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# Signalling Expertise in Sport Entrepreneurship

*A Mixed-Methods Approach Using Topic Modeling  
and Thematic Analysis*

**Ted Hayduk III**  
**Brianna Newland**

## Abstract

Despite the recent importance of technological entrepreneurship to sport business, very little is known about the entrepreneurs who are actively defining this new landscape. And, given that effective communication is essential to a thriving entrepreneurship ecosystem, it is important for investors to understand who sport entrepreneurs are and how they position themselves to the world. This will help create a sport business landscape that is receptive to new technologies and supportive of the entrepreneurs who champion them. Thus, the purpose of this paper is to illuminate how sport entrepreneurs communicate with potential investors. To do so, the paper employs a mixed-methods approach, using a natural language processing algorithm to decipher themes in the entrepreneurs' self-reported biographies, followed by a qualitative investigation that uncovers how each theme was leveraged.

**Keywords:** *Business, communication, finance, investing, relationships, technology*

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Entrepreneurship is defined as market-altering creative destruction (Schumpeter, 1934). Creative destruction occurs when new technologies are introduced into product development or business processes. Creative destruction brakes down inertial forces that dictate a market's status quo. This process occurs in two steps. First, an entrepreneur recognizes the opportunity by identifying market inefficiencies. Second, they decide to exploit the opportunity by redirecting corporate resources or starting a new business. The benefits of entrepreneurship are numerous and well documented. Scholarship acknowledged that entrepreneurship was generative of competitive advantage and increased market share for firms. Entrepreneurship also increases employment and standards of living for regions (Luke et al., 2007). In developed economies with formalized institutions, entrepreneurship led to increases in GDP growth rate (Valliere & Peterson, 2009). New-venture entrepreneurship in particular (as opposed to innovation entrepreneurship—defined as being “entrepreneurial” within a large firm) was positively related to GDP growth rate (Tang & Koveos, 2004).

Recently, scholarship began to acknowledge the overlap between sport and entrepreneurship (e.g., Ball, 2005; Hemme et al., 2017; Ratten, 2011). Both phenomena occurred throughout human history irrespective of time, geography, and culture; both are imbedded in what it means to be “human” (Ratten, 2011). Additionally, sport often required the proactivity, resilience, and risk taking emblematic of entrepreneurship. Ratten and Ferreira (2016) indicated that entrepreneurship allowed sport organizations to improve performance on the field of play, increase fanbases, procure additional services, and optimize revenue. Currently, entrepreneurship bolstered by new technologies has affected the business of sports. Technological entrepreneurship shifted the tides of demand and redefined supply chains overnight. New technologies are salient because the sport industry's value chain is instantaneous; games are produced, packaged, distributed, and consumed simultaneously (Gershon, 2013). These new technologies affect all areas of sport business, and examples include consumer analytics, virtual and augmented reality, mobile applications, social media marketing, and digital streaming.

Despite the importance of entrepreneurship to the business of sports, significant gaps exist in the literature. While work has addressed the conceptual underpinnings of sport entrepreneurship (Ball, 2005; Ratten, 2011; Ratten & Ferreira, 2016), fewer studies examined the practicalities of entrepreneurship in sport business. One of the largest areas of need is to understand the communicative processes between sport entrepreneurs and the entrepreneurial ecosystem (Ratten, 2016). Understanding the mechanisms governing the exchange of information between sport entrepreneurs and other stakeholders is important because successfully reducing information asymmetries encourages collaborative value-generation in an industry (Schumpeter, 1934). Thus, understanding who sport entrepreneurs are and how they communicate is imperative for procuring a sport business landscape that is advantageous for entrepreneurs and hospitable to the technologies they bring with them.

## Entrepreneurial Communication and Signaling Theory

Entrepreneurs' communication with outside stakeholders has frequently been discussed using signaling theory. Connelly et al. (2011) explained how signaling theory is useful when information exchange between two parties is required, but both parties possess different amounts and types of information. To facilitate communication, the sender chooses how to communicate the desired information using signals, and the receiver chooses how to decode them. Signaling theory has been explored in a range of management contexts, including strategic management (Zhang & Wisrsema, 2009), human resource management (Highhouse et al., 2007), and entrepreneurship (Alsos et al., 2016; Eddleston et al., 2016; Giones & Miralles, 2015).

