

Thesis Project Portfolio

Final Capstone Project Report: Force-Sensing Swimming Starting Block

(Technical Report)

**An Analysis of the Effects of Capital and Technological Investment on Basketball Players
and Society**

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Both my technical and STS projects explore the intersection of technology, performance, and athletics. My technical project, the force-sensing swimming starting block, embodies a real-world example of targeted technological investment to enhance elite athlete performance.

Developed for one of the top collegiate swimming programs in the nation, it demonstrates how precise measurement and data analytics can be used to drive performance needed in an increasingly competitive sports environment.

My STS project extends this observation into a broader societal critique by examining how technology and capital has been introduced into sports and has shaped who gets to compete at the highest levels. As technology raises performance standards, it also raises the barriers to entry, reinforcing pre-existing inequalities based on access to financial and social resources. This dynamic mirrors the same pressures observed in swimming: while innovations like our custom starting block offer new opportunities for performance optimization, they also highlight how elite programs benefit disproportionately from technological advancements, leaving resource-constrained athletes and teams at a relative disadvantage.

Together, these projects illustrate that technology in sports is not just about performance enhancement but a reflection of broader societal structures and values. Investment in technology can create new opportunities for excellence, but without equitable access, it can also exacerbate inequalities.

Wahoo SplashTrack: A Tool to Enhance Swimmer Start Performance

In collaboration with the University of Virginia's Swimming and Diving team, our capstone team developed a custom, force-sensing swimming starting block designed to measure and record swimmer start performance. The starting block was retrofitted with two arrays of force-sensitive resistors (FSRs) embedded beneath custom-manufactured aluminum plates. Data collected by these sensors was routed through custom-designed PCBs into a National Instruments MyRIO microcontroller, which communicated with a cloud-hosted web application. The application allowed coaches and athletes to register, record, and track swimmer performance metrics over time through an intuitive interface. Data visualization features, such as trend tracking and export to Excel, enabled practical analysis for athletic development. By engineering a specialized training device tailored to elite swimmers' needs, the project bridged electronics, mechanical design, embedded systems programming, and user-centered software design. The final product, completed on a limited budget and tight timeline, provides the UVA Swim and Dive team with an actionable, data-driven tool to refine swimmer performance and inform training strategies, embodying the growing integration of technology into sports science and athlete development.

An Analysis of the Effects of Capital and Technological Investment on Basketball Players and Society

This STS research investigates how technological and financial investments have shaped the sport of basketball and redefined the societal structures surrounding it. Framed through the Social Construction of Technology (SCOT) theory, the paper explores how capital-driven incentives at professional, collegiate, and youth levels have fueled technological innovations in training, recovery, and performance analytics. These innovations, while advancing the athletic capabilities of elite players, have raised the financial and resource barriers necessary for participation, fundamentally altering the accessibility of the sport. Despite historically being a relatively accessible game, basketball's increasing dependence on specialized equipment, data analysis tools, and recovery technologies now favors those with financial means, narrowing the pipeline for athletes from underrepresented or economically disadvantaged backgrounds. While technological innovation in basketball has led to faster, stronger, and more strategic gameplay, it has also contributed to deeper societal divides. This impact mirrors broader trends in technological adoption across society, where innovation provides opportunities for efficiency and performance, but often exacerbates existing inequities. By examining the social construction and consequences of basketball technologies, this project reveals both the empowering and exclusionary effects of innovation in sports and society at large.