ARTICLE

A Subtle Form of Innovative and Creative Leadership: The Art of Tinkering As a Leadership Skill

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Abstract:
This study considered the effect of tinkering, both individual and organizational, upon leadership confidence. Leadership confidence was expressed via eight facets of leadership confidence to include: empowerment, recognition, influence, expertise, strategy, goals, innovation, and opportunity. Each facet was tested for both correlation coefficients, which were evaluated for strength. Also, regression analysis was conducted to test for association between dependent and independent variables. Of 16 tests conducted, only 3 had statistical significance as a measure of moderate or weak association. Individual tinkering was found to have association with strategy. Both individual and organizational tinkering was found to have association with opportunity. Future research on more detailed connections between opportunity and tinkering is advised.

1 | INTRODUCTION

The ability to think about sustainability in today's enterprise strategies has become a critical need for leaders in many US organizations. This has become the modern buzz terminology in most corporate Vision and Mission statements from print to social media communications (Jevnaker, B. & Olaisen, and J. 2021).

Tinkering is a management skill-set that involves for open-ended exploration with different business processes. Tinkering has the ability to develop the capacity for innovative problem-solving skills that apply to both individuals as well as teams. Tinkering also stimulates creativity and critical thinking (Graham, 2016). Historically, tinkering has been a valued profession. Those who have been adept at analyzing situations and solving problems, those managers or tinkerers tackled anything that needed fixing. They were skilled problem solvers who figured out what was wrong with equipment and machinery and fixed them, as well as found ways to improve their performance (Graham, 2016). What might be more appropriate for today's modern leadership is using skills and behaviors instead of leveraging the historically developed leadership strategies that are based on action-based leadership practices to a more fluid-based leadership strategy that includes "tinkering" or situation-based leadership strategies to provide for a more sustainability perspective. The purpose for this research seeks to understand how tinkering as a leadership skill and strategy might

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impact change thinking and employee impact on US organizations which can promote reusing resources, transforming core processes or offerings, and innovating incorporate missions. To determine if leadership includes tinkering as a skill set or behavior, study data was collected through questionnaires where those in leadership, managerial, or supervisory capacities were asked if and when they might use tinkering as a leadership tactic and how this might impact the success of their overall leadership and impact on their organizations.

2 | LITERATURE REVIEW

Tinkering as a leadership skill is anything but a lost art. Spotting and dissecting problems and coming up with workable solutions is an enormously valuable business skill that requires a lot of "tinkering." What actually is leadership tinkering? At its very core, it is getting things right before we make needless costly and perhaps disastrous mistakes. It's all about insight and creativity. Tinkering is the mindset that "things are good enough" is never acceptable. Whatever the situation or business condition things can always be better. This drills down to regular tasks such as writing a letter, emailing a message, reports, memos, product or service proposals, or even making presentations. Bigger issues include examples such as dealing with problems, responding to questions from customers, addressing customer concerns, creating sales strategies and action plans, or understanding potential business prospects (Graham, 2016).

The concept of tinkering can be closely connected to change management. When a leader chooses to make changes in the organization, a combination of major projects (kludging) and various small modifications (tinkering) will be implemented. Change management therefore varies in both a temporal and a physical sense. It is important for a 'change leader' to understand the organization, his or her contributions, and the required adjustments

needed. For this reason, a leadership tinkerer must have an exceptional knowledge of and aspiration towards the business to ensure compliance from all stakeholders (Roberts & Rowley, 2008, p.95). Not all leaders are capable of such detail-oriented mindsets, which makes leadership tinkerers truly invaluable to any business.

There are no exceptions. Good ideas fail because they are rushed and not thought though. Proposals are rejected because they are superficial. New initiatives are quickly abandoned because they are full of holes. All are victims of the pervasive get-it-done and out the door mindset (Graham, 2016). The one opportunity that overshadows everything else in any job is routinely ignored or passed up opportunity for challenges. Some might consider this another code word in business for solving problems. If you ask most people to spell challenge, they might spell the word "trouble." Many who lack real leadership skills attempt to avoid challenges, avoiding them at all cost. This might conjure the imagery of challenges as illustration of long hours, too much work, getting blamed and failing. This might offer enormous opportunities for those who dare to raise their hands and say, "I'll work on that" (Graham, 2016). What does it take to make good things like this happen? Just a little tinkering and asking one question: "What if we …?" Every company needs leaders who tinker — the more the merrier. They get a kick out of making the place better. No business utilizes tinkering with such confidence as city engineering, or infrastructure. This so-called "urban tinkering" is undoubtedly an art form and can serve as a standard for other businesses. Within urban tinkering, the cities administrative team implements a proactive approach of adaptation, creativity, and experimentation within the city's systems. Various teams such as architects and designers work with the city on conceptualizing different solutions in a professional "interplay" of skills. Each cycle of ideas, or tinker, developed by the team will provide new information that can assist in the

revision process, resulting in an eventual project completion. Urban tinkering, like that of leadership, may also require feedback and engagement from its stakeholders to determine true success (Elmqvist, et al., 2018).

