Redzone

2021 Productivity Benchmark Report
Fourth Biennial

Results from 700 Manufacturers using the
Redzone Connected Workforce Solution

Contents

01 EXECUTIVE INTRODUCTION

We are delighted to introduce our fourth biennial Productivity Benchmark Report. Since 2014 we have been proud to publish the productivity results from this rapidly growing community that is now 700 plants strong. This latest report focuses on the most recent cohort of 300 plants that joined the community between 2018 and 2020. The 300 manufacturing plants are located in North America, Europe and, for the first time, includes a small population of plants in the Asia-Pacific region.

The analysis shows the effect on productivity that occurs with the introduction of a *digital production system*, incorporating lean production techniques applied with the frontline teams, combined with a mobile application to make them stick.

It provides evidence of very specific productivity and savings goals for manufacturers that have joined the Redzone customer community. The goals are set out below:

All plants in this study did the same 90-Day Program to accomplish five measurable *lean journey* goals:

1. A visual factory including Overall Equipment Effectiveness (OEE) measurement visible to all, plant-wide and in real-time
2. Coached-in foundational lean and problem-solving skills to the operators and supervisors on the job
3. Improve the OEE by at least 8 percentage points by the end of day 90
4. Achieve mid six figure cost savings for smaller plants and seven figure cost savings for larger plants, verified by the plant's finance function
5. Sustain all gains made in the first 90 days and continue improving over the long term

In this introduction, I outline the reason why the world's most successful companies target goals like these, share the general success rate for everyone else (which is not good), and highlight three big mistakes usually found when they failed.
Finally, I share the evidence that these mistakes are a thing of the past for what is now the world's largest community of Food, Beverage (F&B) and Consumer Packaged Goods (CPG) manufacturing plants in those industries.

The Objective
Plants at companies like Toyota are consistently benchmarked *best in class* and return more on capital invested. They are safer, have better productivity, better systems for compliance, customer service and employee engagement and retention. Workers for companies like these have a reputation for loyalty and are proud of the part they play in their organizations' success story. These plants exhibit a culture of improvement and attribute success to what they call their production system approach; Toyota having the first widely publicized example, called, the Toyota Production System. Most owners and investors want their plants to have a culture that produces results like theirs.

The Failure Record
In their quest to get to this future state, manufacturers collectively spend billions of dollars on technology systems, consultants and training. Most of which is also wasted because investing in tools and skills without the presence of organizing principles and the behavioral impact of a production system, leads to failed projects and witheringly small productivity gains; which disappear altogether after a few months due to a lack of sustainability.

Symptoms of failure are easy to recognize and are all too common – Continuous Improvement (CI) experts fighting an uphill battle in the plants, while a culture of improvement is nowhere to be seen. Frontline workers feeling left out and jaded by well-intentioned management fads, consultants' promises or technology systems. Ironically, it is usually the frontline workers that end up at the receiving end of the blame.

If you are thinking that you have the wrong people or tools to be successful, bear in mind that those who succeed have similar people and tools to you; what they have done is taken a production system approach to combine them differently. It is this production system approach, in combination with tools and skills, that the 700 plants in the Redzone Community have been exposed to. The results are quite different as this study shows.

What Failure Risks Does The Redzone Connected Workforce Solution Eliminate?
Efforts that have failed have much in common, but the impact of these factors is widely under-recognized within manufacturers embarking upon a lean journey:

1. Not aligning goals and levels of participation between leaders and frontline workers
2. Not managing change effectively to balance the:
   a. People factors (roles, targets, skills, recognition and feedback)
   b. Process factors (methods, tools, measurement, forums)
   c. Technology factors (fitness for purpose, real-time data, social networks, mobile first, ease-of-use)
3. Using failed learning methods like PowerPoint-based classroom training (teaching insights and principles) that are difficult to apply in the real world

The goal of a production system is to provide the workforce with a means of coordinating the CI efforts in the plant with the goals of its leadership. Until now there have only been manual production systems designed and built by CI professionals in the world's most disciplined and sophisticated businesses. Often relying on disparate manual systems, they have required dedicated teams of professionals to feed them with daily data to ensure compliance—at great expense.

The investment necessary to implement such a system is beyond the capacity and capability of small to mid-sized companies and offers no realistic return on investment. For larger companies, while these systems may have provided a foundation, they have been forced from the top-down, overwhelming the frontline teams with yet more cumbersome manual tasks to perform.

The Redzone Connected Workforce Solution
The explosion of mobile and social technologies, combined with lessons from behavioral performance coaching in sports, allowed us to create a digital production system that works for F&B and CPG manufacturers of all sizes offering quick adoption on the frontlines with rapid results.

This Redzone Connected Workforce Solution gives them the same operating advantages enjoyed by organizations like Toyota, without the armies of industrial engineers and CI personnel—at a much lower cost. This report shares the evidence from a community of 700 such plants that implemented it.

The Evidence
With detailed performance data from 700 plants and over seven years of production history, this dataset provides the most comprehensive, empirical evidence base for productivity improvement anywhere in the industry.

These results defy many perceived wisdoms about CI, the workforce's appetite for change and the ability to sustain step-change leaps in performance. It is not intended as an explanation of how this is accomplished. However, Appendix 7.4, *What is the Redzone Connected Workforce Solution?* offers options for the reader to explore this further for their own plant.

This evidence from a community of 700 organizations proves the Redzone Connected Workforce Solution approach turns the dismal history of failures by traditional methods on its head, accomplishing a 100% success record in 90 days and—even more remarkably—sustaining gains over the long term.

I hope you find it a worthwhile read and that it inspires you to action.

Richard Tester

Co-CEO, Redzone

2.1 Redzone History and Growth

Since launching the Redzone Connected Workforce Solution in 2013, the number of plants in the Redzone Community has grown to more than 700 in 2021, representing the largest—and fastest growing—community of food, beverage (F&B) and consumer packaged goods (CPG) manufacturers on a common digital production system anywhere in the world.

Fig 1: **Number of Plants Running Redzone by Year**
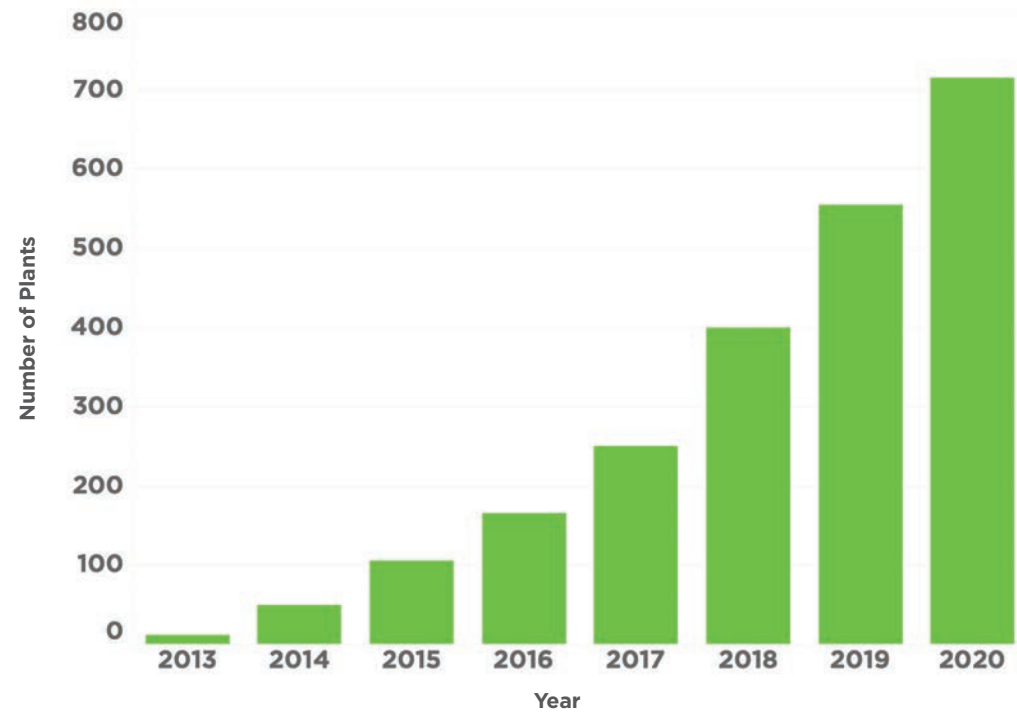
Every plant represented in this benchmark report utilizes the Redzone Connected Workforce Solution software and continuous improvement activities across all production lines. Therefore, the results and findings in the report are generated from the largest dataset of its kind.

2.2 The Redzone Community

Redzone customers become part of a community who share ideas, best practices and lessons learned from their partnership with Redzone. Because that partnership transcends the typical customer-vendor relationship, Redzone customers will be referred to as community members for the remainder of this report.

The following charts show the various breakdowns of the 700 plants in the Redzone customer community by market, channel and revenue. A unique quality of this community is that plants range from small, privately held companies with $10M in revenue to the world's largest F&B and CPG manufacturers with a global network of plants, comprised of multiple divisions and markets. The segments that these companies serve span from ingredients for other manufacturers, products for food service and finished goods products for retail. Further, the sample is fairly evenly split with approximately 36% Retail, 20% Food Service and 44% mix of both.

Fig 2: **Plants by Market Segment**
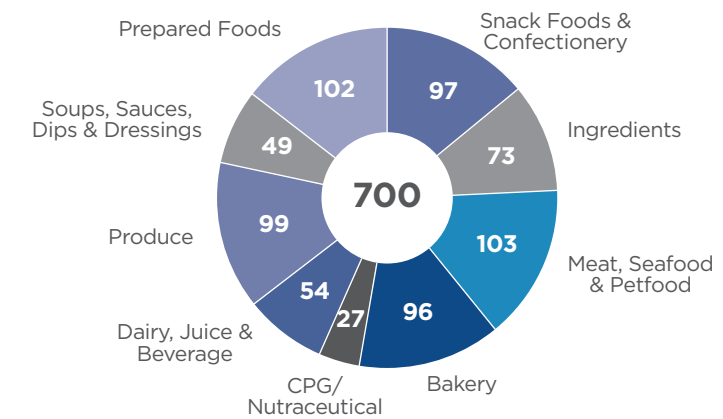
Fig 3: **Plants by Channel**
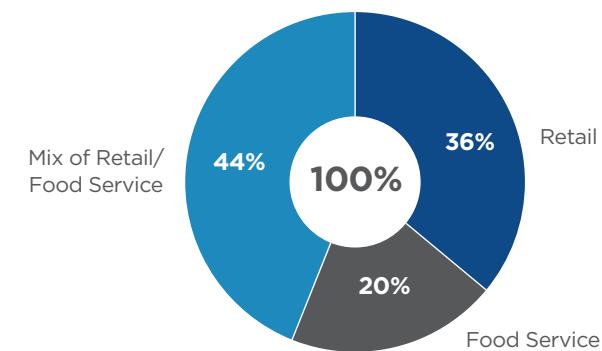
Fig 4: **Plant Revenue**
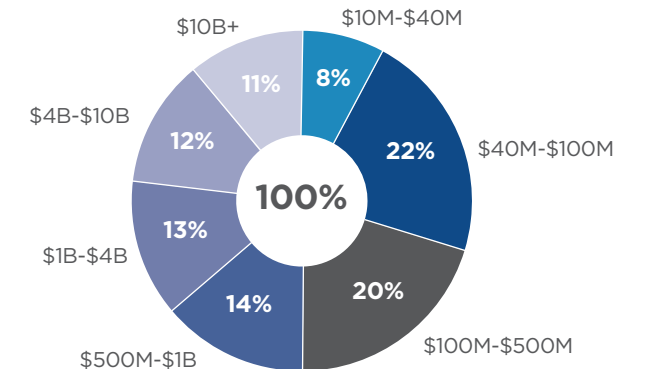
2.3 Scope of the Study

Since launching Redzone, the company has conducted a study every 2 years to provide an industry benchmark that quantifies the impact of the solution for community members. As a cloud platform that is aggregating data directly from production lines and combining it with context from front line teams, the data provides a uniquely accurate representation.

