PIKL (Paddle Integrated Kemper Logic)

The Effects of NIL (Name, Image, and Likeness) on College Athletics

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

The sport of pickleball is experiencing a recent surge in popularity within the United States (US). Over the last five years, pickleball has experienced an average annual growth rate of 11.5% in the US and is now considered the country's fastest growing sport (Mahoney, Cavan & Hambrick, 2024). This popularity is further driven by its inclusivity, out of the 4.8 million players in the US 40% of the players are women and 60% are men (Mahoney et al., 2024). Due to pickleballs accessibility and fast-paced nature, the sport has grown from a casual pastime to a competitive sport with players seeking to improve their skills. This rapid growth has driven a need for advanced training tools like those in other sports such as golf. For example, in golf players use smart tools to provide data on swing mechanics, speed, and accuracy (Webber, 2019). However, despite the popularity, there are currently no smart training tools tailored to pickleball. This gap limits players' abilities to access real-time feedback and improve their pickleball skills.

Pickleball was originally created in 1965 by Joel Pritchard, Bill Bell, and Barney McCallum, who used an old badminton court, ping pong paddles, and a plastic ball to invent the game (Mahoney et al., 2024). While it has remained under the radar for many years, several factors have contributed to its recent surge in popularity. Fitness is the first factor as it provides a beneficial and enjoyable workout for the player (Mahoney et al., 2024). Socialization is the second factor as it allows players to interact with peers and develop a sense of community (Mahoney et al., 2024). Competition is the third factor although it may not seem all that competitive (Mahoney et al., 2024). Any sport with a winner and loser is a competitive sport, and thus gets players excited and motivated. Skill mastery is the fourth factor (Mahoney et al., 2024). Players get hooked on the sport and its competitiveness and have the desire to improve their

skills. Over the last five years, pickleball has experienced an average annual growth rate of 11.5% in the US and is now considered the country's fastest growing sport (Mahoney et al., 2024). This popularity is further driven by its inclusivity, out of the 4.8 million players in the US 40% of the players are women and 60% are men (Mahoney et al., 2024). Pickleball opens opportunities for everyone no matter what gender, age, or skill set. These factors, combined with the sport's accessibility and growing competitiveness, have fueled the rise of popularity in the sport.

In response to the growing demand, the Paddle Integrated Kemper Logic (PIKL) project proposes the development of a smart pickleball paddle designed to bridge the technology gap in training. This paddle aims to enhance the sport's competitiveness by providing players with real-time performance feedback. PIKL will use embedded sensors and wireless technologies to capture real-time performance metrics on various aspects of a player's hit. This will include swing speed, hit location, and impact force. The data will be gathered using piezoelectric vibration sensors and an inertial measurement unit (IMU) sensor that communicates with the microcontroller (MCU) to wirelessly transmit the data to the computer program. The program interface will allow users to view the metrics stated above along with feedback for improvement and match averages. The PIKL project is designed to provide players of all ages and skill sets with the same technology and training tools that other sports already benefit from. PIKL will help players learn the sport and enhance their talent and skills within the sport. The technical section of this prospectus will detail the development of the PIKL paddle including the electronic components and analysis capabilities. The STS section will analyze the broader societal impact of Name, Image, and Likeness (NIL) on college athletics.

Technical Analysis of PIKL

Despite pickleball's growing popularity, the sport lacks smart technology tailored to help players improve their skills. This gap limits players' ability to access valuable data regarding swing mechanics and accuracy. Pickleball players can benefit from a smart device that can offer them those key insights and data on their swings. The PIKL project proposes a solution by introducing a smart pickleball paddle that uses sensor technology and data analysis to track and display metrics like swing speed, impact force, and hit location.

The PIKL paddle uses piezoelectric vibration sensors, an IMU sensor, and a (MCU) embedded in a custom 3D-printed handle to gather and process data. When a hit occurs, the piezo sensors capture the impact to determine the force and location, while the IMU records the swing speed. The MCU processes this data and wirelessly transmits it to a computer program that presents the information in real time. This interface provides users with a visual display of their performance, including a heat map that shows where they are hitting on the paddle and how hard each hit is. Additionally, players can access averages over a match, such as swing speed and hit accuracy, which provide training trends over time. The technical diagram illustrates the layout with each sensor and component (see Figure 1).