Understanding how business fits together, making connections and uncovering what is missing goes beyond superficial and incomplete answers. Many of us think that may be a good idea, but it takes too much time, so why bother? And that is why "Googling" is the accepted standard for research. How many of us are interested in knowing whether something is fact or opinion? How many know the difference or even care? (Graham, 2016). Tinkering gets us to the bottom of things, and that is what it takes to innovate, break down barriers, and make a difference on or off the job (Graham, 2016). Does tinkering as a form of leadership impact mistakes? There are "circumstances beyond our control," but most often, mistakes result from moving too quickly.Steve Jobs tapped Ron Johnson to develop the now wildly successful Apple retail stores. Then, based on this success, he was picked to work his magic on saving the legendary J.C. Penney stores. Instead, he unleashed tornado-like disruption and was quickly blown away. Now, Johnson is launching a new venture. "The mistake I made was trying to change things too fast. I'm going back to what I learned at Apple, which is that there's no such thing as an overnight success." (Graham, 2016).

No one wants to make mistakes, yet they still happen. New executives arrive, for example, with a "here's what we're going to do to make us successful" mindset and approach message. This is always a mistake, because this is the time for tinkering, for learning how the place operates, spotting problems and coming up with plans for improvement that brings everyone on board. "The mistake I made was trying to change things too fast," is good advice. (Graham, 2016). Those who practice the art of tinkering know the secret of taking control. They have learned how to take control of their own personal lives. They don't

retire or shy away, complain, or quit in the face of the endless obstacles they deal with every day. They are always looking for ways to make something better (Graham, 2016).

Tinkering can even impact the lives of others on a much larger scale, such as in national security. Innovation strategy, the science of "improving the yield," has enabled the American military to develop, adjust, and cultivate technologies that create a safer and more protected country. Much of the success in national security in recent decades, including the Navy Seal operation that killed Osama Bin Laden and the easing tensions of the Cold War, can be attributed to careful tinkering by military leadership (Srivastava, 2019, p.3). Sometimes, tinkerers are the catalyst for an even greater discovery. When Watson and Crick received the Nobel Prize for DNA, much of their success would not have been possible without the refining and precision of Rosalind Franklin. Using x-ray diffraction pictures, Franklin made "tiny adjustments" in her pictures with increasingly improved clarity, eventually resulting in what is highly regarded as one of the most stunning x-ray photographs of any material ever developed. Her precision and dedication also represent a common characteristic of tinkerers in the leadership environment: unaltering passion. This passion allows such tinkerers, also referred to as 'refiners,' to gather all possible facts and make continuous adjustments before reaching a final data-driven conclusion (Clampitt & DeKoch, 2010, p. 21-22). Examples of this leadership style are how the mission of Amazon makes customers happy with earlier-than-expected deliveries. How Honda Civic created excitement with a complimentary pair of quality, limited edition driving shoes with each new Civic. How Sunoco service stations makes follow-up phone calls to a customer after working on their car. How a medical office amazes patients with its "no waiting" policy. How a company CEO knows the cleaning person's name and always says hello. How Granite Telecommunications' annual "buzz cut" fund

drive for cancer raised $4 million in one day (Graham, 2016).

In a year when environmental, social and governance (ESG) issues are at the fore of so many discussions—from systemic racism and the impact of COVID-19 on minority communities to the ongoing challenges posed by climate change and resource allocation—companies, investors and governments have an opportunity to pursue economic goals that also helps create positive social and environmental impact (Jevnaker & Olaisen, 2021). At the Sustainable Investing Summit, hosted by the Morgan Stanley Institute for Sustainable Investing and held in October, just how each player in the global economy can best meet these challenges took center stage. The summit virtually brought together corporate executives, institutional investors, academics, nonprofit leaders and policymakers to explore ideas on how to mobilize private and public sector capital for investing in a sustainable world. Four essential themes emerged: organizational leadership in crisis times, COVID-19 and intersectional ESG issues, the policy and business initiatives to curb climate change, and capital markets' role in social justice (MorganStanley/ESG.com, 2022.)

Facilitating Sustainability Leadership through Tinkering

A year defined by pressing demand for coronavirus relief, racial and social justice and climate change mitigation has challenged organizations everywhere. In crisis times, leaders must express confidence that society will endure and recover. Morgan Stanley's Chief Executive Officer James Gorman said: "We're going to have some rough times but we will get through it. And I think that message of acknowledging things are very difficult but also projecting that you will get through it—that authentic message—is the essence of leading through crisis." (Morgan Stanley/ESG.com, 2022.)