Cohort	Year	Description of Enhancements	# of Plants	Avg Points of OEE Uplift	Avg improvement in Productivity
1	2013-2014	OEE visibility and social communication	50	6.6%	11.8%
2	2015-2016	*Win the Day* routines and standard work	150	7.1%	12.3%
3	2017-2018	Daily *vital signs*, problem solving and deliberate practice	200	7.8%	14.5%
4	2018-2020	Re-tooled coaching and technology for frontline engagement, recognition, celebration	300	12%	22%

The 2018 – 2020 cohort is the largest data set that has been analyzed at 300 plants and includes data from the following:

Metric	Count	Metric	Count
Plants	300	Production Runs	6,555,000
People (Frontline Workers)	73,500	Production Lines	2250
Production Shifts	1,980,240		

03 BENCHMARK STUDY CRITERIA

This fourth edition of the report includes the following benchmark criteria:

Criteria	Key Performance Indicator
CI Maturity	CI maturity rating (1-10) based on assessment by qualified CI Coach
Baseline OEE	Average starting OEE on focus lines
Reporting Variance	The variance between the manually reported OEE and actual electronically captured and calculated OEE
OEE Uplift & Productivity Improvement	Percentage points of OEE uplift and corresponding productivity improvement
Sustainability	Percentage point of OEE uplift following 90-Day Program
Financial Impact	Estimated Annualized Savings

3.1 Continuous Improvement Maturity

A plant's CI maturity rating is an audit score between 1-10. The audit is conducted by a qualified coach via shop floor observations and interviews with frontline employees and plant leaders. The assessment considers cultural and systemic elements such as goal alignment, results, recognition, daily CI routines, Kaizen, and much more. A plant with a score between 0 and 5 is considered to be at the beginning to foundational stages of CI maturity. A plant with a score above 5 is considered to be between mature and comprehensive with regards to CI.

3.2 Baseline OEE

Overall Equipment Effectiveness (OEE) is a KPI developed by Seiichi Nakajima in the 1970s to evaluate how effectively a manufacturing operation is utilized. It remains the most commonly used metric for measuring efficiency in manufacturing across the world.

OEE is a non-financial calculation of production rate, quality, and line availability that result in production output being measured against the theoretical maximum (TMax) capability of the production process. It is therefore one of the most reliable ways to monitor and compare production efficiencies. It identifies the percentage of manufacturing time that is truly productive. An OEE of 100% signifies a perfect shift; meaning, only good products are produced (100% *quality*), at the maximum speed (100% *performance*), and with no downtime (100% *availability*). See Appendix 7.1, *Overall Equipment Effectiveness (OEE)* or additional background on OEE.

OEE measures efficiency against a common set of standards, and for this report, is calculated using automated signals directly from input and output sensors, PLC's and/or IIoT devices at each line. It is important to understand that not all companies calculate OEE the same. Whereas Redzone does allow flexibility in how OEE is calculated (within best practice guidelines), this report normalizes the method of calculation, ensuring the benchmark accurately compares *apples to apples*. The baseline OEE is always reviewed and agreed upon with the plant leadership team in the first ten days of the deployment to measure the success of the deployment against.

The first number that is reported is the plant's baseline OEE, against which a subsequent increase in OEE is compared over a period of time. This baseline number provides a benchmark for industry and is compared between plants that are early in their improvement journey vs. more mature plants. For the purposes of summarizing; OEEs ranging from 20% and 60% are considered low-to-moderate and OEEs above 60% are considered moderate-to-high.

3.3 Variance Between Manually Reported and Actual OEE

Having introduced this technology in 700+ F&B and CPG plants, it is commonly observed that plants tend to overstate their OEE performance before deploying a digital solution. This was not generally a purposeful *fudging of the numbers* but rather a flaw in manual, paper-based reporting systems and methodologies. The baseline numbers in this report come from real-time automated data collection and therefore represent the actual baseline OEE.

3.4 OEE Uplift and Productivity Improvements

In practice, it is not the static value of OEE, but rather the trend that is most important. Leaders desire an increasing OEE and may ask for explanations in the case of a decreasing OEE. This report benchmarks the uplift between the baseline OEE and the 90-Day OEE resulting from the first 90-Day Coaching Program for focus lines. Focus lines are identified and agreed to with the plant leadership team and typically include high-volume lines that represent 80% of the plant volume. Note: while the system is always deployed plant wide, coaching efforts are deployed disproportionately on focus lines.

At the end of the 90-Day Program, a detailed success assessment is performed. This assessment analyzes the trends of the 90-Day Program and the official result is signed-off by members of the plant leadership team (always including the finance leader). Once the results have been scrutinized and validated, a townhall meeting is conducted with the entire plant team, where the result is celebrated, and specific recognition is provided to those who contributed the most to the change. It is this validated OEE uplift number that is used in this report; therefore, the system data has been verified for each of the plants in the sample.

While *points* of OEE represents a common measure, it does not help in making useful comparisons between plants. Productivity is a normalizing percentage which calculates the change in OEE divided by the starting point for each plant. See below for details.

Calculating Productivity

Example of calculating the productivity improvement for a 40% OEE with a 10% uplift

$$\text{Productivity\%} = \frac{\text{OEE Uplift (10\%)}}{\text{Baseline OEE (40\%)}} = 25\% \quad \text{Represents a 25\% improvement in productivity}$$

From a business perspective, it is this productivity improvement that is the important metric as it directly correlates with the additional *free capacity* that is unlocked. Alternatively, the labor + overhead costs can be dollars saved in non-capacity constrained environments.

Additional—and significant—OEE uplifts are achieved after the first 90-Day Program by all community members who added 90-Day Programs for Compliance and Reliability excelling in the long term. See Chapter 5, *What Did the Most Successful Plants Do Differently?* for more details.

3.4.1 Sustainability

Achieving an initial improvement in performance is only half the battle; so the results are analyzed for the initial step change over the first 90 days and then over the following 1-year and 3-year periods.

This benchmark focuses primarily on the first 90-day increases, but the trendline for Redzone Community members continues to improve during the first year and then year-over-year which is described in section 4.4 *Sustainability*.

3.4.2 Financial Impact

For the purpose of this report, financial benefits are expressed in savings or reduced costs, where a plant produces the same volume with fewer resources. Reduced costs are most commonly realized through reduction of overtime, running fewer (or shorter) shifts, less temporary labor and reducing variable overhead as a result of fewer production hours in one or more areas. For those plants that are not truly capacity constrained, this is the best measure of the financial impact.

However, those plants that are capacity constrained enjoy an impact to both the top line revenue by increasing throughput without additional capital expenditures and even more considerable increases in gross margins where the fixed cost of each unit is diluted across the increased output. Increased throughput is achieved by running the same number of production hours, but with higher rates, less product loss, and less downtime (whether planned or unplanned).

4.1 Continuous Improvement Maturity

Redzone Community members' continuous improvement maturities are audited by a Redzone qualified coach before launching their 90-Day Program using a scale from 1-10 (ten being the most complete and advanced continuous improvement culture). The audit is comprised of five common criteria shown in Fig 5 below, resulting in an average score for each plant. By including this variable, we are able to compare results between plants that are early in the improvement journey vs. those that are very mature and have robust improvement methodologies. These methodologies are well understood, applied and are delivering results that align with customer needs and the business priorities.

Fig 5: **Example CI Maturity Rating Spider Chart**

Average Continuous Improvement Maturity

Score: 4.7
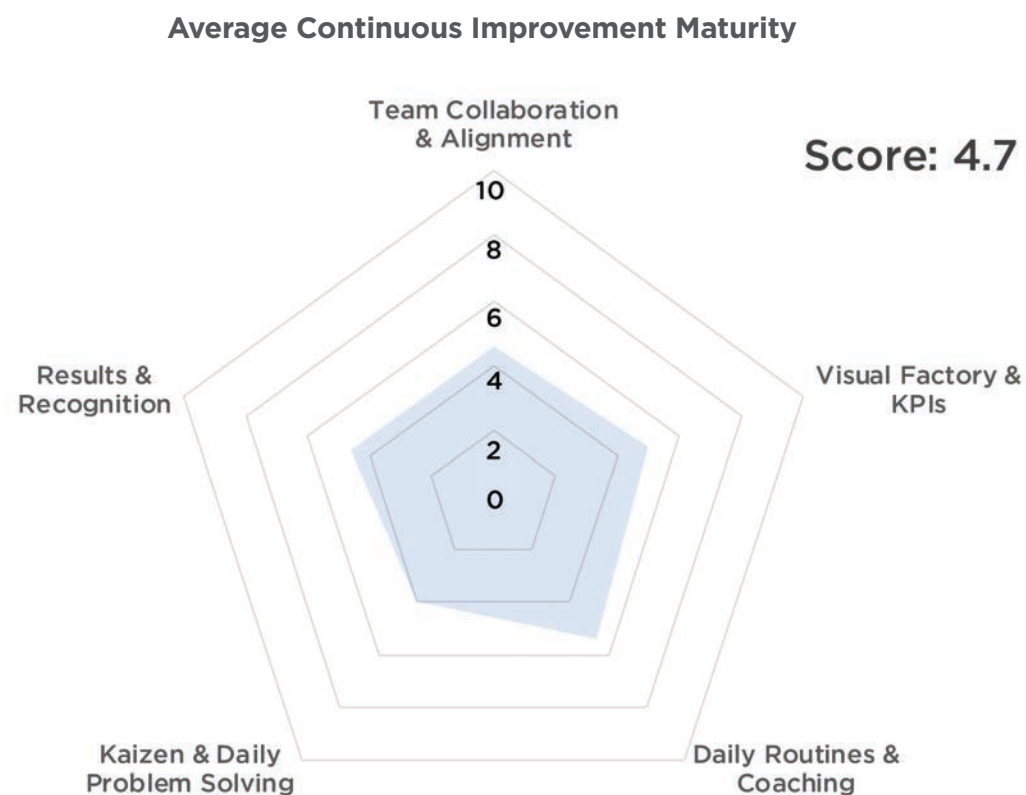
The resulting score then classifies a plant in one of the two following categories:

None to Foundational CI (Rating 1-5): The leadership team is familiar with the concepts of lean manufacturing, six sigma, or other continuous improvement methodologies, but they have not been significantly deployed throughout the organization. Some tools may be in place to drive problem-solving and waste reduction for frontline employees, but the plant team would acknowledge that they are either just starting or in the relatively early stages of the journey.

Mature to Advanced CI (Rating 6-10): All plant employees are aligned around common goals and proactively collaborate across functions to drive improvement. Continuous improvement is seen as a part of everyone's core responsibilities, visual management is clear and obvious, and systems are in place to drive standard work and daily operational cadences. The common skills associated to root cause analysis and problem solving—Kaizen, 5S, SPC—are well understood from management to the plant floor and are applied on a day-to-day basis.

