & Testing

Client Meet #3 and Future Plans

What is our project?

- Product that measures athlete performance
- Users: athletes, coaches or anyone looking to monitor or improve their performance



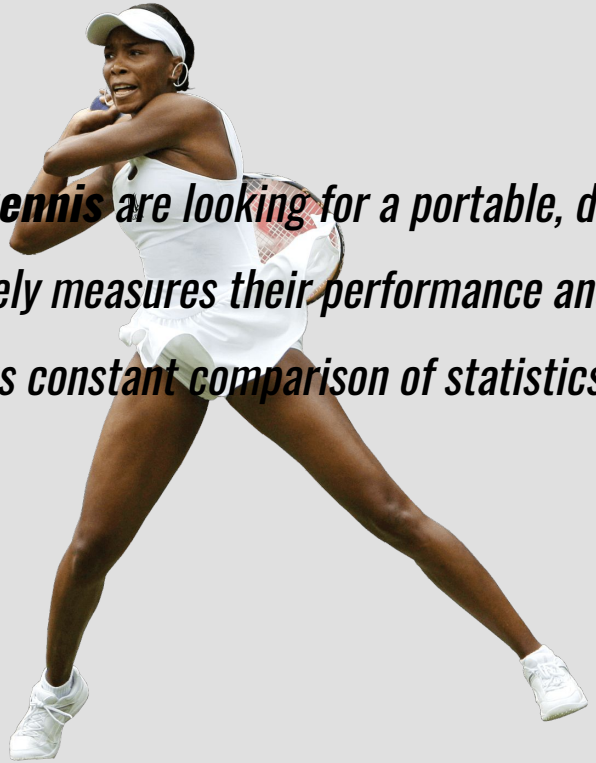


Client Needs

Key Takeaways from Client Meet 1:

1. **The product detects and collects measurable data related to sports performance.**
2. **The product has no effect on the user's ability to perform.**
3. **The product analyzes and categorizes data and outputs it to a user-friendly centralized platform.**
4. **The product is lightweight, portable, durable and waterproof.**

Problem Statement



*“Athletes and coaches **playing tennis** are looking for a portable, durable and waterproof product that effectively measures their performance and outputs it via a user-friendly platform that allows constant comparison of statistics amongst themselves and their team.”*

Benchmarking - Current Products in the Market

Watch Tracker - for Running (FitBit)

figure 1: https://images.app.goo.gl/cFvBTv1aUzP646ow9

- ❏ Easy set up
- ❏ Centralization of data on app
- ❏ App stores daily totals for up to 30 days
- ❏ Waterproof
- ❏ Durable
- ❏ Adaptable to parasports

Playmaker - for Soccer

- ❏ Easy set up
- ❏ Data sorting included
- ❏ Centralization on app
- ❏ Waterproof
- ❏ Durable

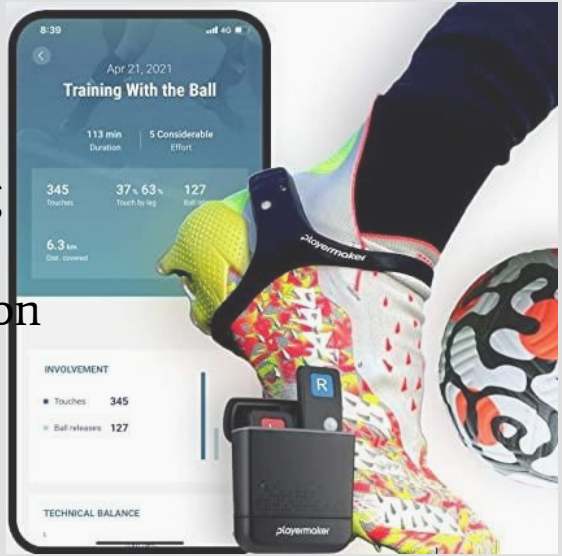


Figure 2: https://images.app.goo.gl/1AQR1NKZqiRgG79n8

GPS Performance Tracker - for Soccer (STATSports)

Figure 3.a

3.b

- ❑ Easy set up
- ❑ Centralization of data on app
- ❑ Waterproof
- ❑ Durable
- ❑ Adaptable to parasports