3. METHODOLOGY

Survey Instrument

Sustainability Leadership finds its roots in the form of tinkering with the norm. As stated above during difficult times leaders look for ways to adjust or consider other options to sustain their organizations during increasing competition (Jevnaker & Olaisen, 2021).

To advance sustainability issues in business, leaders of organizations large and small have to encourage agility, innovation and diverse perspectives from all levels, said Harvard Business School Professor Linda Hill. Only then can a company, nonprofit or government body expect to create real change and make progress. This is in itself tinkering as a form of leadership (Jevnaker & Olaisen, 2021).

Echoing that sentiment, Gorman said that he views his role as identifying thematic changes that may affect business, culture and staff, but relies on others with the passion and expertise to amplify those themes throughout the organization, form a strategy and ultimately execute it through tinkering (Jevnaker & Olaisen, 2021). Incentive opportunities such as "Tinkerer of the Month Award" may encourage those who have hesitancy to get outside of their comfort zone. Allowing employees an environment that favors 'trial-and-error' may create even more success stories for a business (Graham, 2016).

RESEARCH QUESTIONS AND HYPOTHESES

The following two research questions were developed, upon reflection of the literature review. Additionally, from the research questions, the following two null hypothesis statements were developed to test via the collected data and statistical analysis.

Q1: Is leadership confidence effected by individual tinkering?

Q2: Is leadership confidence effected by organizational tinkering?

Null Hypotheses:

H01: Leadership confidence is not effected by individual tinkering.

H02: Leadership confidence is not effected by organizational tinkering.

In order to test the concept of tinkering as a form of leadership, a survey questionnaire was derived from the work done by Swart in 2013 on

innovation, creativity and how these traits are the basis for tinkering as behavior in leadership abilities to be successful in organizations (Swart, 2013). The survey questionnaire is included as an appendix to this report of research.

The subject matter of the survey questionnaire consisted of 10 questions using a five-point Likert scale where the answers are arranged from strongly agree to strongly disagree. The questions were based on the desire to determine the level of confidence through experience of the respondent to those behaviors and traits that define tinkering as a leadership behavior and style.

Frequency analysis was used to generate demographics of the respondents based on the following variables: age, gender, marital status, education level, tenure of leadership, and type of organization the respondent worked in. The survey was administered using Microsoft Office Forms, an online service that allows researchers to anonymously poll respondents and collect data for analysis.

Workflow

The research workflow followed the standard program for data science, which also works well for statistical analysis and scientific research. This workflow is presented in R for Data Science: Import, Tidy, Transform, Visualize, and Model data (Wickham & Grolemund, 2017, p. ix). It is also presented here, with copyright statement, via Figure 1.

## Figure 1

Data Science Workflow
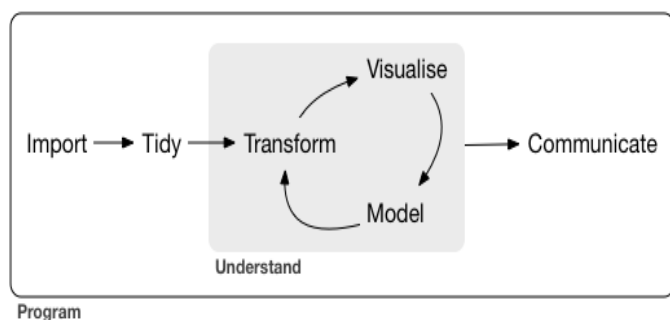
This workflow was optimal for this study, with one important caveat. As a scientific study, the data is observed and analysis is conducted once,

and reporting of the data is based on the results of that one observation. In particular, our focus is hypotheses confirmation (or rejection). However, per the perspective of the book, the workflow can also be used for hypotheses exploration or creation, for example trying to repeatedly improve a fitted model for a hypothesis. It is stated concisely by Wickham and Grolemund (2017, pp. xiii-xiv) as such, "The key difference is how often you look at each observation: if you look only once, its confirmation; if you look more than once, it's exploration." Being a scientific study, this research is focused on hypothesis confirmation with this workflow model, an analysis of observations and statistics run once, a snapshot in time. Following this model, the data was collected from the survey respondents, and formatted into a MS Office Excel worksheet. It was then imported into R using RStudio (R Core Team, 2021; Studio Team, 2021). The version of the base-R programming language utilized was R version 4.1.2 (2021-11-01) "Bird Hippie" (R Core Team, 2021). The integrated development environment (IDE) was RStudio version 2021.09.2 Build 382 (Studio Team, 2021). Several R packages were used for the analysis. It should be noted that R packages have a naming convention, where their name typically starts with a lower-case letter. As such, here in the narrative, as well as in-line citations, and the reference listing, the package names starting with a lower-case letter is intentional. For the purpose of this study the readxl package as utilized to import the data from MS Excel file into R for further analysis (Wickham & Bryan, 2019). The dplyr package was utilized for its ease of use with coding, allowing use of the pipe to flow functions from one to another in sequence (Wickham, François, Henry, & Müller, 2022). The tidyr package was used for data cleaning, and for preparing the data for use in other functions (Wickham & Girlich, 2022). Also, and at a more strategic level, the tidyverse package was used holistically throughout the process (Wickham et al., 2019).After the data was imported, it was cleaned, where it was observed and ensured to be formatted consistently, and that no data would be missed via the computer programming. It was also formatted, or transformed, such that each row was one individual participant observation, and each column of data was one variable. Each row corresponded to one of the forty research

