

Dynamic Signal Formation: A Longitudinal Case Study of Steve Jobs's Voice

Satoshi Miyajima

Graduate School of Management, Kyoto University, Kyoto, Japan

miyajima.satoshi.3s@kyoto-u.ac.jp

Abstract: Existing signaling research has predominantly focused on the effects of signals on evaluative outcomes, while the processes through which signals are formed and transformed over time remain under-theorized. In particular, prior work has tended to treat signals as stable attributes, overlooking their temporal emergence and adaptation across shifting contexts. This study addresses this gap by reconceptualizing nonverbal signals, particularly vocal signals, as dynamic processes rather than static attributes. Building on signaling theory, the study investigates how such signals emerge, adapt, and evolve across time and context, thereby foregrounding the processual nature of signaling. To capture these dynamics, a longitudinal single-case research design is employed, analyzing keynote presentation audio data from Steve Jobs. Specifically, the analysis focuses on a series of keynote speeches delivered over a 28-year period, spanning from age 28 (1983) to age 56 (2011). This approach enables the examination of temporal variation and the identification of generative mechanisms underlying signal formation. Two exploratory quantitative analyses are conducted on acoustic features, including speech tempo, pauses, and pitch variation, allowing for a fine-grained assessment of within-individual changes over time. The findings reveal that while speech tempo remains relatively stable over time, pauses and pitch variation are systematically reorganized in response to shifts in role and organizational context. These results suggest that vocal signals are not fixed traits but evolve through continuous interaction with situational demands and accumulated career experiences. Furthermore, the accumulation of short-term adaptive adjustments appears to produce longer-term structural transformations in signaling patterns, indicating a recursive relationship between micro-level adaptation and macro-level change. By shifting the analytical focus from signal effects to signal formation, this study extends signaling theory into a temporally embedded framework that incorporates time, identity, and experience. The study contributes to the literature by providing empirical evidence for the dynamic nature of signaling and by proposing a conceptual foundation for understanding how strategic communication capabilities develop over the course of a professional career.

Keywords: Signaling Theory, Dynamic Signaling, Vocal Signals, Nonverbal Communication, Longitudinal Analysis

1. Introduction

Even highly successful executives such as Steve Jobs are not necessarily exceptional public speakers from the outset of their careers. Steve Jobs was an American entrepreneur and executive who co-founded Apple, NeXT, and Pixar, and is widely known for redefining consumer values through products such as the Mac, iPod, and iPhone (Isaacson, 2012). However, even a leader of his stature did not possess outstanding public speaking abilities when he first began his business career (Anderson, 2016).

A substantial body of research has examined how executives' strategic communication influences evaluative outcomes, yet insufficient attention has been paid to the processes through which such communication styles are formed. Prior studies have highlighted the role of gestures in impression management (Leary & Kowalski, 1990), the dominance of visual information in evaluative contexts (Tsay, 2021), and the association between stable speech tempo, pitch variation, and success rates (Miyajima, 2025). However, this line of research primarily identifies effective signals rather than adequately explaining the processes by which they are formed and evolve over time.

The purpose of this study is to build on signaling theory and dynamically examine the formation and transformation processes of nonverbal signals. To investigate phenomena that have not been sufficiently addressed in prior research and to uncover the generative mechanisms underlying such processes, a single-case study is an appropriate methodological approach (Yin, 2018). Accordingly, this study analyzes Steve Jobs's keynote presentations as a single case to explore how his vocal and other nonverbal signals were formed and transformed throughout his career, ultimately aiming to propose a theoretical framework of dynamic signaling in which signals are continuously generated over time.

The theoretical contribution of this study lies in reconceptualizing signaling theory along the long-term temporal axis of an individual life and in demonstrating the relationship between vocal signals and significant life events. While Jobs's speech tempo remained stable, his use of pauses and pitch was reorganized in response to shifts in role and organizational context, suggesting that vocal signals evolved through interaction with career turning points. The accumulation of short-term strategic adjustments led to structural updates in signal patterns. By

moving beyond an effect-centered view of signals and focusing instead on their formation process, this study advances a dynamic perspective on signaling.