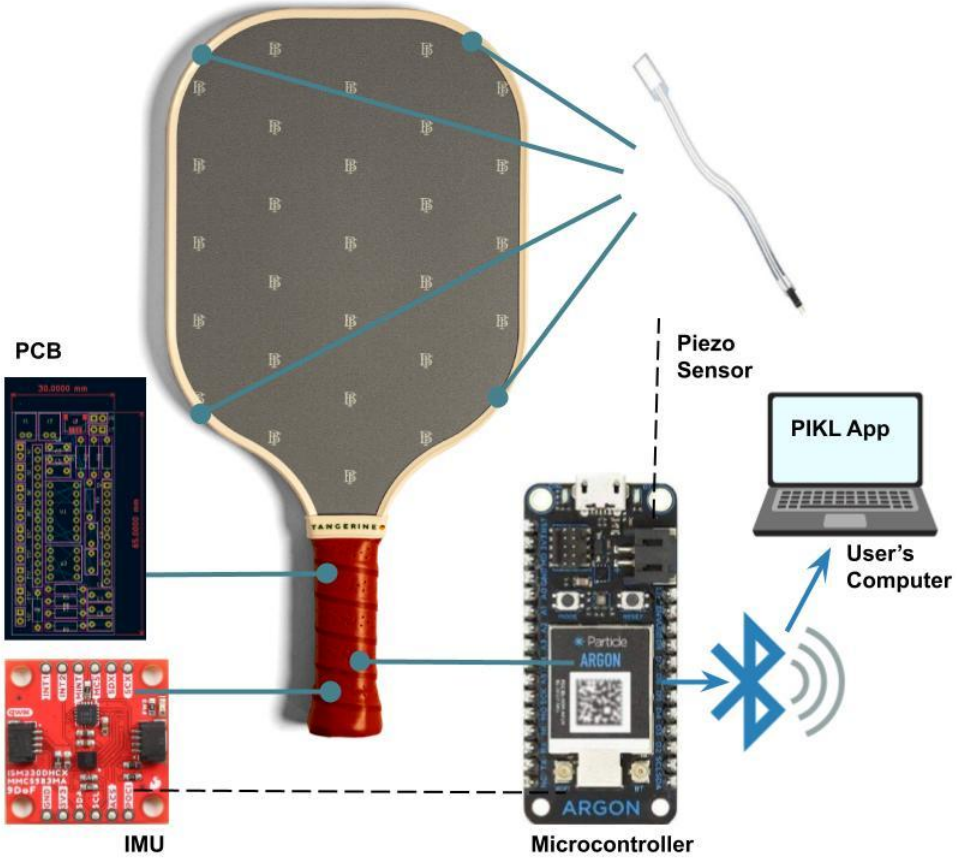

Figure 1. High-Level PIKL Block Diagram (BarneAnimals-PIKL, 2024).

PIKL's design is effective for pickleball as it preserves the feel of a traditional paddle while integrating technological features. The custom 3D-printed handle houses the electronics in a compact form, ensuring the paddle remains lightweight and comfortable (see Figure 2). The sensors are placed along the paddle's edge and hidden under the edge guard. This setup allows players to receive accurate data without altering the feel of the paddle.

