‘Rock Star’ Theory

How to Explain and Predict Entrepreneurial Success

G. Christopher Crawford, PhD is Assistant Professor of Professional Practice of Entrepreneurship, Strategy, and Management at Rutgers Business School in Newark and New Brunswick. His research focuses on entrepreneurship and new venture growth, with a particular interest in studying how the largest, fastest growing companies develop and evolve. In recent work, he models the emergence of outliers – whom he brands ‘Rock Stars’ – as a universal theory for both academia and mainstream culture. Based on his research of more than 12,000 companies, he has developed the ‘Rock Star’ Theory: a conceptual framework that delves into the factors that drive the performance of the most successful individuals and businesses.

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What do Richard Branson, Steve Jobs, and Elon Musk have in common? In addition to being founders of multi-billion-dollar companies, they are also outliers. Outliers can be people, businesses, institutions, or events, depending on the specific context. Lying way outside the normal, outliers wield disproportionate influences on both the business world and society. Their inputs and outputs, either qualitative or quantitative in nature, are considerably more diverse from those of the rest of the population. Most often, an outlier represents an exception to the normal rules.

In this research, Dr G. Christopher Crawford, Assistant Professor of Professional Practice of Entrepreneurship, Strategy and Management at Rutgers Business School—Newark & New Brunswick, models the emergence of outliers in entrepreneurship as a unifying theory for both academia and mainstream culture. He has closely examined more than 12,000 companies at various stages of development. They encompass a broad spectrum, ranging from small businesses employing only one or two people to behemoth companies boasting more than one million employees. Dr Crawford and his collaborators are particularly interested in high-growth entrepreneurship, which is the hallmark of the largest, fastest growing companies. Their aim is to dissect the success of these high-achievers, or ‘Rock Stars’.

CHALLENGING THE LONG-HELD ASSUMPTION OF NORMALITY IN ENTREPRENEURSHIP

Dr Crawford has identified the anomalies in a set of variables that are common to all businesses, namely the number of employees, annual revenue, and the growth of both over time. His analyses of data sets from the S&P 500 (a stock market index measuring the stock performance of the 500 largest publicly traded U.S. companies) and the INC 5000 (the 5,000 fastest growing private companies in both Europe and the U.S.) revealed that each of these variables is distributed according to a power law, where an over-abundance of outliers is so good that they skew the curve far to the right.

Dr Crawford discusses how these findings challenge a long-held assumption that the normal (or Gaussian) distribution characterises the variables of interest. In the traditional bell-shaped curve, a few observations are very good, a few are very bad, and most reside somewhere around the middle (i.e. the average or the mean); in normal distributions like this, every observation can be accurately characterised by the mean and some standard deviation from it. The normality assumption applies to social science research more generally, where it serves as the underlying statistical principle for data analysis, including hypothesis testing. Under this assumption, outliers are viewed as random, statistical anomalies (called “freaks”), and a common data processing practice is to have them cleansed from the dataset, thereby reducing the outlier’s true effects on the entire system.

As Dr Crawford points out: “Some of the most successful companies of our time, such as Apple, Amazon, Google, and Facebook, are extreme outliers that changed the nature of how we engage with the world – they transformed what we do and how we think.” He argues that these companies have a significant impact on businesses and society as a whole. Therefore, rather than ‘fixing’ or excluding these exceedingly influential anomalies from our theories and data analysis, we should turn the spotlight on them and probe their emergence.

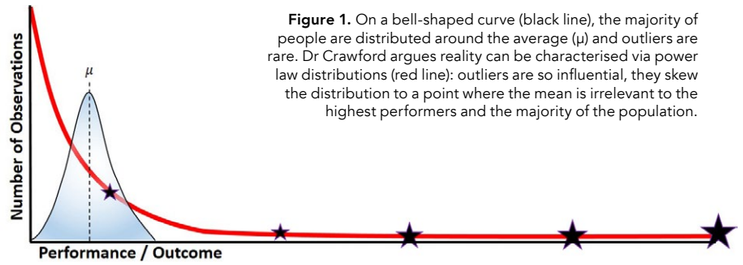

Figure 1. On a bell-shaped curve (black line), the majority of people are distributed around the average (μ) and outliers are rare. Dr Crawford argues reality can be characterised via power law distributions (red line): outliers are so influential, they skew the distribution to a point where the mean is irrelevant to the highest performers and the majority of the population.

THE EMPIRICAL REALITY OF SOCIAL SYSTEMS: POWER LAW DISTRIBUTIONS

In nearly all matters of life, when there are no limits on an individual’s or an organisation’s performance, distributions become skewed by outliers. Put another way, when system constraints are reduced and agents are allowed to perform at their best, outliers – and, subsequently, power law distributions – emerge. In a power-law distribution, most of the observations have very low values; the particularly high values, i.e. outliers, affect the shape and statistical properties of the entire distribution, resulting in a positively skewed asymmetric distribution with a long right tail, similar in shape to a child’s playground slide *(see figure 1)*. Here, about 80% of the population falls below the statistical mean. Power law distributions are ubiquitous in social systems, such as business (e.g. market capitalisation, annual revenue, and number of employees), entertainment (e.g. album sales, movie receipts), politics (e.g. number of elections won), and social media (Twitter and Instagram account followers, TikTok and YouTube views).