2. Theoretical Background

2.1 Signaling Theory

This study is grounded in signaling theory. Signaling theory explains how, under conditions of information asymmetry, a signaler communicates unobservable attributes such as abilities or intentions to a receiver through observable signals (Spence, 1973). The receiver then infers underlying qualities from these signals, but this inferential process involves uncertainty and the possibility of strategic distortion (Crawford & Sobel, 1982; Connelly et al., 2011).

In environments characterized by uncertainty and risk, a signaler's attempt to actively shape others' perceptions can be understood as impression management. Impression management refers to the regulation of observable behaviors to influence how one is perceived by others (Goffman, 1959; Leary & Kowalski, 1990). Leaders form impressions of competence and credibility through nonverbal elements such as speaking style, vocal tone, and gestures (Bolino et al., 2016), and these behaviors can causally affect evaluative outcomes (Antonakis et al., 2011). However, prior research has focused primarily on the effects of signals, while the processes through which they are formed and transformed remain insufficiently theorized (Miyajima et al., 2025).

2.2 Dynamic Signals and Signal Formation

Nonverbal signals emitted by a signaler can be adjusted in response to situational cues and audience reactions, even within brief interactions. Miyajima et al. (2025) showed that vocal signals changed within a few minutes by comparing entrepreneurs' main pitch presentations with their question-and-answer responses. Nonverbal behavior is not necessarily consistent but depends on relational and situational context (Hall et al., 2005). Shifts in perceived power and emotional states are reflected in posture and speaking style, leading to changes in signaling (Keltner et al., 2003).

Signal transformation also unfolds over the long term through accumulated experiences and changing roles. When individuals encounter new roles, they engage in trial and error (Ibarra, 1999). Behaviors that are initially deliberate may gradually become internalized as expressions integrated into one's identity (Ashforth & Humphrey, 1993; Miyajima, 2025).

From a long-term perspective, signal formation can be understood as a process through which self-understanding and future orientation are expressed through behavior. Valsiner (2014) conceptualizes the self as comprising "I AM," identity shaped by the past, and "I WILL," future oriented intentionality, and emphasizes its continuous reconstruction over time. Extending this framework, "I HAVE" represents the current environment and links role and context to observable patterns of expression (Miyajima, 2025).

2.3 Prior Research on Steve Jobs's Presentations

Steve Jobs represents a theoretically valuable case for examining long-term signal formation. He has been positioned as a representative entrepreneur in the United States (Wong et al., 2026) and analyzed as a symbolic example of charismatic leadership and rhetorical competence (Heracleous & Klaering, 2014, 2017).

Prior research on Jobs has addressed both vocal characteristics and rhetorical–narrative dimensions. Vocal studies have identified features such as his high average pitch and wide pitch range (Niebuhr et al., 2016) and have shown that clear articulation is also associated with perceived charisma (Niebuhr & Gonzalez, 2019). In addition, rhetorical and narrative research has demonstrated that Jobs adjusted his storytelling to situational demands while maintaining consistent core themes, and that he presented future visions in ways that made them experientially real in the present (Heracleous & Klaering, 2014, 2017; Sarpong et al., 2019).

2.4 Research Gaps

Three research gaps remain in signaling theory. First, prior research has primarily examined signals in relation to evaluative outcomes and has not sufficiently conceptualized them as dynamic phenomena that evolve over time. Second, although the importance of nonverbal and behavioral signals has been recognized, the generative mechanisms through which these signals are formed and stabilized remain under-theorized. Third, signaling

theory has largely been developed within market-based contexts, and insufficient attention has been paid to signal formation across the life of executives.

2.5 Research Questions

To address these gaps, this study draws on Steve Jobs's longitudinal keynote data as a shared empirical foundation and formulates three research questions at distinct analytical levels:

RQ1 (Theoretical Level). Within the framework of signaling theory, how should nonverbal signals be understood not as fixed attributes, but as dynamic processes that unfold over time and across contexts?