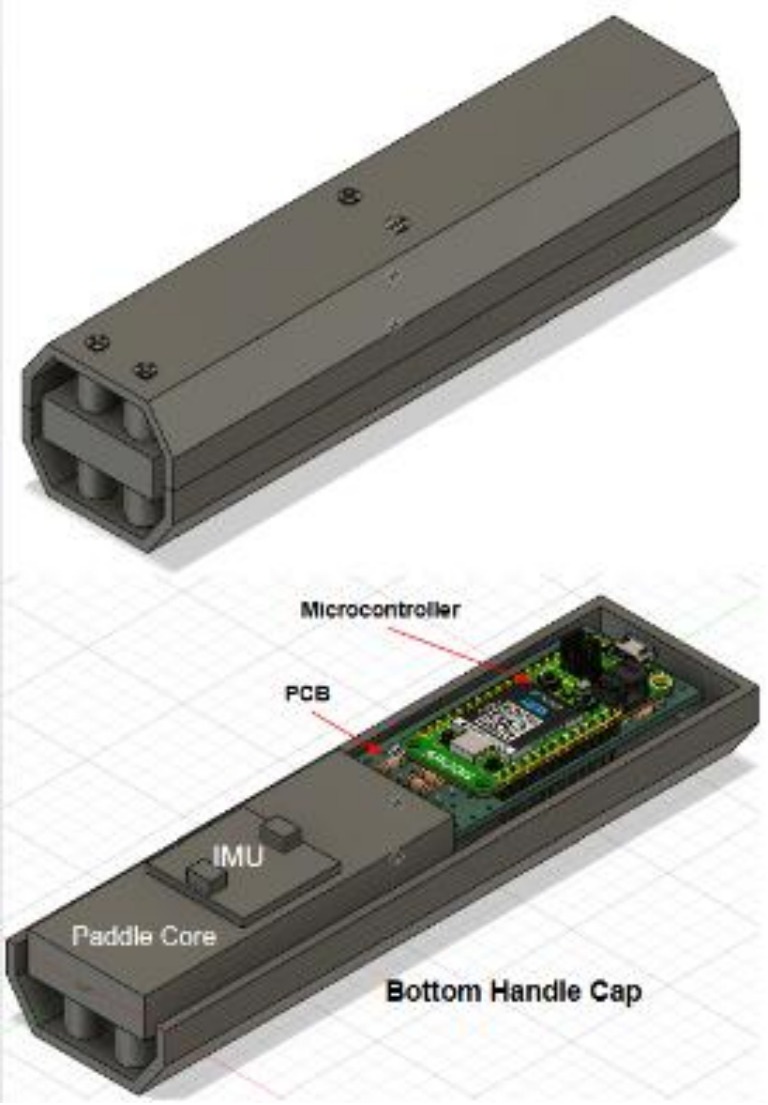

Figure 2. PIKL Handle Model (BarneAnimals-PIKL, 2024).

Although PIKL's primary function is for training analysis, it also has potential social implications. Like the introduction of NIL in college athletics, PIKL introduces a new level of engagement for pickleball players by merging technology with the sport. By making training data accessible, PIKL could reshape how pickleball players view and approach skill development, potentially transforming the sport as NIL policies are transforming college athletics.

One example that highlights pickleball and NIL is the University of Virginia (UVA) pickleball club. In 2023, the club won the Dynamic Universal Pickleball Rating (DUPR) collegiate national championship (Ramspacher, 2024). With that achievement, the club opened its doors to business opportunities. The club ended up signing with Topnotch Management, which made UVA the only collegiate pickleball club in the country to have agency representation (Ramspacher, 2024). After that, sponsors poured in and invested in the UVA pickleball club. The deals include paddles from ProXR, shoes from Head, balls from Vulcan, socks from Thorlo, ball machines from Lobster Sports, nets from Har-Tru, recovery products from Hyperice, hydration drinks from Roar, energy drinks from Reign, and sports apparel from Sergio Tacchini (Ramspacher, 2024). This example illustrates how the merging of technology and sports relates to NIL and sponsorships bringing new opportunities for the athletes, the club, and the university.

Social Construction of Technology: Analysis of NIL Policies

Following the development of PIKL, the examination of NIL policies in college athletics highlights another intersection of technology and societal change. As the PIKL paddle introduces new technology to a growing sport, NIL policies are reshaping college athletics, particularly in terms of recruitment, fairness, and the commercialization of athletes. California passed a law in 2019 to become the first state to allow college athletes to get paid (Tucker, 2022). Once California passed the law it did not take long for other states to follow. As more states passed laws, the National Collegiate Athletics Association (NCAA) began holding meetings to discuss how they should oversee NIL policies. The NCAA went to the US Supreme Court in 2021 over these policies. The ruling was unanimous that the NCAA cannot limit education-related benefits to athletes (Tucker, 2022). Justice Brett Kavanaugh said, “The NCAA is not above the law”

(Tucker, 2022). With this introduction of NIL in college athletics, the way athletes interact with their sports has shifted. NIL creates both opportunities and challenges in the evolving landscape of college athletics. These policies allow athletes to earn money from endorsements and sponsorships. While this may empower college athletes, it also introduces concerns about recruiting, fairness, and the commercialization of athletes.

The Social Construction of Technology (SCOT) framework by Pinch and Bijker argue that technological development is a socially constructed process that is shaped by interpretations of different stakeholders (Pinch & Bijker, 1984). Interpretive flexibility, a concept in SCOT, refers to the idea that different social groups view and assess technologies or policies based on their specific interests, values, and goals. In the case of NIL, stakeholders such as universities, coaches, athletes, sponsors, and fans may each interpret the policies in different ways, leading to diverse interpretations. This framework allows us to explore how these various perspectives shape the development and impact of NIL policies in college sports (Romano Law, 2021).