The distribution of these ratings by number of plants is illustrated in Fig 6 opposite:

Fig 6: **Distribution of Plants' CI Maturity Rating**
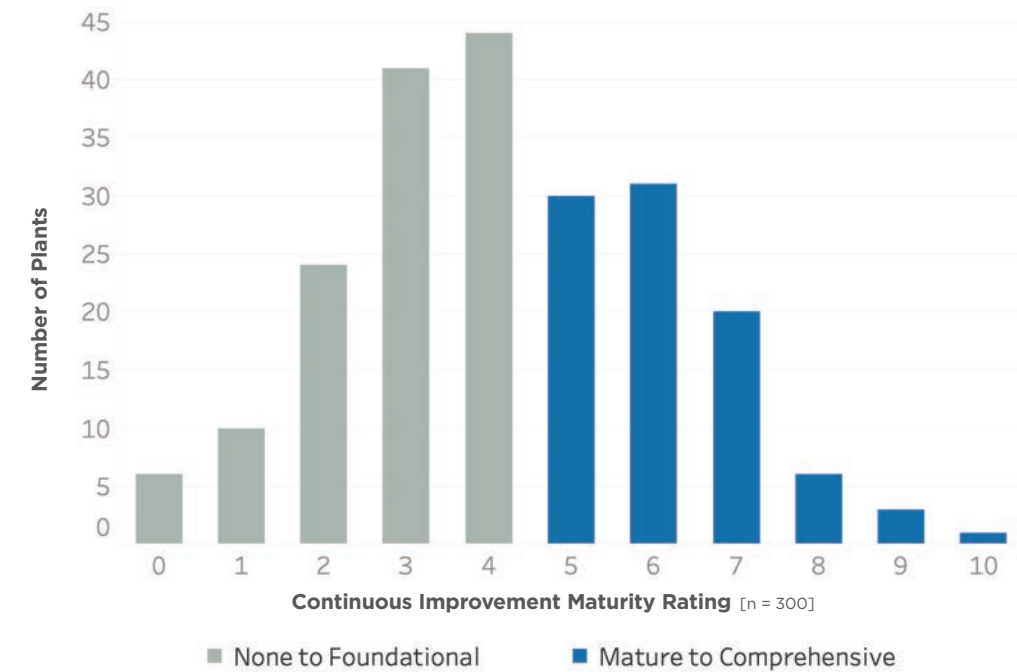
4.2 Baseline Data – OEE Starting Points

To eliminate the negative effects of OEE over-reporting (as described in 3.3), baseline OEE was measured by aggregating the observed OEE during the 1-2 weeks prior to launch and the 2 weeks following. The 90-Day OEE was measured over the last 2 weeks of the 90-Day Program. The baseline OEE varied dramatically across the sample size as indicated below, ranging from the 20s to the high 80s. Across the 300 plants the average OEE baseline was 54%.

Fig 7: **Distribution of Baseline OEE Across 300 Plants**
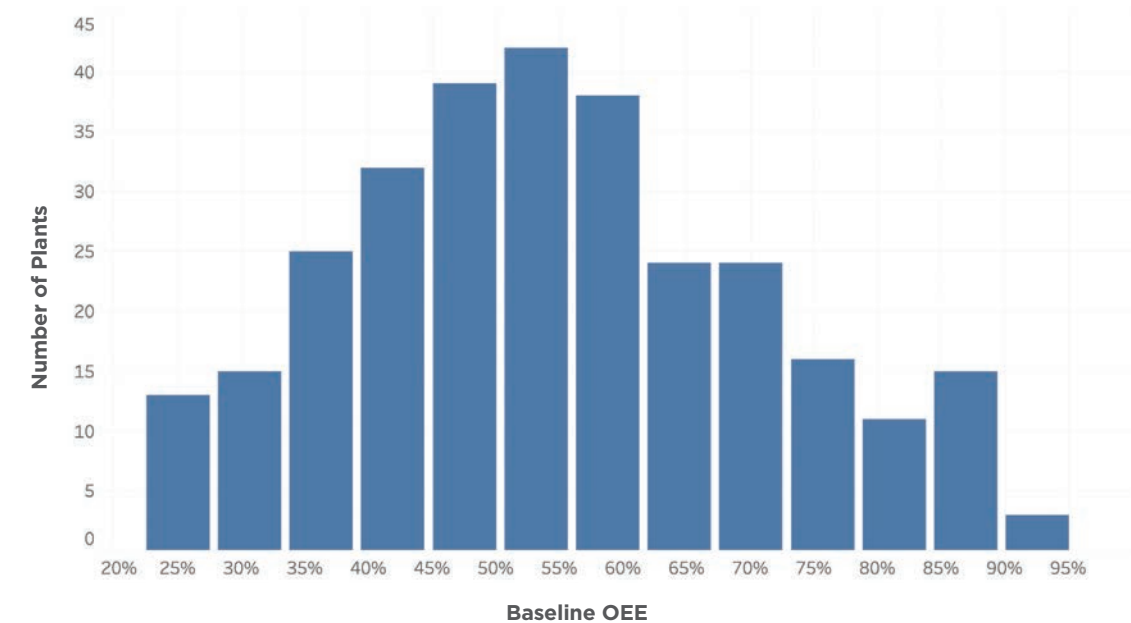
With such a wide distribution of baseline OEE, the data was then analyzed to identify if there was a difference between plants that were rated as earlier in their CI journey vs. plants that were more mature and exhibited a more comprehensive CI program.

The data below clearly demonstrates that those plants that exhibited a more mature CI program had a higher starting OEE vs. plants that were earlier in their maturity curve. Those companies in the early stage showed an average starting point of 47.1% compared to more mature plants that showed a starting point of 63.7%. In both cases, these starting benchmarks show the enormous productivity opportunity that is available to F&B and CPG companies

4.2.1 Baseline OEE by Market Segment
One common question is in regard to the variation in baseline OEE across the different market segments in F&B and CPG. It is interesting to see that the average starting points illustrated in Fig 9 do not vary statistically from one segment to the next. Details and findings for these segments can be found in the appendix in Section 7.3.

Fig 8: **Distribution of OEE by CI Maturity**

Fig 9: **Baseline OEE by Market Segment**
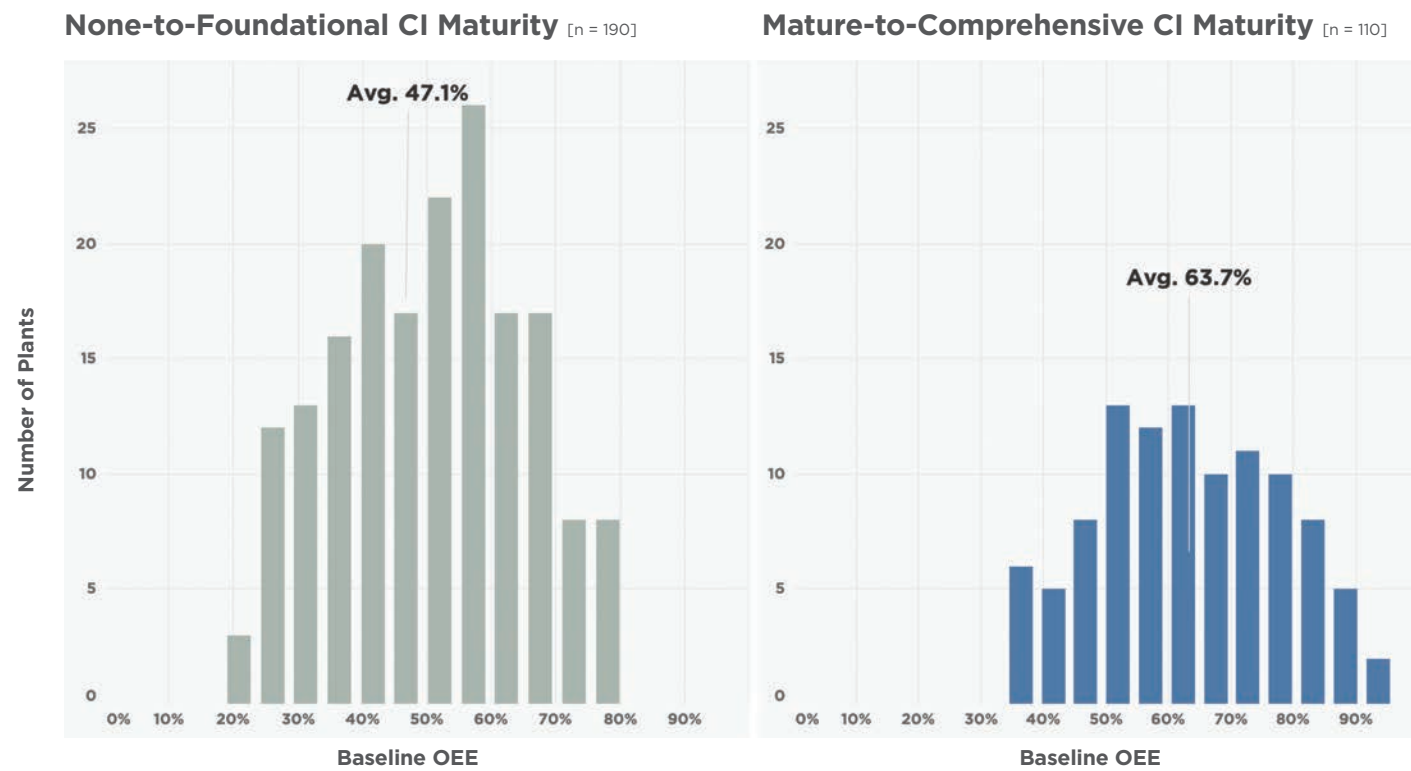
Although this finding is relatively intuitive, it does validate the fact that these CI techniques (visual factory, team alignment, Kaizen, problem solving, etc.) make a statistically material impact on the baseline OEEs. This should encourage plants that are earlier in their maturity curve to accelerate their CI efforts and for more advanced plants to double down on systematizing a continuous improvement culture.

4.2.2 Variance Between Reported and Actual OEE

Having conducted over a 1000 benchmarking exercises, it was commonly observed that plants tend to overstate their reported OEE when relying on manual systems. Given that this over-reporting represents hidden cost saving or capacity opportunities, this fourth edition of the report assessed precisely how much plants tend to over report. Fig 10 shows that the 300 plants represented by the data in this report overstated their baseline OEE by 11 percentage points on average. This is significant as for an average size F&B or CPG plant; this represents over $1M of hidden opportunity. The most common reasons found for the discrepancy were:

1. Over allocation of planned downtime
2. Understating theoretical maxes
3. Insufficient accounting of quality losses

Fig 10: **Reported Average OEE vs. Actual**
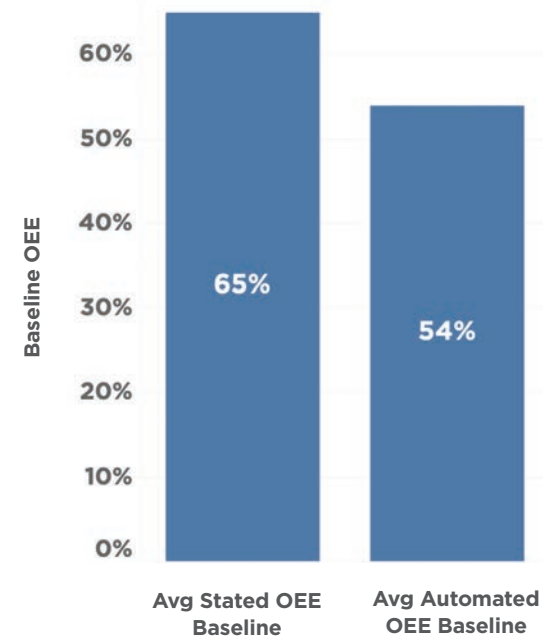
4.3 OEE Uplift and Productivity Improvement

An OEE uplift is measured as the difference between the baseline OEE and the 90-Day OEE on focus lines. Across the sample of 300 plants the average uplift in OEE was 12 percentage points with the distribution illustrated in Fig 11 below:

Fig 11: **% Points of OEE Uplift Distribution Across 300 Plants**
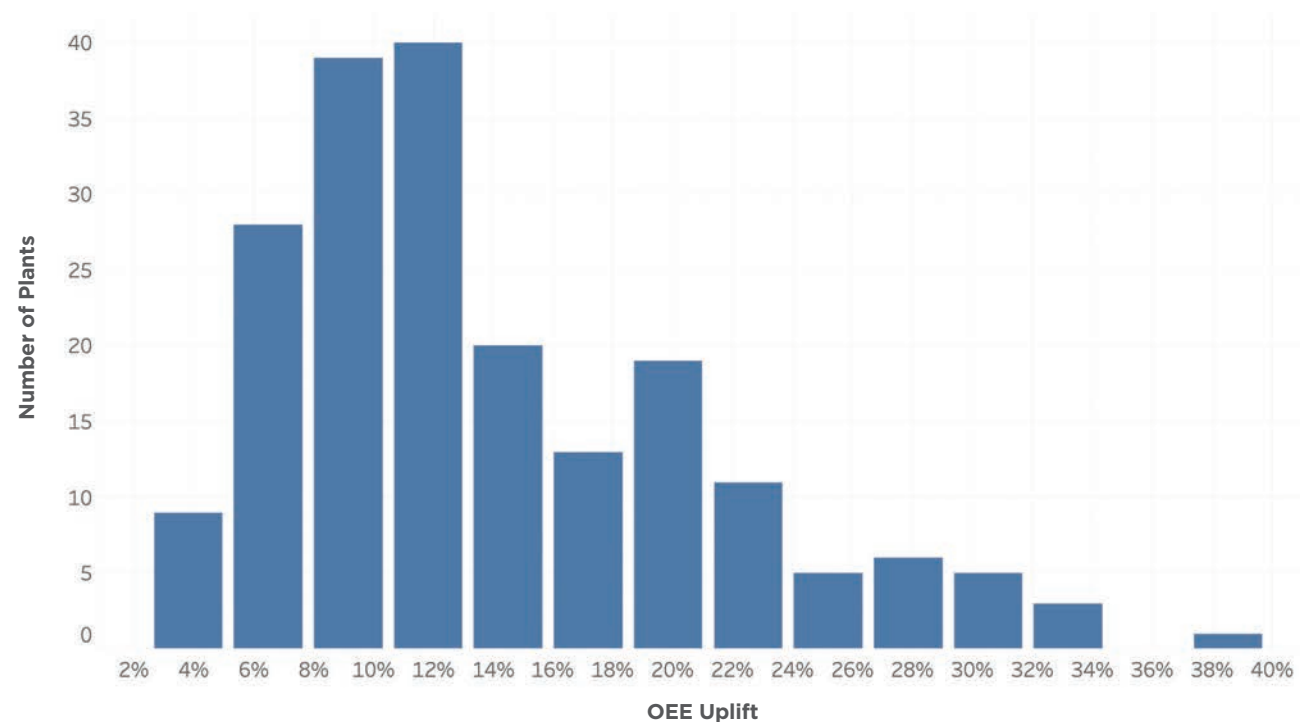
Fig 12: **Detailed and Average OEE Uplift Across 300 Plants**
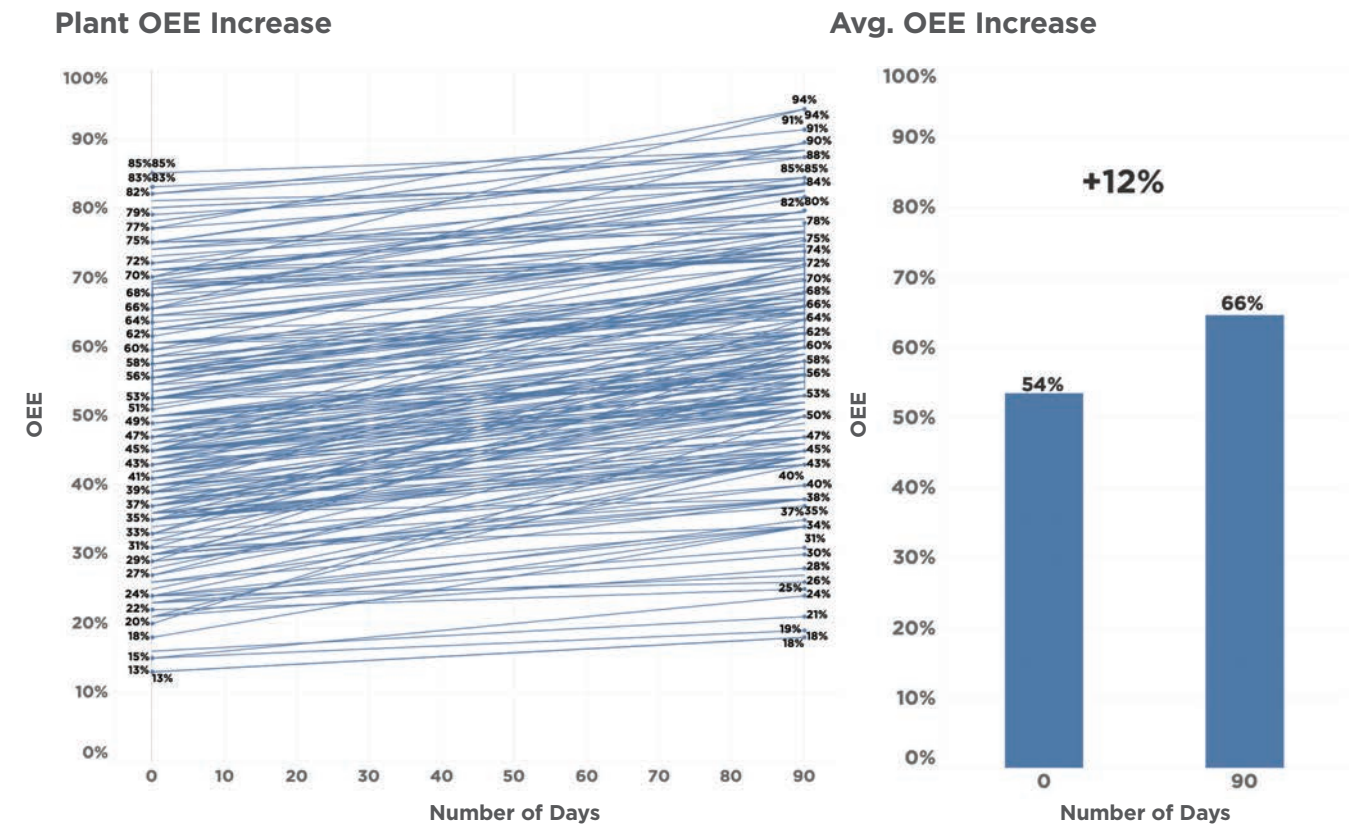
As the data was further dissected, four logical groupings of plants emerged that showed statistically similar OEE uplifts and productivity increases. Although all plants showed significant improvement, the two characteristics that correlate most with the OEE uplift were CI maturity and baseline OEE.

The regression analysis below show the strength of the relationship of the two variables with the strongest correlation to a plant's 90-Day OEE uplift: 1) Baseline OEE and 2) the CI Maturity index. In general, Pearson R coefficients less than -0.5 or greater than +0.5 indicate a strong relation between the input variable and the outcome (OEE uplift in this case).

Given this observation, the charts below show the OEE uplift and productivity improvements for the 300 plants included in this study over the first 90-day period based on these characteristics. Results are presented as a function of the matrix:

Fig 13: **Regression Analysis Comparing Productivity Increase**

Fig 14: **OEE Uplift for Low Baseline / Low Maturity – _Gainers_**

Baseline OEE vs. OEE Uplift

CI Maturity vs. OEE Uplift
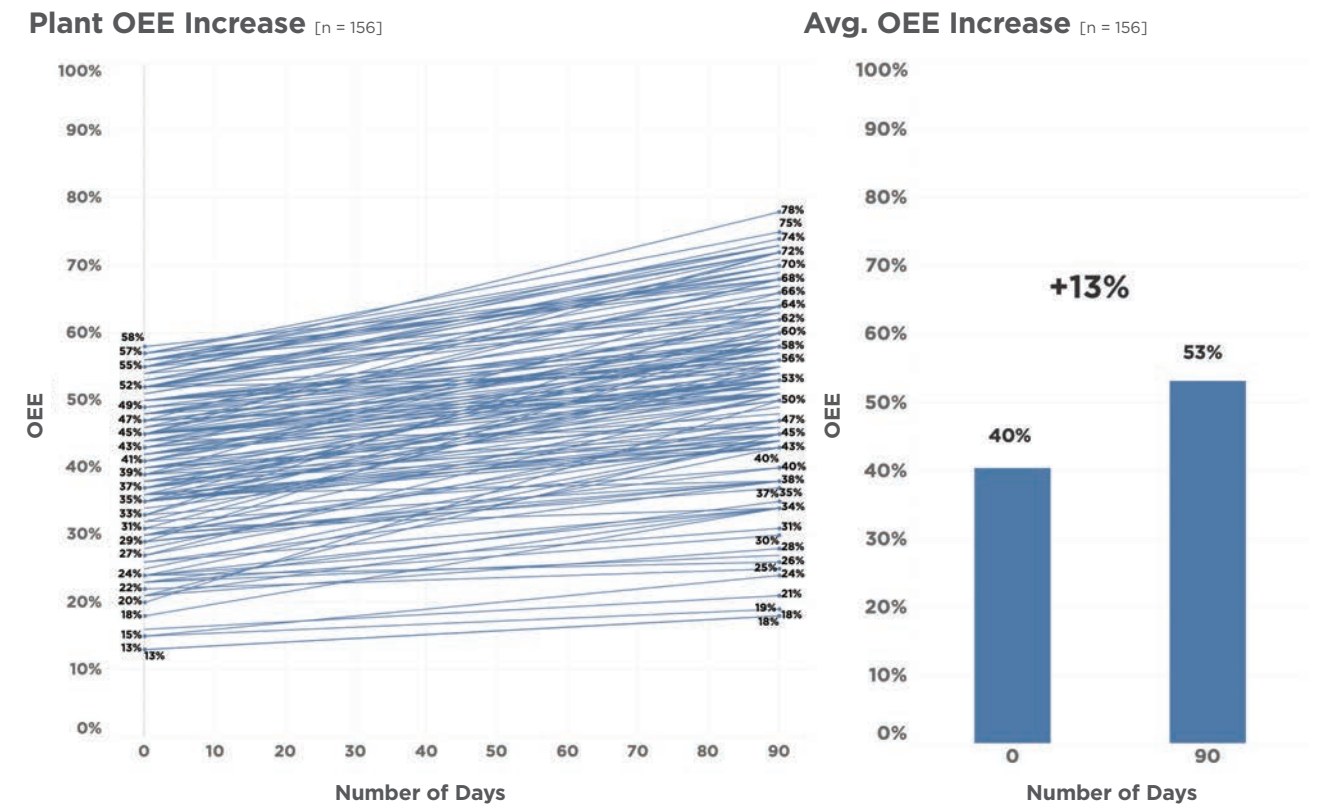
This group showed the greatest level of OEE uplift (13% points) and productivity improvement (33%). With a significant amount of opportunity coupled with structured improvement methods being introduced for the first time, this group demonstrates how immediate and significant the Redzone approach is. Given this group achieved the highest overall OEE uplift and productivity improvement they were classified as *Gainers*. These findings dispel the myth that a plant has to be *ready,* or *lay foundations,* to benefit from this CI approach.