RQ2 (Process Level). In the case of Steve Jobs, how were vocal and other nonverbal signals acquired, refined, and stabilized through short-term interaction and long-term experiential accumulation?

RQ3 (Mechanism Level). How are changes in Jobs's self-understanding (I AM) and future orientation (I WILL) connected to the formation and transformation of his nonverbal signals?

3. Methodology

3.1 Research Design

This study conducts two quantitative analyses of Steve Jobs's keynote presentations based on signaling theory. It examines whether his vocal signals changed over time and across contexts. The research consists of two studies with distinct analytical scopes.

Study 1 compares the keynotes between early- and late-career stages, which are temporally distant from each other. By analyzing differences in duration, speech tempo, and voice pitch, it assesses whether changes in speaking style occurred.

Study 2 focuses on major turning points in Jobs's career and compares vocal characteristics across focal years. It examines the relationship between changes in role (Signaler) and organizational context (Environment) and the vocal features observed in the corresponding keynote (Signal Message) for each year. Using the same acoustic indicators, the study systematically describes differences in speaking style at these transition points.

3.2 Analytical Approach: Non-Hypothesis Testing Quantitative Design

Rather than testing predefined causal hypotheses, this study adopts an exploratory descriptive quantitative approach to document longitudinal variation in acoustic indicators. Consistent with methodological fit for process-oriented theory development (Edmondson & McManus, 2007), the analysis relates observed temporal patterns to shifts in role and context to inform theorization.

3.3 Sample

The focal case of this study is Steve Jobs. Extensive longitudinal keynote data are publicly available for Jobs, and major turning points in his career are clearly documented in biographical and historical sources. These characteristics make him a theoretically suitable case for analyzing long-term processes of signal formation.

This study focuses on publicly available keynote presentations. Other speech formats are excluded to ensure comparability, as keynote settings maintain stable purposes, audiences, and stage conditions across years, allowing temporal variation to be examined under consistent conditions.

The analysis proceeds by quantitatively extracting acoustic indicators from keynote recordings, including duration, speech tempo, and voice pitch. These measures are compared across years and examined in relation to major career turning points. Events such as business successes and failures, organizational departure and return, and changes in health status are organized chronologically to interpret shifts in vocal patterns within their experiential context.

3.4 Data Collection

In this study, the audio data and chronological information required for the analysis were systematically collected. Publicly available recordings of Steve Jobs's keynote presentations were obtained from an online archive (Moisescot, n.d.). When links in the archive were inaccessible, the relevant files were supplemented

through additional searches. Chronological information was collected from biographical sources (Isaacson, 2012).

3.5 Measures

Public speaking ability was operationalized using quantitative acoustic indicators directly derived from audio data. Each keynote recording was segmented at sentence and breathing boundaries and converted into WAV format. The following acoustic features were extracted using the Python library Librosa.

- Duration (seconds). Represents the length of spoken and silent segments, measured as the duration of spoken sentences and silent intervals in seconds.
- Speech tempo (BPM). Indicates speaking rate within a given interval, calculated as beats per minute, with higher values reflecting faster tempo.
- Voice pitch (F0, Hz). Fundamental frequency, measured in hertz (Hz), representing vocal pitch. Males generally exhibit lower F0 values than females.

These indicators are physically derived acoustic measures rather than latent psychological constructs; therefore, internal consistency reliability (Cronbach's α) is not applicable (Bollen, 1989). These measures directly capture temporal and spectral properties of speech (Boersma, 1993; Juslin & Laukka, 2003).

3.6 Analysis

In this study, a longitudinal analytical approach was employed to examine the development and evolution of Steve Jobs's public speaking abilities. The unit of analysis was defined as the year in which each keynote was delivered, and the analysis focused on three vocal indicators calculated for each year: duration, speech tempo, and voice pitch. First, descriptive statistics were used to summarize the year-by-year trends of each vocal indicator to capture long-term patterns of change.