Outliers are typically defined as observations that are markedly different from the rest of the sample. Under the assumptions of normal distributions, a positive outlier only occurs 0.1% of the time. However, from a power law perspective, outlier observations make up about 10-15x more than the bell curve would suggest. Even though they are relatively rare, outliers have the potential to exert disproportionate influences, positive or negative, which the researcher termed “nonlinear, cascading, and co-evolutionary effects”.

Outliers often have the ability to push back on evolutionary selection forces, such as competition or governmental policies. These outliers are ‘stars’ in the sense that once they reach some critical threshold, they attract resources from the environment – similar to the pull of a star’s gravity. Outlier effects occur when one observation is so influential that it changes a system’s normal rules, pulls in resources from the environment that are unavailable to others, and substantively changes the statistical and behavioural properties of those in the sample.

In a nod to Malcolm Gladwell’s bestselling *Outliers* book, Dr Crawford explains some of these terms in the context of the world’s richest man (at the time), Bill Gates, and the most influential rock band in history, The Beatles. While Gladwell’s *Outliers* conducted several qualitative case studies on outliers, Dr Crawford’s quantitative research in entrepreneurship of N=12,000 provides a complementary, actionable framework. Though Gladwell wasn’t wrong, his arguments were based on N=1 qualitative cases, and primarily focused on describing the path of one outlier’s emergence.

When you expect to accomplish things that others can’t or won’t or don’t, you have to do things differently or do different things.

First, Gladwell identifies how, while in high school, Gates routinely snuck out of his house at 1am in the morning to write code on one of the first computers in the world with a text-based user interface (as opposed to the normal punch cards) at the University of Washington campus; later, Gates uses the capabilities he developed to found Microsoft and, subsequently, became the richest man in the world (at the time). Then, Gladwell recognises The Beatles’ *White Album* as the most critically acclaimed LP of all time. The cause, he proffers, is that the band practiced and experimented so much together that they crossed over a critical threshold: the so-called ‘10,000-hour rule’ that suggests scientific and artistic genius emerges as a result of the extensive time working on a specific skill. Dr Crawford characterises these actions and interactions as ‘engagement’. He finds that among samples of individuals, teams, and companies, engagement – whether measured by amount of time spent, number of attempts, number of failures, number of interactions with potential stakeholders, or total distance travelled – is power law distributed.

THE FOUNDATION OF ‘ROCK STAR’ THEORY

After finding power laws in all S&P 500 and INC 500 outcomes, Dr Crawford reviewed additional research on the causes of skewed distributions. He theorised that if the outcome variables assume a power law distribution, there would likely be input variables that were similarly skewed. An examination of data pertaining to entrepreneurs prior to the founding of their ventures showed that the distributions of almost all of input variables follow a power law, as do the new ventures’ outcome variables.

This revelation led Dr Crawford to aggregate the variables down into the following four principal components: Expectations, Endowments, Engagements, and Environments, or the ‘Four Es’. These are meta-constructs, composed of lower-level constructs that research has shown to influence the

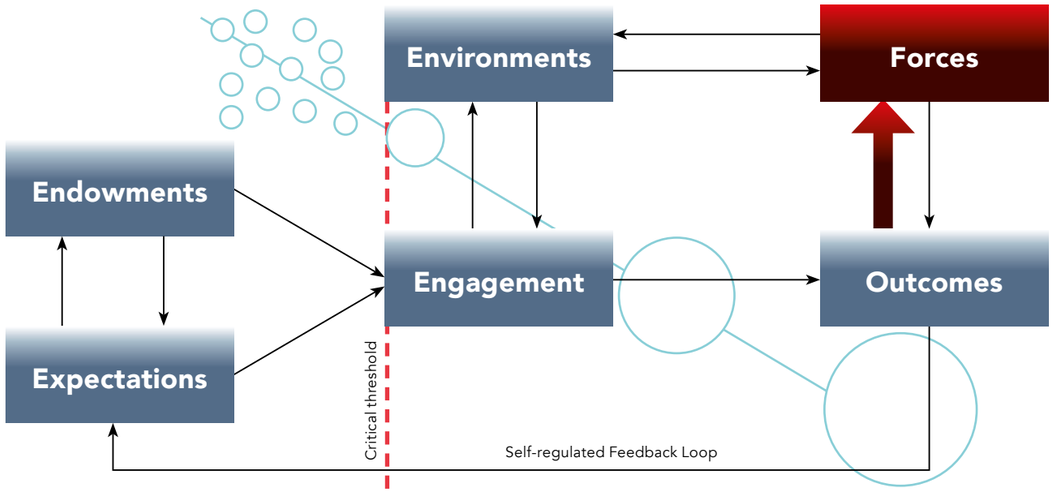

Figure 2. The 4Es – each with underlying power law-distributed variables – form the foundation of Dr Crawford's conceptual framework for achieving Rock Star outcomes.