Fig 15: **OEE Uplift for Low Baseline / High Maturity – *Changers***

Plant OEE Increase [n = 62]

Avg. OEE Increase [n = 62]

+12%
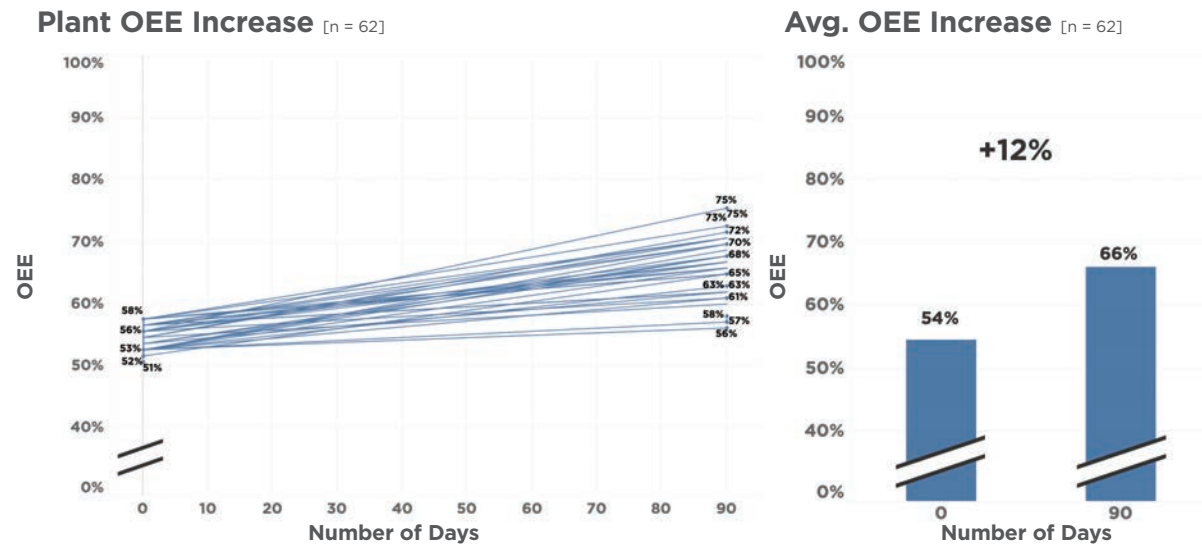
A smaller subset of the study population are those plants with advanced CI maturity, yet relatively low OEE starting points. Termed *Changers* due to the need to refocus CI efforts in order to get better value from their efforts, the uplifts in both OEE (12% points) and Productivity (22%) remain significant for these companies as the approach allows for the shifting of resources to true problem solving rather than the day-to-day maintenance of existing CI efforts that are not moving the needle fast enough. The relatively low OEE is most commonly the result of high changeover, short run business models. While the business model does not change, changeover times are improved and agility increased as a result of the Redzone approach and the CI efforts are more focused and action orientated directly leveraging the frontline teams to enhance the value from these efforts.

Fig 16: **OEE Uplift for High Baseline / Low Maturity – *Accelerators***

Plant OEE Increase [n = 45]

Avg. OEE Increase [n = 45]

+10%
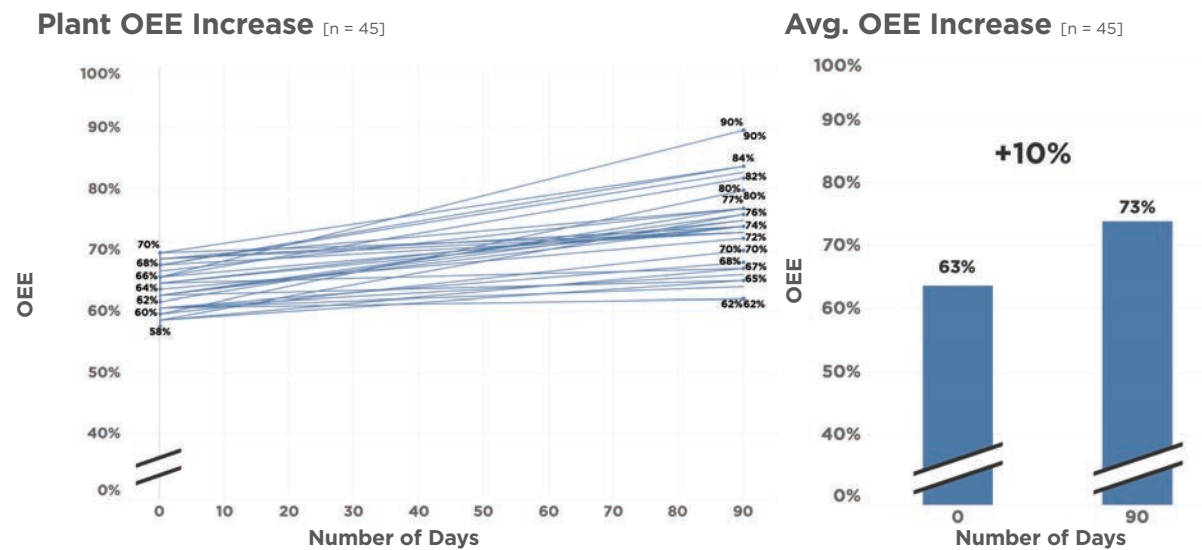
Alternatively, the *Accelerators* are the population of plants demonstrating relatively high baseline OEE performance without comprehensive CI programs in place who are typically looking to accelerate these relatively high baselines. In general, these operations produce a lower number of SKUs, resulting in fewer changeovers between product formats and are viewed as relatively straight forward manufacturing processes. OEE uplifts (10%) and productivity improvements (16%) remain significant as CI efforts focus on eliminating minor stoppages, running optimal rates, and creating a fast responding, problem solving culture.

Fig 17: **OEE Uplift for High Baseline / High Maturity – *Sustainers***

Plant OEE Increase [n = 37]

Avg. OEE Increase [n = 37]

+8%

Many plants already experience a best-in-class combination of factors: high starting OEEs enabled by existing advanced CI programs. These *Sustainers* are generally very large and advanced plants with a large pool of technical resources and CI expertise. In many cases these high performing plants had sta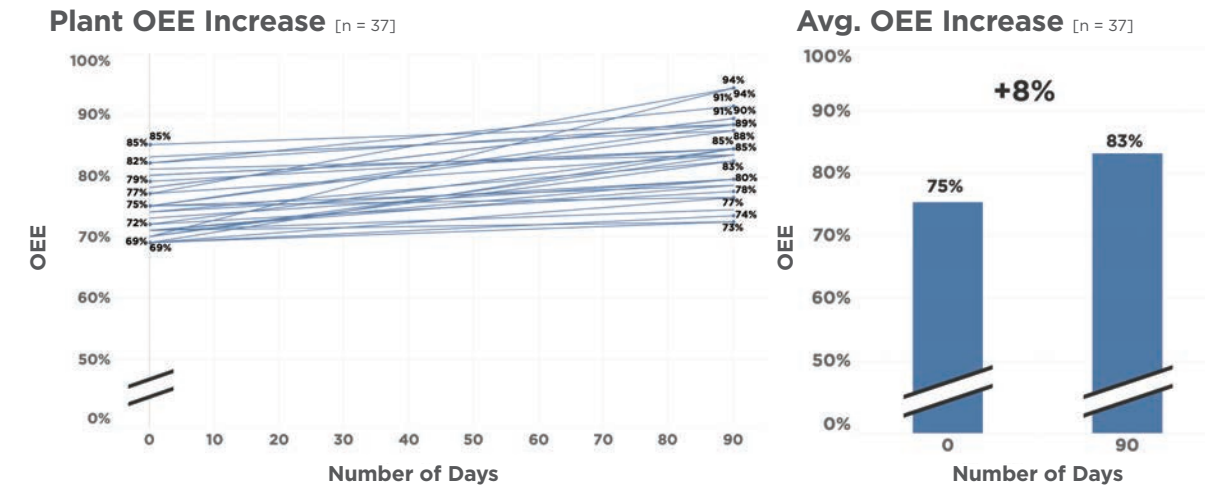rted to plateau in terms of productivity improvements and were looking for the stimulus to drive OEEs from the mid 70s into the 80s and then lock in those gains. Considering the high starting baselines, the gains were still significant following the Redzone approach. Additionally, they delivered outsized savings and return on investment as the improvements made would not only be prohibitively costly and time intensive to achieve via traditional methods; but deliver more in real dollars due to the size, scope, and volumes of product these plants produce.

In summary, all 300 plants experienced OEE uplifts averaging approximately 12% points and an associated 22% productivity improvement across the sample with the categorical averages for each category represented in the following results matrix:

Category	Baseline OEE	90-Day OEE	OEE Uplift	Productivity
All 300 Plants	54%	66%	12%	22%
Gainers: Low Baseline OEE / Low Maturity	40%	53%	13%	33%
Accelerators: High Baseline OEE / Low Maturity	63%	73%	10%	16%
Changers: Low Baseline OEE / High Maturity	54%	66%	12%	22%
Sustainers: High Baseline OEE / High Maturity	75%	83%	8%	11%

The findings are the basis for modeling a plant's specific opportunity. The model consistently and accurately predicts the OEE uplift that a company can expect to achieve when adopting the technology and behaviors instilled during a Redzone 90-Day Productivity Coaching Program. The model is summarized in the matrix below.

Fig 18: **Initial 90-Day Benchmark Results Matrix**

Continuous Improvement Maturity

■ BASELINE OEE ■ PTs OEE UPLIFT **XX%** 90-DAY OEE
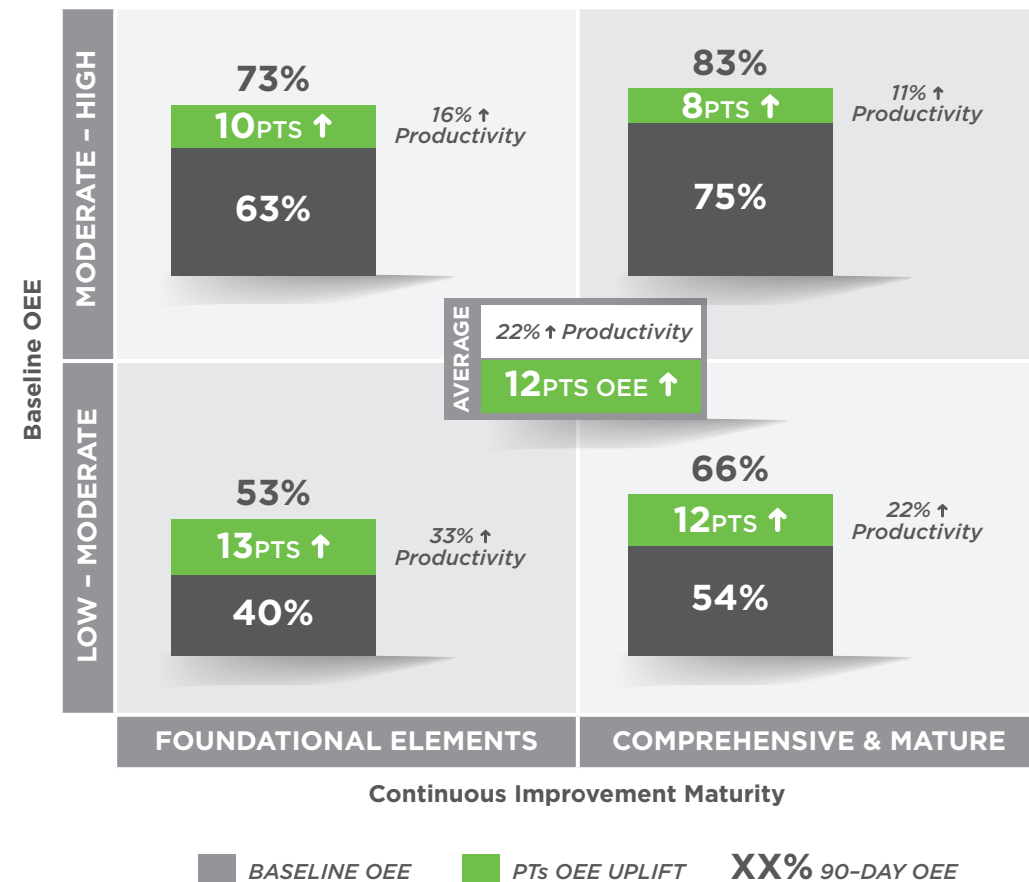
4.4 Sustainability

As anyone that has been involved in a change management or improvement project will attest, getting an improvement in short-term performance is only half the battle. Making sure short-term gains are sustained and that everyone does not revert to their *old ways* of doing things is the real test.