Based on signaling theory, Jobs's role, organizational context, and keynote performance were classified for each year as Signaler (I AM), Environment (I HAVE), and Signal Message (I DID). Drawing on Miyajima's (2025) extension of Valsiner (2014), the classification relied solely on factual information documented in existing literature. Major career turning points were then positioned along a chronological timeline, and acoustic indicators before and after these events were compared to exploratorily examine their temporal correspondence.

4. Study 1

Study 1 compares Steve Jobs's public speaking at age 28 (1983) and age 56 (2011) to examine vocal differences between early- and late-career stages. To characterize duration patterns of speech ("On") and silence ("Off"), the relationship between the mean and median was analyzed, allowing a descriptive assessment of whether the distribution was homogeneous or included disproportionately long intervals.

4.1 Results of Study 1

- Duration (seconds). "On" segments were descriptively longer in 2011 than in 1983, while "Off" segments showed only minor differences (Table 1). No statistically significant differences were detected, although variability was higher in 2011.
- Speech tempo (BPM). Mean BPM did not differ significantly between 1983 and 2011, suggesting structural stability in speech rate across the two keynotes.
- Voice pitch (F0). F0 was significantly higher in 2011, with a large effect size. Although absolute variability increased, relative variability was slightly higher in 1983, indicating a more consistently elevated pitch in 2011.

Table 1: Descriptive Statistics and Nonparametric Results (1983 vs. 2011)

Measure	Year	Mean	Median	SD	IQR	CV	Min	Max	p	Δ
Duration "On" (sec.)	1983	1.68	1.50	0.71	0.94	0.42	0.73	4.20	.164	-0.19
	2011	2.23	1.77	1.34	1.80	0.60	0.27	5.74		

Measure	Year	Mean	Median	SD	IQR	CV	Min	Max	p	Δ
Duration "Off" (sec.)	1983	0.73	0.59	0.43	0.60	0.59	0.20	1.94	.391	-0.12
	2011	0.78	0.73	0.47	0.77	0.60	0.27	2.57		
BPM	1983	144.06	143.55	43.85	66.75	0.30	78.30	234.91	.507	0.09
	2011	136.48	136.00	32.05	34.55	0.23	73.83	198.77		
F0 (Hz)	1983	339.51	333.23	56.35	72.83	0.17	241.07	487.74	< .001	-0.85
	2011	479.85	486.57	73.84	119.71	0.15	306.26	590.80		

Note: "On" indicates segments in which the speaker is actively speaking, whereas "Off" indicates silent intervals between speaking segments. Nonparametric tests (Mann–Whitney U) were used. Negative Δ indicates higher values in 2011.

4.2 Discussion of Study 1

Study 1 suggests that speech tempo remained largely stable over time, whereas duration structure and pitch exhibited selective change. The absence of tempo differences indicates that vocal evolution did not occur through speed modulation, but rather through structural adjustments in pause configuration and pitch level. The significant upward shift in F0 in 2011 implies a transformation in vocal stance rather than random fluctuation.

5. Study 2

Study 2 examines whether the vocal differences identified in Study 1 reflect incidental variation or a process of nonverbal signal formation. Because a two-point comparison is insufficient, this study reconceptualizes nonverbal signals as dynamic processes that evolve over time and across contexts (RQ1).

It situates dynamic signal formation within Jobs's career trajectory and investigates how vocal indicators were acquired, refined, and stabilized through short-term adaptation and the accumulation of long-term experience (RQ2). It further examines how changes in role identity and future orientation are linked to the reconfiguration of nonverbal signals (RQ3). In doing so, the study theorizes vocal expression not merely as a technique, but as part of identity formation unfolding over time.

5.1 Results of Study 2

5.1.1 Dynamic Signal Formation Across Career Stages

Table 2 maps Jobs's role (I AM), environment (I HAVE), and keynote performance (I DID) across major career turning points. These mapped stages provide the analytical framework for examining longitudinal changes in vocal indicators.