In entrepreneurship, the sender is nearly always an entrepreneur, and the receivers are potential investors or advisors (Connelly et al., 2011). Ideally, when signals are sent and received successfully, the investor chooses to pursue a relationship with the entrepreneur. A range of forces can affect the success of the signaling process, among which are characteristics of the receiver (Gulati & Higgins, 2003), the signal (Filatotchev & Bishop, 2002), the signaling environment (Janney & Folta, 2006), the industry environment (Sanders & Boivie, 2004), feedback loops (Gammoh et al., 2006), organizational and institutional cultures (Highhouse et al., 2007), and the sender (Ndofor & Levitas, 2004). Thus, there are a range of things that can hinder entrepreneurs in their quest to send clear, convincing signals.

### Signaling Theory and Sport Entrepreneurs

There has been increasing attention in entrepreneurship devoted to understanding how characteristics of senders affect their signals' perceived quality and resonance. Some of these characteristics include educational attainment (Van Der Sluis et al., 2004), credibility (Certo et al., 2001), and gender (Alsos et al., 2016, Eddleston et al., 2016).

Research also found that differences in these characteristics induce different types of signals (Eddleston et al., 2016). Entrepreneurs of disparate backgrounds, career experiences, educational pedigrees, or genders send signals that are in part determined by these traits. Such an assertion is consistent with socialization theories of human interaction and development (Maccoby, 2007). In particular, research has investigated the signals sent by male versus female entrepreneurs and how they are received (Alsos et al., 2016; Cassidy et al., 2016; Eddleston et al., 2016; Giones & Miralles, 2015; Martel et al., 2012). This work noted that signals sent by males and females differed in their execution, despite the entrepreneurs' common goals. Given that the business of sport is susceptible to masculine- and hetero-normativity (Burton, 2015; Cunningham & Melton, 2013; Walker & Melton, 2015), it follows that male and female sport entrepreneurs may send different signals to potential investors. Given the nascent state of scholarly work in this area, the purpose of this descriptive study was to identify the shared and dis-

parate signals sport entrepreneurs sent to investors. The following research questions guided this work:

**RQ<sub>1</sub>:** What signals do sport entrepreneurs use to communicate with investors?

**RQ<sub>2</sub>:** Do these signals differ by gender, and if so, how?

The analysis also investigated the purpose of the signals sent by sport entrepreneurs. Embedded in the logic is that good signals are sent purposely (Connelly et al., 2011), and that their purpose may be inadvertently influenced by a range of cultural or demographic traits (Brunson et al., 2009). It follows that, through careful contextual analysis, researchers can make judgments about how each signal is being utilized. Therefore, in tandem, the analysis aimed to understand (1) how the common signals sent by both groups were used (i.e., the purpose of the signal), and (2) which signals were unique to one gender (if any), and how those were used. Thus, the third research question is:

**RQ<sub>3</sub>:** What was the intended purpose of the entrepreneurs' signals?

## Methodology

### Sample

A search was performed using a popular venture capital database (crunchbase.com) for entrepreneurs who had started at least one sport-specific startup between the years 1972 (the earliest year in the database) and 2017 (the most recent year for which reliable data could be gathered). To be included in the sample, the individual must have played a foundational role (Founder, CEO, COO, CTO, etc.) in the startup. Each entrepreneur's name, gender, and self-reported biography was collected.

To confirm the sport-specific nature of their startup(s), the "company description" field had to contain the term "sports." These initial results were examined by the lead researcher to ensure that each entrepreneur was tied to at least one startup that was specific to the sport industry. The final sample contained 630 entrepreneurs—41 females and 589 males.

### Procedure

The investigators undertook a mixed-method approach to data analysis. First, a quantitative approach was used to answer the first two research questions using Latent Dirichlet Allocation (LDA). LDA probabilistically categorizes words and phrases into collections that are representative of the underlying topics present in a corpus (Blei et al., 2002).<sup>1</sup> LDA was chosen because it reduces researcher bias when identifying themes but allows for researcher input when assigning topic

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<sup>1</sup>'ldagibbs' in stata ([https://warwick.ac.uk/fac/soc/economics/staff/crschwarz/lda\\_stata.pdf](https://warwick.ac.uk/fac/soc/economics/staff/crschwarz/lda_stata.pdf))

names (Dyer et al., 2017). Also, LDA was chosen because it allowed words to belong to multiple topics based on the specific context of its occurrence, a noted benefit of modern topic modeling procedures (Dyer et al., 2017). The procedure was completed for the collection of entrepreneurs' biographies, and a series of themes was rendered.