4.4.1 OEE Increase Over One Year

The previous three reports have demonstrated not only that Redzone Community members sustain the gains made over the first 90 days; but continue to make additional gains in OEE over the first year and beyond. This most recent cohort continues that trend and although the gains over the first 90 days have increased (as above) the results continue to grow over the 1st year.

The chart below shows a subset of the 300 plants that have been live for over one year (187 plants) and the uplifts they achieved upon completion of the 90-Day Program. The average OEE continued to incrementally improve by 3 percentage points throughout the first year as illustrated in Fig 19 opposite, giving a 1st year average OEE uplift of 15% points or 28% productivity improvement.

Fig 19: **Average OEE Point Uplift Over the First Year with Redzone**
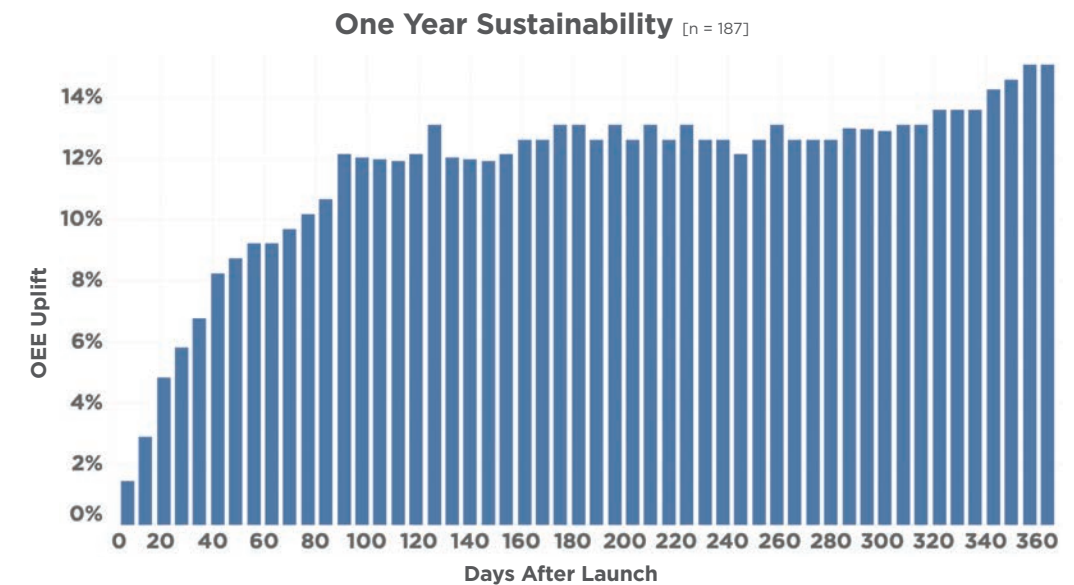
Regardless of the variability of the included manufacturers, the data shows that all plants make dramatic gains in the first three months following go-live of the initial Productivity module (see Appendix 7.4, *What is the Redzone Connected Workforce Solution?* for product details) and continue with a steady increase over the course of their first year.

4.4.2 OEE Increase Over Three Years

A common request from readers of this report is for sustainability data over a number of years. To analyze the results over a three-year period, a subset of the plants including those who launched in early 2018 (48) were analyzed. Fig 20 below includes a 1000-day trend of productivity. This subset improved OEE by approximately 12 percentage points over the first 90 days, followed by a similar 3-point uplift over the remaining first year. The trendline for the next two years continues to increase by 3–4 percentage points of OEE per year, showing an average point improvement of approximately 22 percentage points of OEE over 3 years. This represents a transformational productivity gain of approximately 41%.

Fig 20: **Average Points of OEE Increase in the First Three Years Using Redzone**
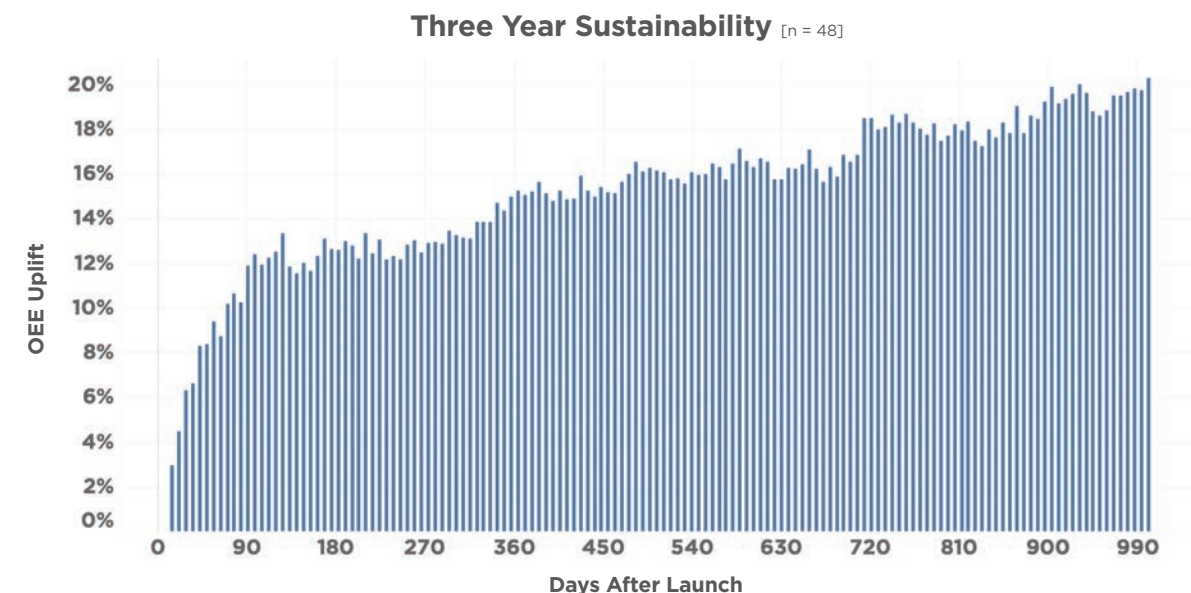
4.5 Annualized Savings

These OEE uplifts are converted to illustrated cost savings to highlight the typical business impact. The degree of cost saving is a factor of both the OEE uplift and the existing labor and overhead cost structure. Larger, higher revenue plants have higher labor and overhead costs vs. smaller plants. The table below shows the typical costs savings per 1 percentage point of OEE uplift for plants of different revenues. A definition of the calculation for impact of 1% OEE is included in the Appendix.

Plant Revenue	Labor Opportunity (per 1% OEE)	Overhead Opportunity (per 1% OEE)	Total Savings Opportunity (per 1% OEE)
All Plants	$61,334	$17,179	$78,513
$10M - $40M	$34,312	$9,865	$44,177
$40M - $100M	$71,837	$16,204	$88,041
$100M - $250M	$94,247	$23,477	$117,724
$250M - $500M	$168,327	$51,218	$219,545

4.5.1 Illustration of Savings

In order to illustrate likely savings, the revenue of each plant was cross-referenced against the four categories that were described earlier. Although this is a generalization, there was a correlation between the category of plant and the most likely revenue band:

- *Gainers* (low-low) were most likely to be $10M - $40M range, meaning the value of 1% point was $44,177
- *Accelerators* (high-low) were most likely to be in the $40M - $100M range, meaning the value of 1% point was $88,041
- *Changers* (low–high) were most likely to be in the $100M - $250M range, meaning the value of 1% point was $117,724
- *Sustainers* (high-high) were most likely to be in the $250M and above range, meaning the value of 1% point was $219,545

Using these generalizations enables an illustrated likely savings depending on a plant's maturity and baseline. This is calculated purely from labor and overhead savings generated by OEE increases. They do not take into account the savings from reduced overtime, the value of scrap reduced or targeted Kaizen problem-solving activities.

Bringing all of these benchmark results together in Fig 21 opposite, shows that it is possible to consistently deliver rapid, measurable gains across the F&B and CPG industries, regardless of process type, size, product mix, CI maturity or starting OEE. This demonstrates true continuous improvement as an **outcome**, and not just a philosophy or methodology.

It is worthy of note that the most recent cohort shows a step-change improvement from the previous cohort with the average OEE uplift increasing from 7.8 percentage points (13.3% productivity increase) to 12 percentage points (22% productivity increase). This step-change can be directly attributable to changes made in both the technology and coaching methods as a result of the vast experience the Redzone teams now have in deploying these enablers. This result is even more impressive in light of the new challenges the industry faced from March 2020 when COVID-19 first arrived.

Fig 21: **Initial 90-Day Benchmark Results Matrix With Savings Estimates Included**
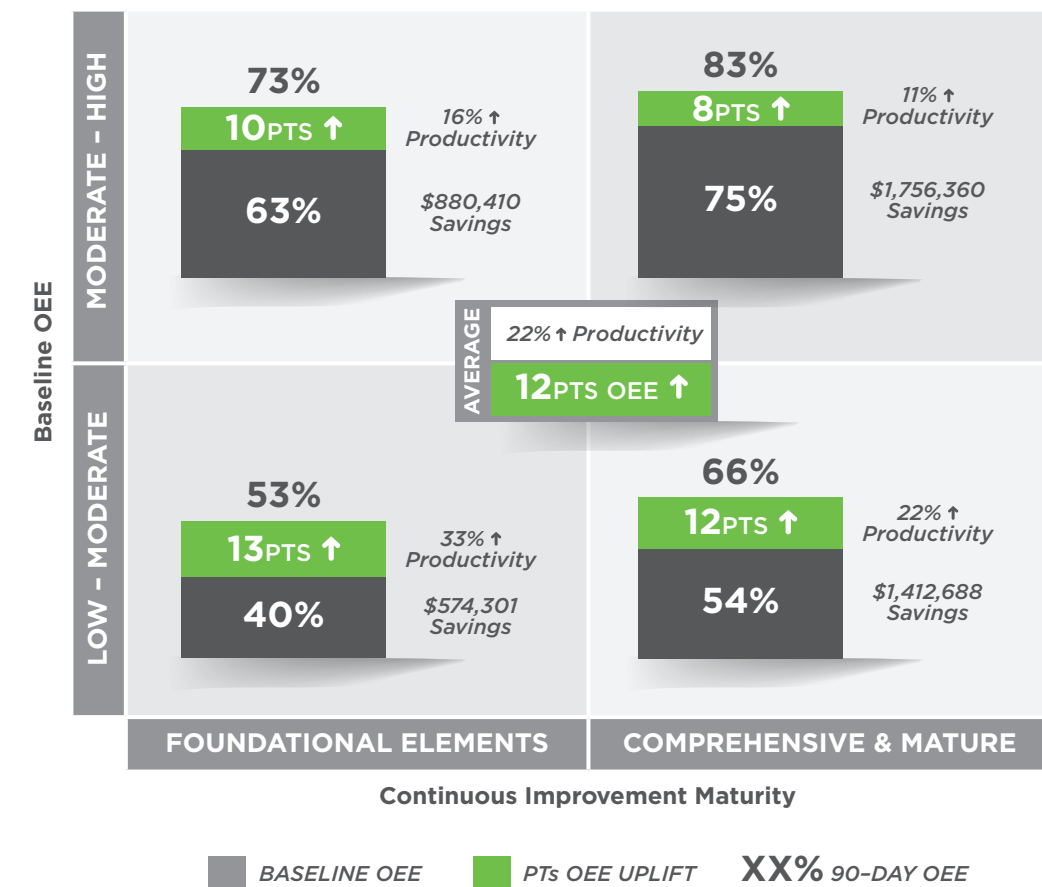
4.5.2 Intangible Benefits

Many intangible benefits were reported such as increased frontline worker retention and engagement as well as improved flexibility and agility. The ability for frontline workers to move from line to line and be able to quickly operate new lines and equipment was highly visible during the pandemic of 2020 when frontline workers needed to rely on innovation and creativity to just maintain their productivity. In spite of the new challenges, many community members reported record output and productivity during their pandemic responses.