Table 2: Steve Jobs's Signal Formation across Career Transitions

Year	Signaler	Environment	Signal Message
	I AM (Role and Position)	I HAVE (Context, Constraints, and Resources)	I DID (Observable Actions)
1983	Apple: Co-founder & CEO	Before being fired from Apple	Apple Lisa / Macintosh — graphical user interface as a signal of human-centered computing
1988	NeXT: Founder & CEO / Pixar: Chairman	Founded NeXT after leaving Apple	NeXT Computer — signaling technological purity and future-oriented OS design
1992	NeXT: Founder & CEO / Pixar: Chairman	Developing next-generation OS at NeXTSTEP demonstrations while scaling Pixar as a serious animation studio	NeXTSTEP demonstrations — signaling long-term vision over short-term market success

Year	Signaler (Role and Position)	Environment (Context, Constraints, and Resources)	Signal Message (Observable Actions)
1997	NeXT: Founder & CEO / Pixar: Chairman Apple: Advisor to Apple (interim return)	Apple acquired NeXT; Jobs returned without a formal CEO title but with substantial influence	Macworld Boston 1997 — signaling focus, and strategic simplification
2001	Apple: CEO Pixar: Chairman	After iMac success, formally appointed CEO; Apple entered the recovery phase; iPod launched	iPod introduction keynote — signaling Apple as a digital lifestyle platform
2007	Apple: CEO Pixar: Major Shareholder (acquired by Disney in 2006)	Apple transformed into a consumer electronics company	iPhone keynote — signaling category creation and Apple's role as an industry architect
2011	Apple: CEO (until August) Apple: Chairman of the Board (after August) Pixar & Disney: Largest Shareholder of Disney	Transition from operational leadership to symbolic and legacy-based authority	iPad 2 / final public appearances — signaling continuity, succession, and enduring design philosophy

Note: Signaler refers to Steve Jobs's formal role and positional status at each point in time. Environment captures the organizational and historical context surrounding the signaler, including constraints and available resources. Signal Message denotes observable actions in the form of keynote presentations and demonstrations. The table is intended to organize analytical units and does not imply causal relationships.

5.1.2 Temporal Variation in Vocal Measures

This section summarizes year-by-year variation in acoustic indicators across seven keynotes (1983–2011), treating each year as the unit of analysis. Duration, speech tempo (BPM), and voice pitch (F0) were calculated annually and presented as descriptive statistics (Table 3).

- Duration (seconds). Across all years, “On” duration exceeded “Off” duration (all $p < .001$). “On” means ranged from 1.68 to 2.87 seconds, whereas “Off” means remained below 1 second. The “On”/“Off” ratio varied (1.78–5.74), indicating changes in speech–pause structure over time.
- Speech tempo (BPM). BPM remained stable (135–158), with no significant year differences in central tendency or dispersion (Kruskal–Wallis: $p = .53$; Levene: $p = .22$).
- Voice pitch (F0). F0 showed substantial year-to-year variation, ranging from 234 Hz (2001) to 486 Hz (2011). Year effects were significant for both central tendency and variance ($p < .001$), indicating structural shifts in pitch level and variability.

Overall, duration showed moderate fluctuation, speech tempo remained stable, and voice pitch exhibited marked long-term transformation.

Table 3: Vocal Indicators by Year (Summary)

Year	“On” Mean	“Off” Mean	BPM Mean	F0 Mean (Hz)	F0 CV
1983	1.68	0.73	144	339	0.17
1988	2.87	0.50	135	379	0.32
1992	2.39	0.55	155	358	0.33
1997	1.69	0.95	143	459	0.25
2001	2.43	0.79	158	234	0.56
2007	1.78	0.52	145	398	0.29
2011	2.30	0.73	136	486	0.15

5.2 Discussion of Study 2

Study 2 suggests that vocal signals were reconfigured not only in relation to changes in role-based self-understanding (I AM), but also in response to shifts in contextual constraints and available resources (I HAVE). Across different career stages, Jobs's speaking style appears to have been adjusted in accordance with his organizational position and market environment. During the NeXT and Pixar period, future-oriented vision was emphasized; in the 1997 return phase, his speech reflected focus and reorganization; and in the iPhone and iPad era, vocal expression was shaped against the backdrop of market dominance and accumulated symbolic capital. Accordingly, vocal signals (I DID) can be interpreted as embodied expressions of the interaction between role (I AM) and context (I HAVE), while simultaneously reflecting the reconstruction of future orientation (I WILL) as a dynamic process.