emergence and growth of individuals and organisations *(see figure 2)*. Expectations concern a venture's envisioned future and take the form of outcomes or goals. Endowments refer to the venture's initial resources, that is, human, social, or intellectual capital, and financial resources. Engagement is defined as the number of interactions and total amount of time, depth, and novelty of these interactions. Environments are defined as the resources available, such as people, money, and artefacts (things like buildings or patents). These input variables drive the emergence of outliers in entrepreneurship and all social systems where new order is created.

These four components form the foundation for Dr Crawford's 'Rock Star' Theory: a conceptual framework for explaining and predicting outlier outcomes for both individuals and businesses. In essence, the Rock Star Theory intends to elucidate the factors that drive the performance of the most successful individuals and businesses. It proposes that outliers are expected to emerge given a typical system with limited top-down performance constraints, where agents can perform at their best. When measured on a continuous scale, all inputs and outcomes are distributed according to a power law. In these distributions, a critical threshold exists where, above some minimum measure of size, outliers emerge. Here, observations change from an additive linear state to a multiplicative nonlinear state. Beyond this point, outliers begin to influence the statistical and behavioural properties of other members in the system. Expectations are the key to superior achievements, as Dr Crawford elucidated: "When you expect to accomplish things that others can't or won't or don't you have to *do things differently* or do *different things*." While high Expectations do not always translate into successes, they exponentially increase the likelihood of outstanding achievements because they change one's pattern of engagement. According to the framework, even if its initial Endowments are below a critical threshold, a new venture can still deliver outlier outcomes provided that it engages with potential stakeholders in outlier ways.

Outlier effects occur when one observation is so influential that it changes a system's normal rules.

BROADER APPLICATIONS

Rock Star Theory has the potential to explain the occurrence of any extraordinary outcome in any social system. This theory is based on well-researched complexity science tenets, which state that when identical power law-distributed outcomes occur in a variety of domains, it is a sign of universality – in other words, the same simple set of mechanisms 'cause' the primary outcomes of interest. Following this line of reasoning, the 4E mechanisms that drive the outcomes in entrepreneurship are presumed to be identical to those in all social systems where extreme outcomes are possible. Most importantly, this research provides strong evidence that outliers are not random, unpredictable anomalies; instead, we see that there is a distinct, recurring, and repeatable pattern of outlier emergence.

In the Rock Star workshops he conducts, Dr Crawford guides participants to select their own outlier outcome of interest, identify which of the 4Es most constrains the achievement of that outcome, isolate that 'E' by creating a plan to push through the constraint, then initiate action (i.e., engage). For a large percentage of participants, Dr Crawford notes, the primary constraint is Expectations, where "too many just don't expect that they can achieve such great things. My goal is to change their expectations about what is possible."

Dr Crawford's Rock Star framework is also being used to construct algorithms that could facilitate decision-making that increases the probability predicting outcomes. For firms hiring new employees, the algorithm could help select outlier candidates who could best help a company grow. For venture capital firms, the algorithm has the potential to predict the emergence of outlier ventures (e.g. 'unicorns', startups with venture capital valuations above $1 billion). Given that venture capitals have historically only been able to accurately predict about 15% of the ventures that are wildly successful, the initial trials of the Rock Star algorithm's 94% successful prediction rate looks exceptionally promising.

Behind the Research

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Sketchbook of Research Summary: https://youtu.be/eQ5zp8Okdis

Research Objectives

Dr Crawford's 'Rock Star' Theory explains the driving forces that underlie the performance of the most successful individuals and businesses.

Detail

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Personal Response

What is the most exciting outcome of your research to date?

"In 2012 I was investigating the causes of growth of entrepreneurial firms with a co-author, but he bailed. So, for the next six days I worked nonstop analysing data on 11,000 ventures in three different datasets. Analyses showed the shape of the distribution of founders' expectations for future growth at the nascent stage of organising was identical to the outcome distributions of 1) emerged venture five years later, 2) young firms, and 3) hyper-growth firms.

These identical power law distributions, across time and stage of venture development, suggested that *expectations for growth was a universal driver of growth* at multiple levels. After only sleeping about ten total hours, I submitted the paper literally one second before the deadline. The submission won a Best Paper Award in 2012, was the groundwork of my dissertation (which won a $20,000 Kauffman Dissertation Fellowship in 2013) and was the foundation – the first of the four 'Es' – of Rock Star Theory (which won a $205,000 NSF grant in 2017). This is a perfect example of how outlier engagement can have disproportionately influential, unexpected, and cascading effects at multiple levels over time."