Technology and policy are shaped by social, economic, political, and cultural factors, not solely by science (MacKenzie & Wajcman, 1999). NIL policy is not shaped by science but rather shaped by the various interests and opinions of the stakeholders. For athletes, NIL represents a chance for financial freedom and control over their personal brand, while for universities, it raises concerns about fair recruiting practices (Owens, Rennhoff & Roach, 2024). As NIL continues to evolve, the SCOT framework's multidirectional model suggests that the policy's effects are not unidirectional but rather shaped by interactions among stakeholders, each influencing the policy's trajectory and outcomes.

The transfer portal and recruiting have become challenging under NIL policies. Top recruits are now factoring in NIL opportunities as they make their college decisions, which

impacts how universities and coaches approach recruiting strategies. For example, Matt Rhule, Nebraska football head coach, notes how expensive it has gotten to get a quarterback. Rhule states, “Make no mistake: a good quarterback in the portal costs $1 million to $1.5 million to $2 million right now (Dreifaldt, 2023).” College athletics are resembling professional sports, where athletes can sign contracts and transfer between teams. SCOT’s focus on interpretive flexibility allows us to view the perspectives of the universities and the athletes as they manage the recruitment process with NIL. Universities must balance the need to attract top talent with concerns about the future and competitiveness, while athletes must face the opportunities and challenges NIL presents.

Beyond recruiting, NIL’s impact extends to larger social concerns in college sports. Through the SCOT framework, this analysis will capture how NIL policies are reshaping college athletics, focusing on the interpretations of the stakeholders. The framework also considers whether NIL policies are reaching closure and stabilization, which occurs when a dominant interpretation emerges among the stakeholders. As NIL continues to grow and unfold, understanding its social implications is essential for stakeholders seeking to balance the positives and negatives, ultimately shaping the future of college athletics.

Research Question and Methods for NIL Recruiting

How are NIL policies influencing college athletics? This research explores the effects of recruiting and fairness in college athletics, focusing on the UVA football program. To answer this question, a case study will be conducted, leveraging interviews with stakeholders and existing evidence to develop the analysis. This approach allows for a deeper understanding of how NIL policies impact recruiting practices and stakeholder interpretations at UVA.

1. Case Study: The case study will be centered around the UVA football program, using interviews with administrators, coaches, athletes, and UVA's NIL sponsor, Cav Futures. These interviews will capture the various perspectives of key stakeholders and illustrate how NIL is influencing recruiting. The data gathered will be supplemented with existing studies and data to provide a broader context and support the research question. The following sources will be used as evidence and support:
    - The impact of name, image, and likeness on college athletics (Clifft, 2022).
    - Name, image, and likeness and the health of the young athlete: a call to action for sports medicine providers and the athletic healthcare network (Hollabaugh, Jeckell & Diamon, 2024).
    - College athletics and NIL: perspectives from a practitioner and an athlete (Sinatra & Williams, 2023).
    - Why NIL has been good for college sports… and the hurdles that remain (Bilas, 2022).
    - College athletes are getting paid, and fans are starting to see a growing share of the bill (Pells, 2024).
    - The current state of NIL (Moody, 2024).
    - New NIL, health and academic benefits take effect for NCAA student-athletes Thursday (Wright, 2024).
    - NIL hurts college athletics. Here's how we fix it (Orr, 2022).
    - Hidden consequences: examining the impact of NIL on athlete well-being (Harris, Brison & Dixon, 2021).

- Why did Tony Bennett retire? UVA basketball coach explains decision (Newton, 2024).
- The effect of the NIL on recruitment (Arunarthi & Gregorich, 2022).
- Putting athletes first: an empirical examination of the hedonic well-being of college student-athletes in response to NIL (Gulavani et al., 2023).

Through this method, the case study will apply the SCOT framework to examine stakeholders' interpretations of NIL and determine whether NIL has achieved closure, stabilization, and a dominant interpretation.

Conclusion

The PIKL smart pickleball paddle addresses the growing need for smart training tools by capturing real-time data on swing speed, impact force, and impact location, providing players with useful feedback. By integrating embedded sensors, wireless communication, and a user computer program, PIKL bridges a technological gap in pickleball training, offering players a data-driven approach to skill enhancement. Similarly, the STS analysis of NIL policies examines their impact on college athletics, focusing on recruiting and fairness. Using the SCOT framework, this research explores how stakeholders interpret NIL policies and influence their implementation, ultimately shaping the dynamics of college sports. The analysis also considers whether NIL policies are approaching closure and stabilization, reflecting a dominant interpretation among stakeholders. Together, the PIKL paddle and NIL study highlight the intersection of technology and policy in sports, contributing to a broader understating of how technology and policy shape athlete experiences and opportunities.

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