6. General Discussion

This study found that specific vocal features evolved differently across Steve Jobs's career. Speech tempo remained stable, whereas duration structure and voice pitch were reorganized in response to changes in role and organizational context. Significant shifts in pitch level and variability during key transitions, such as becoming CEO or assuming a symbolic leadership role, suggest that vocal signals are shaped by role identity and symbolic function. These findings indicate a dual dynamic in which short-term vocal adjustments gradually consolidate into more stable signal structures over time.

This study offers both theoretical and practical contributions. Theoretically, it reconceptualizes signals as dynamic processes formed and updated over time and across contexts, demonstrating that vocal signals are reorganized throughout long-term career development and role transitions, thereby extending signaling theory from a static selection model to a dynamic formation perspective. Practically, it reframes speaking style not as mere technique but as a strategic capability rooted in evolving role identity and accumulated experience. Future research should evaluate the generalizability of dynamic signal formation across multiple leaders and integrate multimodal and experimental designs to further examine nonverbal signals as socially embedded capabilities.

7. Conclusion

This study reconceptualizes nonverbal vocal signals as dynamic processes embedded in time, context, and identity development. By demonstrating stability in tempo alongside selective reconfiguration of duration and pitch, it shows that signal formation is neither random nor purely tactical, but structurally linked to role transitions and internal identity change. In doing so, it advances signaling theory beyond static attribute-based models toward a dynamic formation perspective.

Ethics Declaration

Ethical clearance was not required for this research as only publicly available data were used.

AI Declaration

An AI tool (ChatGPT by OpenAI) was used during the development of this paper for language editing only. All AI-generated content was reviewed and revised by the author to ensure accuracy, originality, and alignment with the research goals.

References

- Anderson, C. (2016) *TED Talks: The official TED guide to public speaking*, Headline Book Publishing, London.
- Antonakis, J., Fenley, M., & Liechti, S. (2011) "Can charisma be taught? Tests of two interventions", *Academy of Management Learning and Education*, 10(3), pp.374–396. doi:10.5465/amle.2010.0012.
- Ashforth, B. E., & Humphrey, R. H. (1993) "Emotional labor in service roles: The influence of identity", *Academy of Management Review*, 18(1), pp.88–115. doi:10.2307/258824.
- Boersma, P. (1993) "Accurate short-term analysis of the fundamental frequency and the harmonics-to-noise ratio of a sampled sound", *Proc. Institute of Phonetic Sciences*, 17, pp.97–110.
- Bolino, M., Long, D., & Turnley, W. (2016) "Impression management in organizations: Critical questions, answers, and areas for future research", *Annual Review of Organizational Psychology and Organizational Behavior*, 3(1), pp.377–406. doi:10.1146/annurev-orgpsych-041015-062337.
- Bollen, K. A. (1989) *Structural equations with latent variables*, Wiley, New York.

- Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011) "Signaling theory: A review and assessment", *Journal of Management*, 37(1), pp.39–67. doi:10.1177/0149206310388419.
- Crawford, V. P., & Sobel, J. (1982) "Strategic Information Transmission", *Econometrica: Journal of the Econometric Society*, 50(6), pp.1431–1451. doi:10.2307/1913390.
- Edmondson, A. C., & McManus, S. E. (2007) "Methodological fit in management field research", *Academy of Management Review*, 32(4), pp.1246–1264. doi:10.5465/amr.2007.26586086.
- Goffman, E. (1959) *The presentation of self in everyday life*, Bantam Doubleday Dell Publishing Group, New York.
- Hall, J. A., Coats, E. J., & LeBeau, L. S. (2005) "Nonverbal behavior and the vertical dimension of social relations: a meta-analysis", *Psychological Bulletin*, 131(6), pp.898–924. doi:10.1037/0033-2909.131.6.898.
- Heracleous, L., & Klaering, L. A. (2014) "Charismatic leadership and rhetorical competence: An analysis of Steve Jobs's rhetoric", *Group & Organization Management*, 39(2), pp.131–161. doi:10.1177/1059601114525436.
- Heracleous, L., & Klaering, L. A. (2017) "The circle of life: Rhetoric of identification in Steve Jobs' Stanford speech", *Journal of Business Research*, 79, pp.31–40. doi:10.1016/j.jbusres.2017.05.011.
- Ibarra, H. (1999) "Provisional selves: Experimenting with image and identity in professional adaptation", *Administrative Science Quarterly*, 44(4), pp.764–791. doi:10.2307/2667055.
- Isaacson, W. (2012) "The real leadership lessons of Steve Jobs", *Harvard Business Review*, 90(4), pp.92–100, 102, 146. <https://www.ncbi.nlm.nih.gov/pubmed/22458204>.
- Juslin, P. N., & Laukka, P. (2003) "Communication of emotions in vocal expression and music performance: different channels, same code?", *Psychological Bulletin*, 129(5), pp.770–814. doi:10.1037/0033-2909.129.5.770.
- Keltner, D., Gruenfeld, D. H., & Anderson, C. (2003) "Power, approach, and inhibition", *Psychological Review*, 110(2), pp.265–284. doi:10.1037/0033-295x.110.2.265.
- Leary, M. R., & Kowalski, R. M. (1990) "Impression management: A literature review and two-component model", *Psychological Bulletin*, 107(1), pp.34–47. doi: 10.1037/0033-2909.107.1.34.
- Miyajima, S., Yamada, J.-I., & Jikuya, Y. (2025) "Dynamic signaling theory in entrepreneurial pitch: Interplay of valence-arousal & investor reaction", *Academy of Management Proceedings*, 2025(1). doi:10.5465/amproc.2025.24585abstract.
- Miyajima, S. (2025) "Signal formation cycle and process: A single-case study of an intrapreneur", *Proceedings of the European Conference on Entrepreneurship and Innovation*, 20(1), pp.820–827. doi:10.34190/ecie.20.1.3675.
- Moisescot, R. (n.d.) *All about Steve Jobs*, allaboutstevejobs.com. <https://allaboutstevejobs.com/>
- Niebuhr, O., Voße, J., & Brem, A. (2016) "What makes a charismatic speaker? A computer-based acoustic-prosodic analysis of Steve Jobs tone of voice". *Computers in Human Behavior*, 64, pp.366–382. doi:10.1016/j.chb.2016.06.059.
- Niebuhr, O., & Gonzalez, S. (2019) "Do sound segments contribute to sounding charismatic? Evidence from a case study of Steve Jobs' and Mark Zuckerberg's vowel spaces", *The International Journal of Acoustics and Vibration*, 24(2), pp.343–355. doi:10.20855/jav.2019.24.21531.
- Sarpong, D., Eyres, E., & Batsakis, G. (2019) "Narrating the future: A distinctive capability approach to strategic foresight", *Technological Forecasting and Social Change*, 140, pp.105–114. doi:10.1016/j.techfore.2018.06.034.
- Spence, M. (1973) "Job Market Signaling", *The Quarterly Journal of Economics*, 87(3), pp.355–374. doi:10.2307/1882010.
- Tsay, C.-J. (2021) "Visuals dominate investor decisions about entrepreneurial pitches", *Academy of Management Discoveries*, 7(3), pp.343–366. doi:10.5465/amd.2019.0234.
- Valsiner, J. (2014) *An Invitation to Cultural Psychology*, SAGE Publications, London. doi:10.4135/9781473905986.
- Wong, B., Kemp, P., Hamer, J., & Copsey-Blake, M. (2026) "Only Ada?: dominance of entrepreneurial white men as the famous figures in computing and technology for young people", *Oxford Review of Education*, 52(1), pp.117–134. doi:10.1080/03054985.2024.2432639.
- Yin, R. K. (2018) *Case study research and applications: Design and methods (6th ed.)*, SAGE Publications, Thousand Oaks.