(a) Link: https://images.app.goo.gl/bWodynJA7M3VkLDA8
(b) Link: https://images.app.goo.gl/zihkShEmqxu6MKY9

Installed Club Sensors (Garmin Approach CT-10)

- ❑ Easy set up
- ❑ Data sorting included
- ❑ Centralization of data on app
- ❑ Waterproof
- ❑ Durable

Figure 4. https://images.app.goo.gl/dCvubkroaUY47pzk9

Target Specifications

Metric	Unit	Marginal value	Ideal value	Reason for choices
Speed measurable	m/s	0-118.33	0-150	Cover the world's maximum badminton hitting speed to avoid unexpected situations.
Impact force measurable	N	>280	>300	Simplified estimation done according to the maximum and minimum speed measurable in Metric #1 Conducted through testing (Nagwa).
Weight	g	>80	80<	Light and convenient; It should be a seamless device.
Size of device	cm3	<9	7.5<	Small and fits the racket.
Life expectancy	Years	>1	>3	The battery life is long enough to be used during multiple seasons and the battery is replaceable.

Decision matrix

Selection criteria	Racket: Detachable	Racket: Built-in	Gloves
Speed measurable	5	5	4
Impact force measurable	5	5	4
Weight	5	2	4
Size of device	4	1	3
Life expectancy	3	3	4
Total score	22	16	19

Therefore, the Group Concept will be a detachable sensing system mounting on a tennis racket.

Feasibility Study

Strengths:

- Inexpensive and Affordable
- Lightweight and Compact
- Sensitive and Accurate
- Data visualization

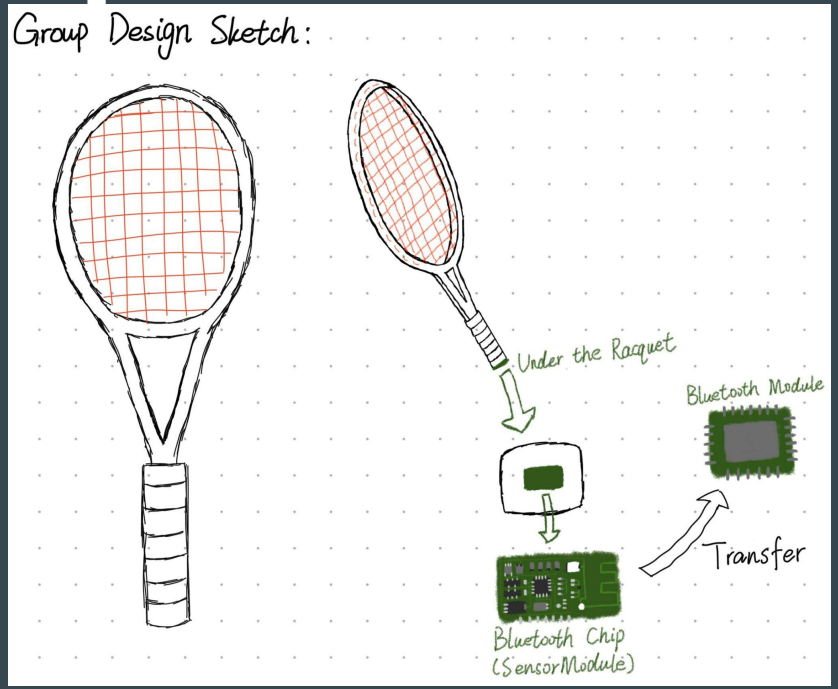
Weaknesses:

- Difficult installation/ disassembly process
- Few target clients
- Short product development period

TELOS:

- ➢ **Technical:** Technical support in software, but still lack the knowledge of hardware.
- ➢ **Economic:** R&D expenses slightly exceeded expectations.
- ➢ **Legal:** Make sure developer-friendly tools and low-cost deployment.
- ➢ **Operational:** Rational task allocation and On-chain governance.
- ➢ **Scheduling:** Deadline is Nov. 30, and a three-month period is short for R&D work.