participants in the study. Each variable corresponded to one of the ten survey questions. There were eight dependent variables, one for each of the factors that expressed a facet of leadership confidence; and two independent variables that aligned to the individual and organizational assessment of tinkering. The eight facets of leadership confidence, as explored in this study are: empowerment, recognition, influence, expertise, strategy, goals, innovation, and opportunity.The data was visually checked per above, and then also visualized via methods of histograms, box plots, and QQ-plots. The histograms on several sets of the data gave some concern that it was potentially not normally distributed. The box plots were most informative and are included as Figure 2 in this report. The QQ-plots were not informative.

Figure 2

Box Plots of Survey Data
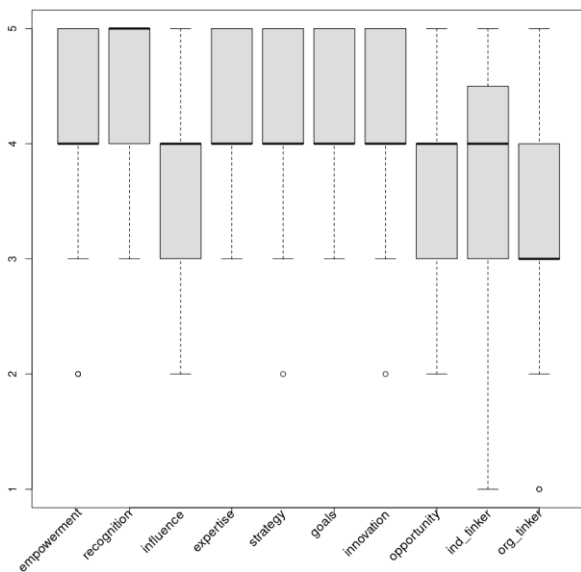
Linear models were created for hypothesis testing. The function lm (.) is used in R for linear modeling. In the code it takes the format lm (predict ~ predictor). This can be likewise equally expressed from a different perspective lm (dependent ~ independent) for the input of dependent and independent variables. As applied to this study, to test if the hypothesis for leadership confidence, using the factor of consideration of empowerment was potentially predicted by the predictor of individual tinkering, the model would be expressed in the code as: lm(empowerment ~ ind_tinker) where ind_tinker is the variable for individual tinkering. Similarly,

testing the same factor for organizational tinkering, using the variable name of org_tinker, would be expressed in the code as: lm (empowerment ~ org_tinker). As there were eight dependent variables and two independent variables, there were a total of 16 models to test. From a mathematical perspective the same linear models covered in the code, can be presented with a basic mathematical linear model as illustrated in Figure 3. In this model, y is leadership confidence, and x is tinkering (individual or organizational).

Figure 3

Basic Linear Model

$$Y_i = \beta_0 + \beta_i x_i + \varepsilon_i$$

The workflow then concludes with the work towards communication via conference presentations, and other artifacts of communication to include this report. It should be noted that one of the additional positive aspects of using R programming, is that is also creates a detailed artifact of the code used for the study, as well as the ability to re-run the code for the results at a later date.

From a statistical analysis perspective, the methods utilized also flow neatly. The process started with demographic count data for participants. Then with the survey data, visualization, for example with the box plots. Then basic or descriptive statistics which work well as a numeric cross-check with the visualization of the box plots. Followed by correlation coefficient determination and related strength assessment. Then concluding with linear regression testing and results. We will now cover the details, starting with the demographic count data for participants of the study.

Sample and Data Collection

The responses to the survey produced forty (40) viable participant observations, sample of n=40. The demographic data of the participants was assessed via simple count data, or frequency analysis. Of the 40 participants, 17 were male and 23 were female. As to marital status, 14 were married and 26 were single. Education level was demarcated by three groups: 31 were in college or

had a bachelor's degree, 8 were in graduate school or had a master's degree, and 1 had a doctorate, terminal degree. The participants worked for a diverse group of organization types with 5 at a medium size organization, 29 with a large size organization, 2 in government employment, 2 with family-owned business, and 2 working in non-profit organizations. The time in their career, or tenure in career, was primarily low, with 20 respondents in the 1-3 years of experience category, 12 with 4-6 years of experience, 4 with 7-10 years of experience, 1 with 11-14 years of experience, and 3 with 15 or more (plus) years of experience. Age was relatively young professional adults, with 15 participants aged 20-25 years, and 10 aged 26-30 years. Further, there were 9 aged 31-35 years, 1 aged 36-40 years, 1 aged 41-45 years, 0 aged 46-50 years, 2 aged 51-55 years, 0 aged 56-60 years, and 2 aged 61-65 years. A concise summary of these demographic data can be found in Table 1.