Signaling theorists studying entrepreneurship have noted that good signals should be explicit, such as the written or spoken word (Certo et al., 2001). Good signals should also aim to establish credibility (Janney & Folta, 2006), and focus on the most relevant and important information (Zimmerman, 2008). Short, public autobiographies posted by entrepreneurs on the Internet thus constitute opportune chances for signal sending, and similar approaches have been used in prior work (e.g., Piva & Ross-Lamastra, 2017).

Second, using an explanatory sequential approach, the investigation expanded on these initial findings (Creswell & Creswell, 2018). Using the themes derived by the LDA, the researchers employed axial coding to review each biography and examine similarities and differences in how each theme was employed (Babbie, 2008).

In sum, the themes identified by the LDA were interpreted as signals sent to investors, and the axial coding provided further detail about how each theme (i.e., signal) was being utilized (Miles & Huberman, 1994).

### **Data Quality**

To ensure the quality of the data analysis, three procedures were used: purposive sampling, search for alternative explanations, and investigator triangulation (Lincoln & Guba, 1985). Purposive sampling identified entrepreneurs who were founding members of at least one sport startup in their career. Following the LDA, investigators independently searched for alternative explanations, then peer debriefing was used to arrive at strong conclusions. Finally, investigator triangulation was used to cross-check the coding by comparing results among two separate investigators (Johnson, 1997).

## **Results**

### **Latent Dirichlet Allocation**

Table 1 presents the results of the topic-modeling procedure. Topics are separated by gender and ordered from most predominant to least predominant. Table 1 illustrates the six themes and each theme's most strongly indicative words, in order from most-to-least likely to connote that grouping as a topic. Three takeaways form the LDA informed the subsequent axial coding. First, male sport entrepreneurs sent strong signals related to sports, while females did not. This is shown in Table 1, where Sports is the most prominent theme for males, while females did not produce any sport-specific themes at all. Second, both groups employed signals relating to their leadership, albeit to different degrees. Third, both sent signals related to technology/technology investing.

**Table 1***Themes and Most Representative Words*

<b>Theme</b>	<b>Most Representative Words</b>
<b>Males</b>	
Sports	league, sports, American, national, basketball
Technology	venture, capital, technology, investor, partner
Leadership	served, executive, president, board, chief
Entertainment tech	media, digital, entertainment, games, mobile
Achievements	entrepreneur, school, work, award, board
Technical Skillset	technology, product, development, management, online
<b>Females</b>	
Women in the media	magazine, women, national, media, cable
Marketing skillset	concierge, strategic, leading, international, marketing
Technology startups	YouTube, startup/s, founding, project
Consumer focus	Google, sales, years, consumer, early
Health/social impact	digital, health, foundation, advisory, efforts
Leadership	board, technology, served, executive, president

**Axial Coding**

Tables 2–4 present the result of the axial coding. Each of the three takeaways was examined in order to assess how entrepreneurs signaled their competencies to investors. For brevity, the results illustrated in Tables 2–4 are not recapitulated here; rather, they are referred to in order to inform and bolster the study’s managerial implications.

**Managerial Implications**

Relevant stakeholders should take note that female sport entrepreneurs are much less likely to discuss the theme of “sports” in their biographies. Even when their startups were sport-related, the theme of “sports” was not present for the group of female entrepreneurs. This is salient given the preeminence of “sports” in the males’ biographies. In general, female entrepreneurs are funded less frequently than their male counterparts are, and when they are funded, they receive less in funding (Brush et al., 2002; Eddleston et al., 2016). Prior work has also stressed that when information asymmetries exist in an entrepreneurial context, the venture has a greatly reduced chance of attaining funding (Courtney et al., 2016). Our findings suggest that female sport entrepreneurs run a considerable risk by not communicating more overtly about the sporting elements of their career experi-