4.5.3 Cultural Transformation

Perhaps the most impactful—but immeasurable—outcome has been the cultural phenomenon that resulted from improved communication across the plants considered in this study. Surely, improved communication contributes directly to OEE improvement, but the impact of everyone-to-everyone communication—giving everyone a *voice*—stimulated a cultural transformation of frontline teams creating their own culture of shop floor ownership and improvement. Anecdotally, plants enjoy lower staff turnover, lower absenteeism and higher engagement; which is often reflected in staff surveys as a result.

In addition to the results included previously, this report examines the traits most commonly observed by Redzone Community members achieving the highest results. These *in-field* observations support our own beliefs around CI methodology. The outcomes from these findings have rolled directly into the product definition and development process resulting in continuous improvement by way of enhancements delivered year-over-year to community members.

Fig 22: **Productivity Uplift Pareto Across the 700 Plant Community**
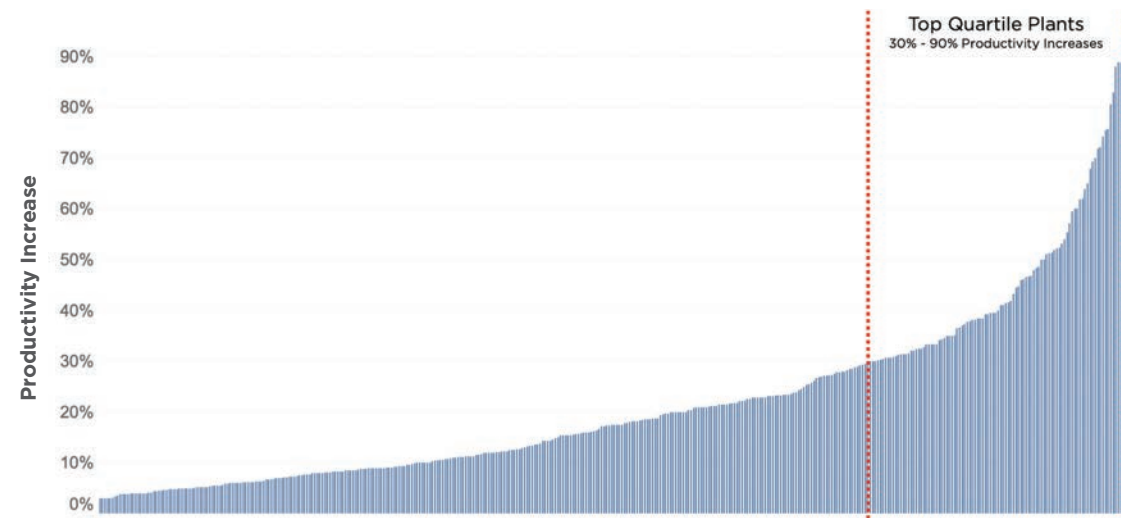
From a deeper analysis of these companies, the following five elements have been established to have been the most significant contributing factors to their success:

5.1 Leadership Team Participation

Senior leadership team (SLT) participation and focus is probably the most important element of any business process change exercise. This does not necessarily imply the allocation of large amounts of their time, but rather a focused application of time on things that have a high impact. Leading plants were found to have SLTs that were highly engaged both with their immediate reports and with frontline workers, both in structured and unstructured interactions. Managers were found to be a common presence on the shop floor engaging with people, listening to their thoughts and issues and giving feedback and encouragement. The SLT also maintained a clear and consistent dialogue regarding company priorities and direction that included broadcast video communications and regular town halls including workers, not just management.

The impact of this was to create well informed workers who had trust in the leadership and felt recognized for their effort and achievements, as well as their collective performance. This was especially felt during the uncertainty of the 2020 pandemic when regular communication was required to keep everyone up with the regularly changing requirements and restrictions. Leaders providing visibility of their actions to everyone on a regular basis was reported as having a big impact on reducing frontline employees' fears.

5.2 Rigorous Forum Discipline

The leading plants all maintained exceptional discipline around structured forums, both at an operational and a leader level. Different plants adopted different forums for specific purposes, but three critical forums were similar across all plants:

1. Shop floor huddles on each line at pre-determined points during the shift involving representatives from each of the Production, Maintenance and Quality teams.

2. Daily operations meetings involving Production, Maintenance and Quality management

3. Weekly improvement review meetings which involved the senior operations leaders and members of wider management team.

More importantly, it was understood that these forums were the primary vehicle to recognize top performers, raise and escalate issues that are interfering with *Winning the Day* and follow up on ideas and actions to correct mistakes. It was also observed that a majority held their daily operational meeting out on the floor, in front of a big screen displaying Redzone, thereby ensuring everyone was aware they were all looking at the real time performance data, and that actions were being followed up on.

5.2.1 Plant-wide Communications, Recognition and Celebration

The leading plants were found to have more open and frequent dialogue with the shop floor and had made significantly greater use of the social and unstructured communications capabilities in Redzone. These plants were significantly more frequent users of Redzone chats, issues and alerts to enable peer-to-peer problem solving and on-the-spot decision making. They had also published standard work instructions on how to use the data to make decisions.

In addition, it was found that the leading plants had taken the time to establish realistic but challenging hourly performance targets and daily goals, which had been widely communicated on dashboards, leaderboards and line-side iPads.

Leadership teams in the most improved plants created highly visible mechanisms to monitor and share progress to promote the most productive activities. Rewarded behavior is repeated behavior, so higher performing plants had higher degrees of recognition such as using *high fives* and *good catches* sent from the Redzone app to *catch people doing the right things.* More formal Reward & Recognition programs were recognized in higher performing plants such as incentivizing higher performance with monetary or otherwise valuable rewards. Finally, higher performing plants held more town halls to publicly recognize individuals, teams, and overall company performance.

5.2.2 Practice

The most subtle, yet overwhelmingly consistent characteristic of the leading plants was their attention to repetition and practice. It is well understood that people learn by doing, and need to go through the steps of observing, practicing and mastering new skills in order to implement new behaviors. This is fundamental to the Redzone Way.

5.2.3 Stayed on the Redzone Journey

This report focuses on the results obtained across the Redzone Community during their first 90-Day Program. It was, however, a common observation of plants that continued on the Redzone journey, deploying additional capabilities such as Compliance and Reliability, achieved further *leaps* in performance beyond the incremental improvements of plants that only implemented Productivity modules. Additional step-change uplifts are accessible with the addition of the Compliance and Reliability modules including their associated 90-Day Coaching Programs. See Fig 23 below that shows the incremental results experienced by the plants that continued on the Redzone journey.

Fig 23: **OEE Uplifts Available from Continuing the Redzone Journey**
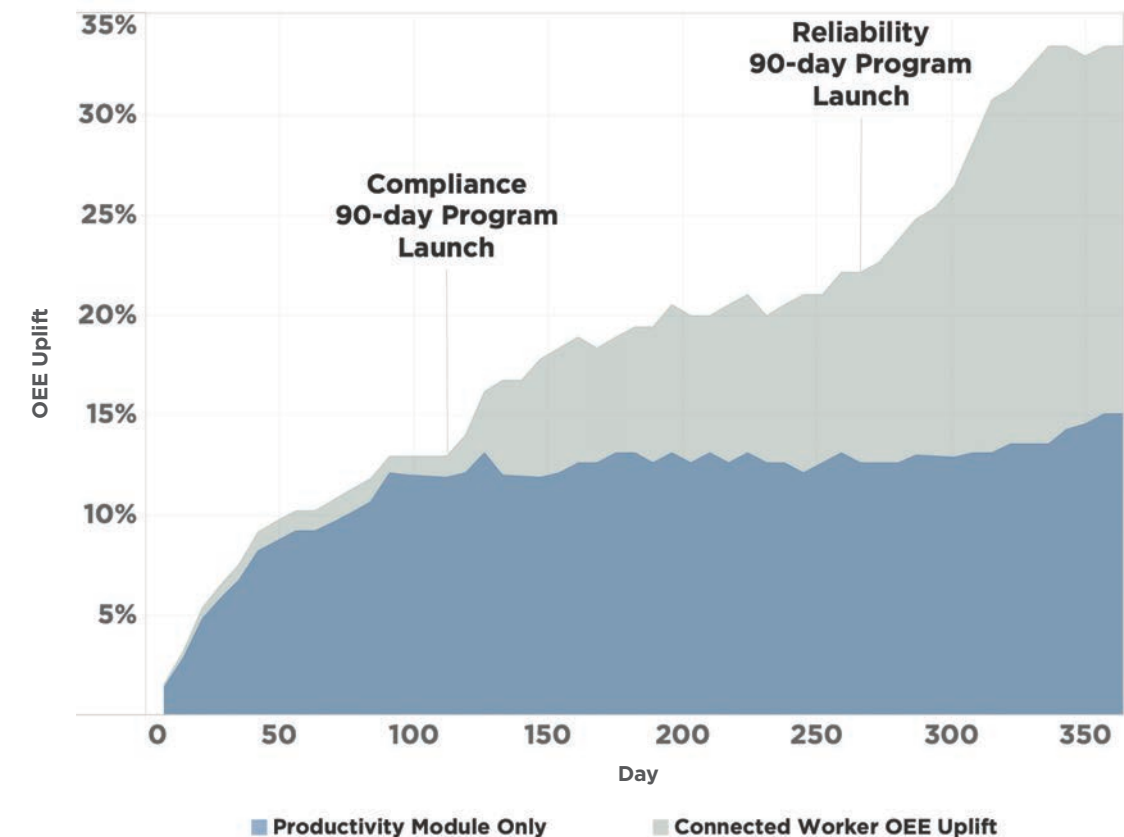
The productivity improvement results shared previously highlight miraculous performance improvements for F&B and CPG manufacturers. For an industry reporting an average baseline OEE of about 54%, the opportunity to improve and deliver *more with same* is dramatic! The average 12% OEE uplift or 22% productivity improvement is compelling for those seeking *Productivity Now*.

The approach to enlist and empower frontline workers though continuous improvement coaching supported by easy to deploy technology and robust social-mobile communication tools is clearly working for this community of 700 plants. The results of these controlled measurements of the finite scope of improvement over 90 days is exciting, and the sustainability is predictable.

This report clearly indicates that any F&B or CPG manufacturer—regardless of segment—can enjoy double digit productivity improvements irrespective of their size. The metrics that impact the magnitude of the result is clearly a function of baseline OEE and CI maturity, but for all delivered exemplary value and ROI.

Moreover, you can expect valuable intangible improvements such as dramatic enhancements to your shop floor culture (and beyond) where your workers want to come to work—for you—and commit more to their work when they are there. Although listed as an *intangible*, this results in a virtuous circle of improved culture delivering higher worker engagement that results in higher performance that continues to energize the culture. Repeat.

These results defy some preconceived notions that "Frontline workers aren't able to use modern technology." They can. They want to. And they prove it in spades with Redzone. This report is the most comprehensive empirical evidence for productivity performance in the F&B and CPG industries. It is the proof.