Group Concepts



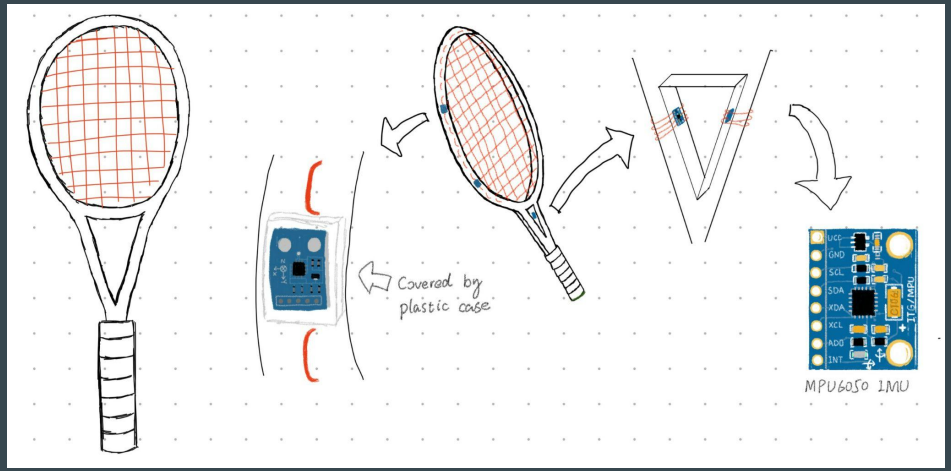
Initial Group Concept

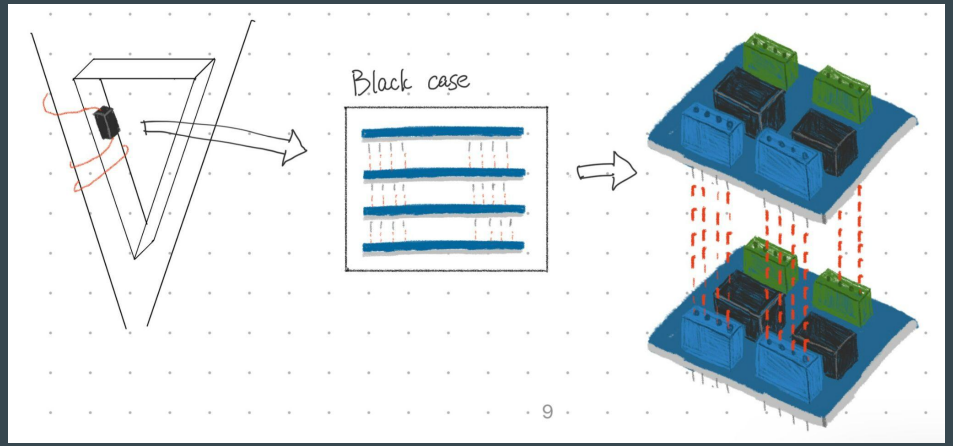
Client Meet #2

- Feedback for Design Improvement

- Preferred use of bluetooth chips
- Advised use of more sensors positioned around the racquet
- An advertisement or an application alongside the product.
- Output of data to the user should be continually updated.
- Data is outputted in a user-friendly manner

Group Concept After Client Meet 2





Project Plan

#	Task	Time																Owner
		Month 1				Month 2				Month 3				Month 4				
1	Team contract & project plan & client meeting 1 (PD-A)		x															All
2	Client needs & Problem definition (PD-B)			x														Jemma
3	Conceptual design & client meeting 2 (PD-C)				x													Vive
4	Detailed design & Prototype 1 (PD-D)					x												Laura
5	Project progress presentation (PD-E)						x											Yassine

Project Plan

X : 1 week
 : Milestone

Issues encountered:

- Task #4: Sickness
- Task #4: Uncertainty about final design
- Task #5: Review of final design

Project Plan

#	Task	Time																Owner
		Month 1				Month 2				Month 3				Month 4				
6	Prototype 2 (PD-F)								x									Chelse
7	Business model & Economics report (PD-G)										x							Jemma
8	Design day pitch & Final prototype & Client evaluation (PD-H)												x					Vive
9	Video & User Manual (PD-I)													x				Laura
10	Final presentation (PD-J)													x				Yassine

Project Plan

X : 1 week

 : Milestone

Issues expected:

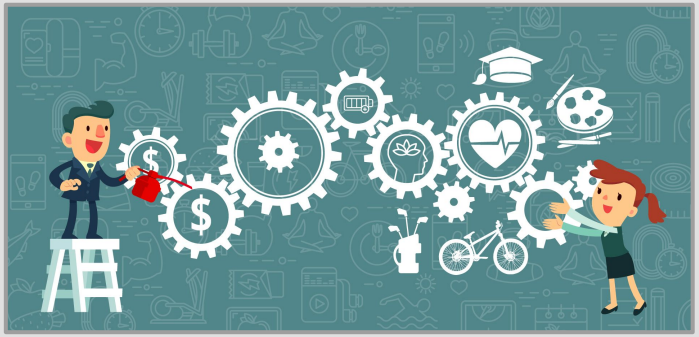
- Task #6: Delay in components arrival
- Sickness or member absence

Prototype 1

Using Gyroscope and Accelerometer
- Acceleration Input

We want:
- Peak Velocity (at what position & time)

How does it work?



Create a loop

Calculate current velocity

If it’s higher replace it

Time To Test!

Acceleration	0	+2	+3	-1	+1.5
Time	0	1	2	4	5

Kinematic Equation: $V_f = V_i + a * \Delta t$

1

Initialize variables

Set V_i , V_f , a , t , peakV = 0

2

Calc current velocity (V_f)

Use data table and equation

$V_f = 0 + (0 * 0) = 0$

Time To Test!

Acceleration	0	+2	+3	-1	+1.5
Time	0	1	2	4	5

Kinematic Equation: $V_f = V_i + a * \Delta t$

3

Change peakV and V_i?

V_f = 0, so peakV still 0

$V_i = V_f = 0$

4

And repeat...

For all data table values

Time To Test!

Acceleration	0	+2	+3	-1	+1.5
Time	0	1	2	4	5

Kinematic Equation: $V_f = V_i + a * \Delta t$

Row 2:

$V_f = 0 + (2 * 1) = 2$

$peakV(0) < V_f(2) \rightarrow$

$peakV = 2$

$V_i = V_f = 2$

Row 3:

$V_f = 2 + (3 * 1) = 5$

$peakV(2) < V_f(5) \rightarrow$

$peakV = 5$

$V_i = V_f = 5$

Row 4:

$V_f = 5 + (-1 * 2) = 3$

$peakV(5) > V_f(3) \rightarrow$

$peakV = 5$

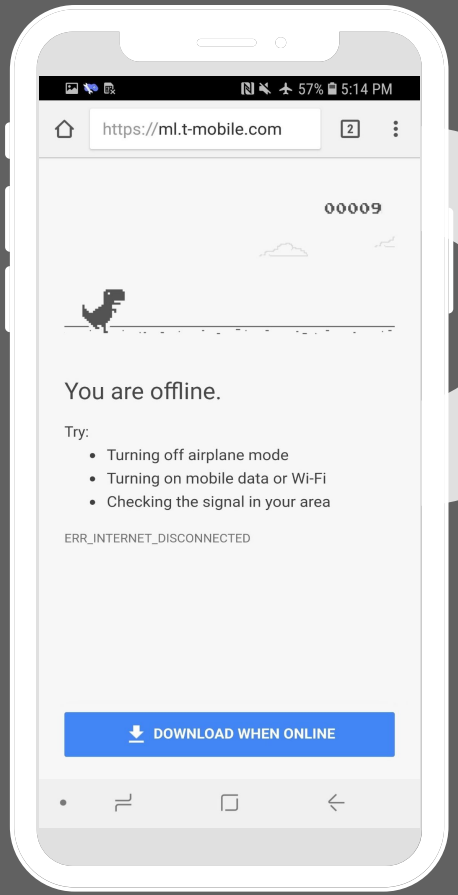
$V_i = V_f = 3$

Row 5: $V_f = 3 + (1.5 * 1) = 4.5$

$peakV(5) > V_f(4.5) \rightarrow peakV = 5$

Potential Limitations

- Requires high frequency measurements
- Assuming constant acceleration between intervals
- X, Y, & Z axis may make things more complex



Next Steps

Objectives:

- **Update Prototype 1**
- **Prototype 2**
- **Final Prototype**

Thank you!

Any Questions?