**Table 2**

*Representative Statements for the Technology Theme*

Theme: Technology	Representative Statement
Males	<p><i>Describe a specific industry/ subsector</i> He currently serves on the boards of SeatGeek and Adaptly, both DreamIt companies, and has advised emerging companies in e-commerce, marketing and advertising technologies including iContact, OrderMotion and Transactis.</p> <p><i>Investor in</i> Jim invests nationwide and focuses on information technology investments, with particular interest in consumer Internet, application software, and Internet enabled market places.</p> <p><i>Associations and Awards</i> He also was named the Southern California Technology Association's CEO of the Year in 2009</p> <p><i>Thought leadership</i> As CEO and co-founder of the entertainment management company Three Six Zero, he utilizes his visionary perspective to skillfully unite music, entertainment, and technology.</p>
Females	<p><i>Optimization</i> Currently she is the VP of Product Strategy at Wonga a ground breaking online lender which uses sophisticated risk and decisioning technology to make automated yet responsible lending decisions</p> <p><i>Women in Technology</i> She speaks globally on women in technology, design, investing, and entrepreneurship</p>
Shared	<p><i>Build legitimacy/describe experience</i> Bartz brings to the Board of Directors leadership experience including service as the chief executive of two public technology companies. These roles have required technology industry expertise combined with operational and global management expertise.</p> <p><i>As a lever for social/community change</i> Inspired by all that technology could do for humanity she double majored in Electrical Engineering and Computer Science at Duke University.</p>
<i>Consumer focus</i>	<p>Carving a niche as an agency that could deliver both excellent design as well as the creative technology to successfully execute transformational experiences, they caught the attention of Steve Jobs and several top-tier companies around the world</p>
<i>Passion/love for: source of inspiration</i>	<p>Chris attended the State University of New York at Buffalo for six years of graduate- level mathematics classes wearing thick glasses, awkward braces, and knowing the entire time that technology and computers would be passions of his for life</p>

**Table 3**  
*Representative Statements for the Leadership Theme*

Theme: Leadership	Representative Statement
<b>Males</b>	
<i>Informal sources of</i>	While he learned his earliest lessons in leadership and web design from his high school Quake 2 clan and Everquest guild, Alexis continued his official studies at the University of Virginia
<i>As a strategic resource</i>	Throughout his career, LaGuardia has earned a reputation for his leadership, collaboration, and innovation
<b>Females</b>	
<i>Technical Leadership</i>	Prior to VMware Diane held technical leadership positions at Silicon Graphics Inc a provider of technical computing storage and data center solutions Tandem Computers Inc a manufacturer of computer systems and Sybase Inc an enterprise software and services company and was Chief Executive Officer of VXtreme Inc a developer of streaming media solutions
<b>Shared</b>	
<i>Professional Legitimacy</i>	Coles has been widely recognized for her leadership in the world of journalism
<i>Social and Community</i>	Mike was part of the founding team of the African Leadership Academy, a start-up pan African secondary school, dedicated to improving Africa's leadership through educating future native leaders of Africa
<i>Aiding with change management</i>	Under her leadership Nickelodeon became the top rated hour cable service and won several notable honors
<i>Thought Leadership</i>	A recognized authority on the psychology of leadership, negotiations and organizational turnaround, he has served as an advisor to leaders around the world for more than 39 years.

Table 4

*Representative Statements for the Sports Theme*

Theme: Sports	Representative Statement
Males	
<i>Ownership/Founder/Investor/Manager</i>	<p>Greg is also Founder, Chairman &amp; CEO for Momentum Sports Group, LLC, which owns and operates the UnitedHealthcare Pro Cycling Team, the #1 professional cycling team in the United States for most of the past decade. In 2002, he became vice chairman of Rainbow and helped lead the executive management team directing AMC, IFC, Bravo, WE tv, Fuse, Lifeschool, News 12 Networks, Rainbow Advertising Sales Corporation and Rainbow Sports Networks.</p>
<i>Media and sports</i>	
<i>Personal Sport Journey/Former Athlete</i>	<p>Baron Davis is a two-time NBA All-Star and record-holder. Over a thirteen-year career, he played for the Charlotte Hornets, the Golden State Warriors, the Los Angeles Clippers, the Cleveland Cavaliers, and the New York Knicks. A sampling of his elite clients from the world of sport include: golfers Mark O'Grady, Meata and Justin Rose; tennis players Jim Courier, Monica Seles, and Arantxa Sanchez-Vicario; boxer Ray Mancini; hockey players Eric Lindros and Mike Richter; and Olympic gold medal speed skater Dan Jansen</p>
<i>Athlete Management and Performance Evaluation</i>	<p>Hawkins introduced many strategies and practices to the PC and game industries and was the creative force behind EA Sports.</p>
<i>eSports Industry</i>	
<i>Sporting Goods Industry</i>	<p>Professor Ulrich has led dozens of innovation efforts for medical devices, tools, computer peripherals, food products, web-based services, and sporting goods.</p>