Table 1: Demographic Count Data

Sample (n = 40)					
Gender		Organization Type		Age	
Male	17	Medium Size	5	(20-25)	15
Female	23	Large Size	29	(26-30)	10
Marital Status		Government	2	(31-35)	9
Married	14	Family Owned	2	(36-40)	1
Single	26	Non-Profit	2	(41-45)	1
Education Level		Tenure in Career		(46-50)	0
College	31	(1-3)	20	(51-55)	2
Masters	8	(4-6)	12	(56-60)	0
Doctorate	1	(7-10)	4	(61-65)	2
		(11-14)	1		
		(15+)	3		

Continuing with the survey data, basic or descriptive statistics as well as visualization were used as a cross comparison. We will review the descriptive statistics next.

Descriptive Statistics:

It is worth time, for the reader, to cross compare the visual of the box plots of Figure 2, with the numeric representation of data in Table 2. The basic statistics of minimum, 1st quartile, median, mean, 3rd quartile, and maximum in numeric form, correspond to elements of the box plots in visual form. With this, the common statistics of standard deviation and variance are also included as the last two columns of Table 2. Of note, there are still signs that the data is non-normal in distribution. Both the box plots and numeric data exhibit signs of skewing. Upon review it should be noted that empowerment, expertise, strategy, goals, innovation, and organizational tinkering

show right skewed. While recognition, influence, opportunity, and individual tinkering show left skewed. There are also four outliers in the data, with the minimum values or first column of Table 2 for: empowerment, strategy, innovation, and organizational tinkering. It was decided to keep the outliers in and continue to conduct analysis of the full data set, as is. The full basic or descriptive statistics can be reviewed within Table 2.

Table 2 Basic Descriptive Statistics

Basic Statistics								
Variable	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	sd	var
empowerment	2.000	4.000	4.000	4.275	5.000	5.000	0.847	0.717
recognition	3.000	4.000	5.000	4.625	5.000	5.000	0.540	0.292
influence	2.000	3.000	4.000	3.650	4.000	5.000	0.975	0.951
expertise	3.000	4.000	4.000	4.275	5.000	5.000	0.716	0.512
strategy	2.000	4.000	4.000	4.150	5.000	5.000	0.736	0.541
goals	3.000	4.000	4.000	4.250	5.000	5.000	0.670	0.449
innovation	2.000	4.000	4.000	4.300	5.000	5.000	0.758	0.574
opportunity	2.000	3.000	4.000	3.925	4.000	5.000	0.764	0.584
ind_tinker	1.000	3.000	4.000	3.775	4.250	5.000	1.050	1.102
org_tinker	1.000	3.000	3.000	3.425	4.000	5.000	1.152	1.328

Correlation:

After basic descriptive statistics, a pursuit to determine correlation coefficients was begun. There were a total of 16 correlation tests accomplished. Each was a set of eight, where the eight facets of leadership confidence were tested for correlation against one of the two perspectives of tinkering, individual or organizational. The data with correlation numeric values as well as strength assessment can be found in Table 3. As a reminder, unlike slope within a line equation that can take on any value, correlation is constrained within a scale between negative one and positive one. In general, negative one would be the extreme negative correlation. Positive one would be the extreme positive correlation. Zero, in the middle of this spectrum, would be perfectly not correlated, or perfectly non-correlated. The scale assessment of strength was obtained from thresholds outlined by Johari (2013). A quick review of Table 3 shows that nearly all of the tests for correlation were tending towards not correlated, with a "very weak" assessment of strength. In fact, this was the case for 13 of the 16 correlation tests. It should be noted that due to prior concerns for potential non-normal distribution, the Spearman method was utilized, for the nonparametric qualities of the Spearman rank correlation coefficient test. The only correlation that registered other than "very weak" were three comparisons: strategy ~ ind_tinker

(0.436, "weak"), opportunity ~ ind_tinker (0.587, "moderate"), and opportunity ~ org_tinker (0.428, "weak"). The full correlation data can be reviewed within Table 3.

Table 3: Correlation Coefficients and Strengths

Variable	Correlation coefficient and strength			
	individual tinker		organization tinker	
	correlation	strength	correlation	strength
empowerment	0.138	very weak	-0.171	very weak
recognition	0.123	very weak	0.084	very weak
influence	-0.030	very weak	0.005	very weak
expertise	0.168	very weak	0.005	very weak
strategy	0.436	weak	0.104	very weak
goals	0.042	very weak	-0.007	very weak
innovation	0.248	very weak	0.031	very weak
opportunity	0.587	moderate	0.428	weak

Regression Analysis:

Following consideration of the correlation data, it was useful to then consider linear regression. Linear regression was conducted with a similar pattern. There were 16 total tests, with two groups of eight, the perspective of tinkering (individual or organizational) run against the eight facets of leadership confidence. The results are summarized in Table 4 and will be further discussed in detail within the findings section of the paper.

Table 4: Regression Analysis

Variable	Linear Regression							
	individual tinker				organization tinker			
	Adj. R^2	F	DF	p-value	Adj. R^2	F	DF	p-value
empowerment	-0.016	0.386	1 & 38	0.538	-0.011	0.582	1 & 38	0.450
recognition	-0.012	0.543	1 & 38	0.466	-0.016	0.368	1 & 38	0.548
influence	-0.026	0.001	1 & 38	0.982	-0.026	0.018	1 & 38	0.894
expertise	-0.012	0.542	1 & 38	0.466	-0.026	0.017	1 & 38	0.898
strategy	0.146	7.684	1 & 38	0.009	-0.015	0.419	1 & 38	0.522
goals	-0.026	0.003	1 & 38	0.956	-0.025	0.066	1 & 38	0.799
innovation	-0.003	0.893	1 & 38	0.351	-0.026	0.000	1 & 38	0.986
opportunity	0.220	12.000	1 & 38	0.001	0.151	7.939	1 & 38	0.008

4. FINDINGS

The results are reviewed within the findings of the paper. As to the research questions, and hypothesis tests, we will cover those within the alignment of the two groups. We will start with the individual tinkering perspective. The research question was:

Q1: Is leadership confidence effected by individual tinkering?

And the related null-hypothesis to test was:

H01: Leadership confidence is not effected by individual tinkering.

Here are the findings for the eight tests and results related to the individual perspective:

1. Empowerment ~ ind_tinkering: the adjusted R2 was -0.016, with F statistic of 0.386, with 1 and 38 degrees of freedom, and p-value of 0.538. The null hypotheses is accepted.

2. Recognition ~ ind_tinkering: the adjusted R2 was -0.012, with F statistic of 0.543, with 1 and 38 degrees of freedom, and p-value of 0.466. The null hypotheses is accepted.

3. Influence ~ ind_tinkering: the adjusted R2 was -0.026, with F statistic of 0.001, with 1 and 38 degrees of freedom, and p-value of 0.982. The null hypotheses is accepted.

4. Expertise ~ ind_tinkering: the adjusted R2 was -0.012, with F statistic of 0.542, with 1 and 38 degrees of freedom, and p-value of 0.466. The null hypotheses is accepted.

5. Strategy ~ ind_tinkering: the adjusted R2 was 0.146, with F statistic of 7.684, with 1 and 38 degrees of freedom, and p-value of 0.009. The null hypotheses is rejected.

6. Goals ~ ind_tinkering: the adjusted R2 was -0.026, with F statistic of 0.003, with 1 and 38 degrees of freedom, and p-value of 0.956. The null hypotheses is accepted.

7. Innovation ~ ind_tinkering: the adjusted R2 was -0.003, with F statistic of 0.893, with 1 and 38 degrees of freedom, and p-value of 0.351. The null hypotheses is accepted.

8. Opportunity ~ ind_tinkering: the adjusted R2 was 0.220, with F statistic of 12.000, with 1 and 38 degrees of freedom, and p-value of 0.001. The null hypotheses is rejected.

In summary, for the individual perspective of tinkering, leadership confidence was not effected when considering 6 of the 8 facets of leadership confidence. The two exceptions, where the null hypotheses was rejected, were strategy being effected by individual tinkering, and also opportunity being effected by individual tinkering.

Likewise, we continue with the organizational tinkering perspective. The research question was:

Q2: Is leadership confidence effected by organizational tinkering?

And the related null-hypothesis to test was:

H02: Leadership confidence is not effected by organizational tinkering.

Here are the findings for the eight tests and results related to the organizational perspective:

1. Empowerment ~ org_tinkering: the adjusted R2 was -0.011, with F statistic of 0.582, with 1 and 38 degrees of freedom, and p-value of 0.450. The null hypotheses is accepted.
2. Recognition ~ org_tinkering: the adjusted R2 was -0.016, with F statistic of 0.368, with 1 and 38 degrees of freedom, and p-value of 0.548. The null hypotheses is accepted.
3. Influence ~ org_tinkering: the adjusted R2 was -0.026, with F statistic of 0.018, with 1 and 38 degrees of freedom, and p-value of 0.894. The null hypotheses is accepted.
4. Expertise ~ org_tinkering: the adjusted R2 was -0.026, with F statistic of 0.017, with 1 and 38 degrees of freedom, and p-value of 0.898. The null hypotheses is accepted.
5. Strategy ~ org_tinkering: the adjusted R2 was -0.015, with F statistic of 0.419, with 1 and 38 degrees of freedom, and p-value of 0.522. The null hypotheses is accepted.
6. Goals ~ org_tinkering: the adjusted R2 was -0.025, with F statistic of 0.066, with 1 and 38 degrees of freedom, and p-value of 0.799. The null hypotheses is accepted.
7. Innovation ~ org_tinkering: the adjusted R2 was -0.026, with F statistic of 0.000, with 1 and 38 degrees of freedom, and p-value of 0.986. The null hypotheses is accepted.
8. Opportunity ~ org_tinkering: the adjusted R2 was 0.151, with F statistic of 7.939, with 1 and 38 degrees of freedom, and p-value of 0.008. The null hypotheses is rejected.

In summary, for the organizational perspective of tinkering, leadership confidence was not effected when considering 7 of the 8 facets of leadership confidence. The one exception, where the null

hypotheses was rejected, was opportunity being effected by organizational tinkering.

Considering both perspectives, we can now summarize the findings holistically. The alpha = 0.05 was used for this study, meaning there is only a 5 percent chance of a spurious association between variables. In nearly every case, 13 of the 16 total cases, we accepted the null hypotheses, and recognize that individual tinkering and organizational tinkering do not effect leadership confidence, in essence answering "no" to our research question. There are three statistically significant caveats to this, where we rejected the null hypotheses, and would answer "yes" to our research questions. There is indication that individual tinkering effects strategy as a form of leadership confidence. Also, there is evidence that both individual tinkering and organizational tinkering effect opportunity as a form of leadership confidence.

5. LIMITATIONS OF THE STUDY

There are several limits to our study. With a sample of n= 40, there is a concern that this could be a non-representative sample for a larger total population. There is also concern that the smaller sample size could have contributed to the pattern within the data distribution giving concern to non-normal distribution. There is also a concern of history. As this study was conducted during the COVID-19 pandemic, there could be concern that it was itself influenced by contributing third factor influences of the pandemic experience as a whole. Further, due to the limited scope of the study, there is the reality that it may not represent the full demographics of a population. This study in particular had a large group of young professionals at the college level of education within the sample that may have skewed the data. The data also could have had different results, if the outliers were removed during data analysis.

6. POTENTIAL FUTURE RESEARCH

It is interesting that both individual and organizational tinkering had effect on leadership confidence from the perspective of opportunity. Reworking this study into a future more detailed study on opportunity itself, drilling down into

eight facets of opportunity, might have valuable results to consider. It is also interesting that individual tinkering had some effect on strategy as a facet of leadership, yet organizational tinkering did not have effect on strategy. What makes the difference here between the two perspectives? That answer could be illuminating for strategy development or implementation, dependent on future study results.

7. IMPLICATIONS FOR MANAGEMENT

Business leaders and managers can consider several aspects from the results of this study. It is illuminating to know that from the perspectives of the facets explored within leadership confidence, there is very little connection between tinkering and leadership confidence. So, while tinkering might help with creative problem-solving, it is not perceived as a leadership trait. However, tinkering had several connections that might be useful to business. With individuals, there might be an opportunity to utilize activities of tinkering towards personal reflection and individual strategy development. Perhaps there might be a connection between motor skills and hands-on activity, or development related to tasks that spark ideas towards individual strategy development. Similarly, leaders can review this report and find value in the prioritization of opportunity. There should be a leadership priority to create opportunity for others, for example career development as both a leadership and human resources concept. Further this study showed a link of association between both individual tinkering and organizational tinkering,

independently, with opportunity. This includes opportunity for employees, organizations, and society.

8. CONCLUSION

This study sought out the answers to two research questions. Was there an effect on leadership, via tinkering, both individual and organizational? For the most part, the answer was no. However, there were indications of statistically significant association between strategy as a facet of leadership confidence and individual tinkering. There were also statistically significant associations between opportunity and individual tinkering, as well as opportunity and organizational tinkering. Seeking out more connections towards opportunity, in more fine grain detail could provide unique options for both individuals and businesses in relation to tinkering, whether via creative problem-solving, or other common workplace manifestations.

APPENDIX

SURVEY QUESTIONNAIRE
Innovative Leadership Quality Psychological Measurement Instrument.
Thank you for your willingness to participate in this research on Tinkering as a function of Leadership. We would like to know your level of experiences with the following statements. Please complete this brief survey. Your responses are anonymous and are kept confidential. Thank you for your participation.