ence and/or current sport startups (Eddlestone et al., 2016). Thus, female sport entrepreneurs can likely enhance their odds of success by tailoring their signals more closely to what sport investors are attuned to. If females are seeking funding for sport startups, demonstrating a link to sport could bolster perceptions of their expertise (Balachandra et al., 2016). These efforts could build implicit confidence in the entrepreneur and her idea/product/company.

The second takeaway illuminated by the LDA were the slight differences between males' and females' use of the "technology" theme. On average, both groups used this theme throughout their signaling efforts. Males used technology to describe their investment activity, list their awards and professional associations, and highlight their thought leadership. Females did this in part; they discussed using technologies to optimize business processes. However, a key difference was that females also discussed technology in the context of describing women's roles in high-tech and the ability of technology to secure alliances and strengthen relationships. The latter use of the technology signal implies that there are networks of formalized exchange taking place among female sport entrepreneurs, and that those networks are enabled by technology. Sport investors may find benefit in seeking out networks of female sport entrepreneurs to learn how they can become stronger allies, which may include helping female sport entrepreneurs develop their personal networks (Brush et al., 2002; Noguera et al., 2013).

The last takeaway concerned the extent to which each gender discussed leadership. Both used leadership themes, but it was more popular in the males' biographies, which is consistent with the interpretation of entrepreneurship as a profession associated with historic representations of male leaders (Eddlestone et al., 2016). Despite differences in prevalence, the ways males and females discussed leadership was more similar than different. Both groups leveraged the leadership theme to bolster their professional legitimacy, discuss their social and communal impacts, articulate change management efforts, and position themselves as thought leaders. Interestingly, females uniquely discussed leadership by describing their technical leadership, which is a competency-building signal to investors typically attributed to males (Carli & Eagly, 2011; Balachandra et al., 2016). It appears that in sport, female entrepreneurs are comfortable signaling their leadership competence with regard to technical endeavors. This represents a reversal of traditional, gendered interpretations of entrepreneurs in which leadership in technical areas of business is attributed to males (Marlow & McAdam, 2012). In other contexts, women who embodied masculine traits like experience leading technical projects or teams garnered prejudicial reactions in the workplace (Rudman & Glick, 1999). Based on Balachandara et al.'s (2016) findings that feminine behaviors produced bias against entrepreneurs (irrespective of gender), perhaps masculine signals like technical leadership can be of service to female sport entrepreneurs. Importantly, the analysis did not investigate the effectiveness of said signals, meaning there is no way to make judgements about whether females' technical leadership signals were successful.

## Future Research

Despite the difference in the prevalence of sports themes in the males' and females' biographies documented here, more work is needed. For instance, the sample contained only 41 females compared to 620 males. Future work should examine whether sport-related themes emerge in a larger sample of female-founded sport startups. In addition, future studies should examine how sport investors perceive technical leadership signals from male and female entrepreneurs. Finally, this study was primarily descriptive in nature, as little work has been done in this space. Next steps in this domain should attempt to link signals sent by male and female sport entrepreneurs to various measures of entrepreneurial success.

## Conclusion

This study explored how sport entrepreneurs portrayed themselves to investors. The signals sport entrepreneurs send likely affect how they are perceived by investors, thereby effecting funding outcomes. The priority male entrepreneurs gave to 'sport' could act as a credibility-enhancing signal to investors, which was a signal absent from the females' biographies. This could be a strong signal to investors that females should consider when telling their stories. The unique way in which females discuss leadership and technology could serve them in gaining support as it implied creative differences in thought leadership and their approach to networking.

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