1. I Feel Confident in Leading and Empowering Team Members

SA	A	N	D
	SD		
5	4	3	2
	1		

2. I Feel Confident In Recognizing and Valuing Team Member Input

SA	A	N	D
	SD		

5	4	3	2
	1		

3. I Feel Confident IN Influencing Key Stakeholders

SA	A	N	D
	SD		
5	4	3	2
	1		

4. I Feel Confident In Applying Technical Expertise To Situations At Work

SA	A	N	D
	SD		
5	4	3	2
	1		

5. I Feel Confident in My Strategy Development At Work.

SA	A	N	D
	SD		
5	4	3	2
	1		

6. I Feel Confident In My Goal-Setting and Activity Alignment at Work

SA	A	N	D
	SD		
5	4	3	2
	1		

7. I Feel Confident In Adapting and Accepting New Ideas At Work

SA	A	N
D	SD	
5	4	3
2	1	

8. I Feel Confident In My Monitoring Opportunities and Commercialization At Work

SA	A	N	D
	SD		
5	4	3	2
	1		

9. I Utilize Tinkering as Part of My Regular Leadership Duties and Responsibilities

SA	A	N	D
	SD		
5	4	3	2
	1		

Government   Non-Profit

10. Leaders in My Organization Utilize Tinkering as Part of Their Leadership Duties and Responsibilities

SA	A	N	D
	SD		
5	4	3	2
	1		

Please tell us something about yourself:

AGE:

20-25   26-30   31-35   36-40   41-45   46-50   51-55

56-60   61-65   66-70   70 and above

GENDER:

Male   Female

MARITAL STATUS

Single   Married

EDUCATION

High School   College   Masters   Doctorate

YEARS IN LEADERSHIP POSITION

1-3   4-6   7-10   11-14   15 and above

TYPE OF ORGANIZATION YOU WORK FOR

Small/Family Owned   Medium Size   Large Corporation

REFERENCES

1. 3BLMedia (2021). 4 Sustainability issues for business and government. URL: https://www.3blmedia.com/news/4-sustainability-issues-business-and-government

2. Clampitt, P.G., & DeKoch, J.D. (2010). Transforming leaders into progress makers: Leadership for the 21st century. SAGE Publications, Inc.

3. Elmqvist, T., Siri, J., Andersson, E. et al. (2018). Urban tinkering. Sustain Sci 13(1), 1549–1564. URL:

https://doi.org/10.1007/s11625-018-0611-0

4. Graham, J., (2016). 5 ways tinkering is 'serious business' that will strengthen a brokerage. URL: https://www.benefitnews.com/advisers/opinion/5-ways-tinkering-is-serious-business-that-will-strengthen-a-brokerage.

5. Jevnaker, B. & Olaisen, J. (2021). Leadership for sustainability: The importance of sustaining, imaginative work. Proceedings of the European Conference on Management, Leadership & Governance, pps 223-232.

6. Johari, N. M. (2013). Table 3.2.2. Strength values of correlation coefficients, as found in: Stress and coping strategies among commuter and non-commuter students (p. 31).
   a. URL: https://www.researchgate.net/publication/309209846_Stress_and_Coping_Strategies
   b. _among_Commuter_and_Non-commuter_Students

7. Morgan Stanley Institute for Sustainable Investing (2022), https://www.morganstanley.com/what-we-do/institute-for-sustainable-investing/?cid=pp 71700000088127708:700000002375621:58700007477269439:p67225303599&gclid=Cj0KCQjwuMuRBhCJARIsAHXdnqMyOIjnmCIcLWX6AanR8jVlA9SKUfYHkf4gTEpEIM_Xho68IRS5L-caAlp4EALw_wcB&gclsrc=aw.ds

8. R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL: https://www.R-project.org/.

9. Roberts, S., & Rowley, J. (2008). Leadership: The challenge for the information profession. Facet Publishing.

10. Srivastava, T.P. (2019). Innovating in a secret world: The future of national security and global leadership. Potomac Books. Studio Team (2021). Studio: Integrated development environment for R. Studio, PBC, and Boston, MA. URL: https://rstudio.com.

11. Swart, D. (2013). The development of an innovation leadership questionnaire. URL:
    a. http://citeseerx.ist.psu.edu Wickham et al., (2019). Welcome to the tidyverse. Journal of Open Source Software, 4(43), 1686. URL: https://doi.org/10.21105/joss.01686 . Wickham, H., & Bryan, J. (2019). readxl: Read Excel files. R package version 1.3.1.
    b. URL: https://CRAN.R-project.org/package=readxl.

12. Wickham, H., François, R., Henry L., & Müller, K. (2022). dplyr: A grammar of data manipulation. R package version 1.0.8. URL: https://CRAN.R-project.org/package=dplyr.

13. Wickham, H. & Girlich, M. (2022). tidyr: Tidy messy data. R package version 1.2.0.
    a. URL: https://CRAN.R-project.org/package=tidyr.

14. Wickham, H. & Grolemund, G. (2017). R for data science: Import, tidy, transform, visualize, and model data. Boston: O'Reilly.