We hope this report convinces you to consider your place on the above matrix and decide whether your business could leverage the additional competitiveness and financial returns clearly available to you. The next step is yours.

Richard Tester

Co-CEO, Redzone

Initial 90–Day Benchmark Results Matrix

Baseline OEE

MODERATE – HIGH

73%
10 PTS ↑
63%
16% ↑ Productivity
$880,410 Savings

83%
8 PTS ↑
75%
11% ↑ Productivity
$1,756,360 Savings

22% ↑ Productivity
AVERAGE **12** PTS OEE ↑

LOW – MODERATE

53%
13 PTS ↑
40%
33% ↑ Productivity
$574,301 Savings

66%
12 PTS ↑
54%
22% ↑ Productivity
$1,412,688 Savings

FOUNDATIONAL ELEMENTS | **COMPREHENSIVE & MATURE**

Continuous Improvement Maturity

■ *BASELINE OEE* ■ *PTs OEE UPLIFT* **XX%** *90–DAY OEE*
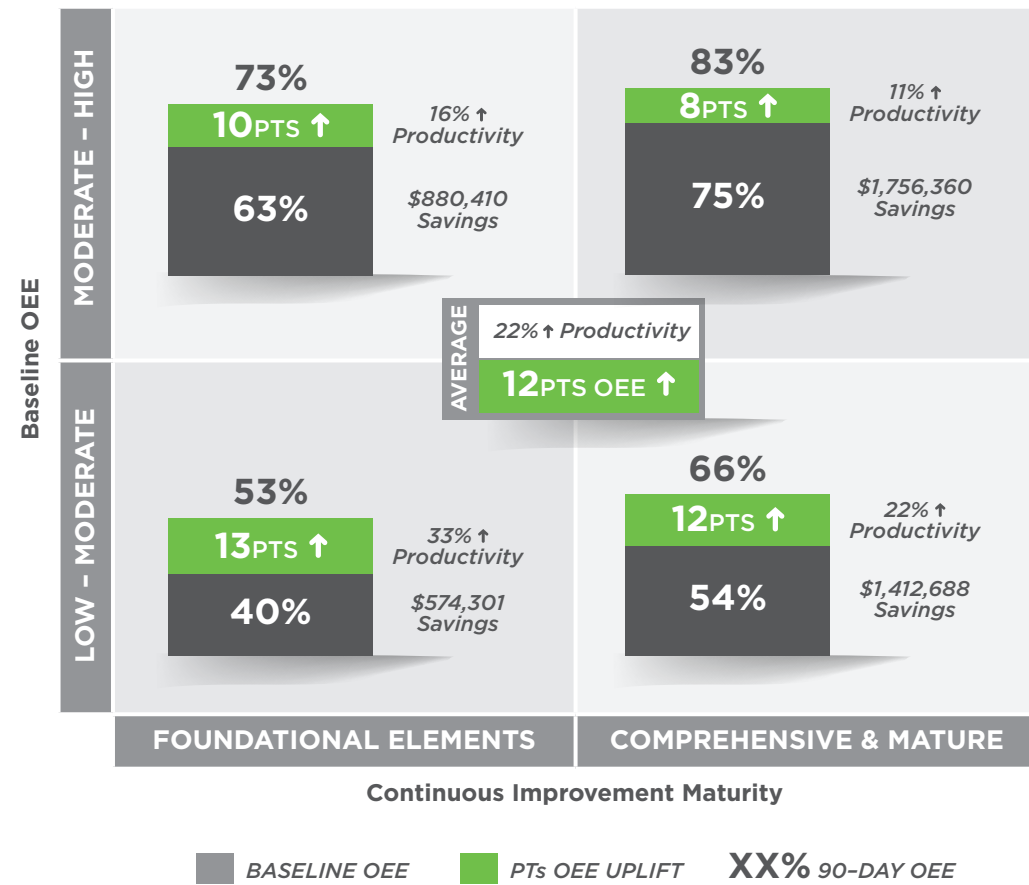
The *Initial 90-Day Benchmark Results Matrix* above illustrates the broad range of opportunities for productivity improvement across the F&B and CPG manufacturing spectrum. Whether you are a low performing plant who aspires to implement CI or a highly sophisticated CI environment with already high performing results, you can count on results that will move the needle on your capacity and/or profitability.

07 APPENDIX

7.1 Overall Equipment Effectiveness (OEE)

Manual calculations of OEE use recorded downtime and scrap figures to derive the performance losses from a perfect 100%. As downtime and scrap are often mis-recorded in manual systems, collecting this data automatically using sensors, as the Redzone Connected Workforce Solution does, is much more accurate.

Overall Equipment Effectiveness is made up of 3 components:

- **Availability** (uptime as a percentage of available time): A threshold percentage per minute is set, to define the level at which a line is considered to be running (uptime) or stopped (downtime) as compared to available time which represents all time where the production line or cell is scheduled to be running. This includes all changeover times and interruptions to the production floor. It does not include any time where the lines are not scheduled to run (such as non-productive shifts or non-working weekends).

- **Performance** (actual rate of production while running, as a percentage of theoretical maximum rate): Measured by Redzone every minute that the line is running and compares the actual input quantity of material against the theoretical maximum rate (safe-running engineering capacity) of production output. This rate differs by SKU so Redzone records which product is running at all times, to allow comparison with the planned rate stored against each SKU (which can be additionally broken down to a rate for each line).

- **Quality** (output quantity as a percentage of quantity produced on the line): Redzone records scrap and re-work on the line, including where the losses occurred (with Reason Codes) to enable the analysis of losses and re-work.

> The standard calculation for OEE is:
>
> ## OEE% = Availability% x Performance% x Quality%
>
> By way of example, a 95% performance on each of these metrics results in what has been accepted as *world class* OEE performance of ~85%: .95 x .95 x .95 = 85.7%

7.2 Calculating Savings

The following summarizes the assumptions made to calculate the impact of a 1% improvement in OEE across different sizes of facility. The savings are expressed as cost reductions for simplicity and are defined as labor and variable overhead reductions.

Labor was considered to be direct employees working on the line (costed at an average regular time rate), excluding any ancillary and in-direct labor such as warehouse, quality, maintenance etc. Variable overhead was taken to be the portion of overhead that would be reduced if the plant ran fewer hours (generally this is utilities and some minor additional overhead). Average numbers of production lines and numbers of people per line were listed per category, along with an average labor rate per direct employee. From these numbers it was possible to estimate the impact of a 1% uplift in OEE.

Estimated Labor Savings for Each 1% OEE Uplift

Size of Plant (Revenue)	Avg # of Lines	Avg Run Hours	Avg People per Line	Avg Labor Hrs/Yr	Avg Wage	Avg OEE	Avg Labor Savings of 1% OEE
All Plants	6	6010	7	214858	$15.42	54%	$61,334
<$10M - $50M	3	5000	6	90000	$15.25	40%	$34,312
$50M - $100M	6	6120	8	293760	$15.41	63%	$71,837
$100M - $250M	7	6468	7	316932	$16.06	54%	$94,247
$250M	10	7488	9	673920	$18.73	75%	$168,327

Similarly, by taking the average number of production hours, the same calculation is used to estimate the reduction in variable overhead associated with a 1% uplift in OEE.

Estimated Variable Overhead Savings for Each 1% OEE Uplift

Size of Plant (Revenue)	Avg # of Lines	Avg Run Hours	Avg Variable Overhead/Hr	Avg OEE	Avg VOH Savings of 1% OEE
All Plants	6	6010	$27.81	54%	$17,179
<$10M - $50M	3	5000	$26.31	40%	$9,865
$50M - $100M	6	6120	$27.80	63%	$16,204
$100M - $250M	7	6468	$28.00	54%	$23,477
$250M	10	7488	$51.30	75%	$51,218

7.3 Industry Segment Definitions

Bakery

Bakeries had a median OEE of 52% with a spread from 12% to 81%. It is not surprising that bakeries have high starting efficiencies since they typically operate long production runs with few changeovers. Lines also tend to have a dedicated flow and built-in accumulation since proofing, baking and cooling processes must be kept running.

Consumer Packaged Goods / Nutraceutical

This group had a median OEE of 56% with a spread between 23% and 83%. These plants were grouped together since they make up a small sub-set of the 250 plants. In general terms, the plants in this group had many similar processes to bottling and traditional food packing plants.

Dairy, Juices and Beverages

This group had a median OEE of 54% with a spread between 31% to 95%. As expected, the dairy, juices and beverage OEE data is skewed more in the 70s and 80s due to the amount of automation that is available for these plants. However, small to medium sized dairy and juice operations tend to have average to low OEEs as they take on a lot of SKUs and have less automation.

Produce

This group had a median OEE of 54% with a spread between 22% and 79%. It was found that many of these organizations were seasonal and efficiencies were hostage to the quality of raw material coming from the farms. Such processes are labor-intensive, and improvements were among the most significant.

Ingredients

The median OEE for Ingredients was right at 50% with a spread between 16% and 70%. These plants include mostly dry blending with a small portion of liquid processing as well. They tend to ship all or a majority of their finished goods in bulk which means traditional approaches to tracking efficiencies lagged behind actual production.

Meat, Seafood and Pet Foods

This group had a median OEE of 52% with a spread between 21% and 82%. It is unsurprising that starting efficiency was lower mainly due to the heightened regulatory requirements in the processing of meat and seafood. Additionally, these plants tended to have several interlinked steps to the process which could cause blocked and starved states upstream or downstream.

Prepared Foods

The median OEE was around 51% with a range between 22% and 81%. The prepared foods group includes a variety of processes, many of which are short lines with simple packaging equipment.

Snack Foods / Confectionery

This group had a median OEE of 45% with the largest spread between 18% to 77%. Although in the same category, the plants within this group had processes that varied greatly and were of significantly different sizes.

Soups, Sauces, Dips and Dressings

This group had a median OEE of 52% with a spread between 18% to 85%. The spread is significant, and it was established that the biggest variable was changeovers; those plants producing branded products with longer runs had higher OEE scores than those in private label or food service with more short runs.

7.4 What is the Redzone Connected Workforce Solution?

The Redzone Connected Workforce Solution defines a new category of solution for F&B and CPG manufacturers. Redzone Community members achieve success and sustainability of their productivity uplifts by using Redzone as a platform to enhance their culture and to support their own CI strategies where such strategies exist and get them started where they do not. Unlike other plant floor technologies, the focus is on enabling and engaging frontline workers as a productivity engine.

The Redzone approach, referred to as **The Redzone Way** is a unique combination of social/mobile technology creating a digital production system with a highly immersive coaching program to drive behavior change to make the uplifts *stick*. *Dashboards, Leaderboards, Actions, Issues, Alerts, Chats, Logs, Blogs* come out-of-the-box providing summarized content for structured Meetings and Forums, all contribute to create a powerful communication and collaboration platform for monitoring, documenting, reporting, analyzing and driving results. They create an action-oriented environment where frontline workers are armed with the tools and support they need to make decisive and timely decisions at the point of activity—on the shop floor.

Rapid Time to Value

The Redzone Connected Workforce Solution goes live with clean data and full utilization of the system within weeks. Most community members report being live and operational within 2 days of the coach being on site. Compare this to a typical MES or CMMS implementation which may take from 6-18 months to implement and an army to maintain. The Redzone coaching team hits the ground running to initiate the shop-floor cultural environment that empowers frontline workers to make good decisions quickly and facilitate changes to improve performance.

Implementation Time

The Redzone Connected Workforce Solution takes the *connected worker* concept one step further by automatically collecting real-time data about production and waste directly from production lines and making it instantly available to frontline workers. It utilizes typical off-the-shelf sensors, Wi-Fi and Edge gateway technology that is already in use in many production facilities. This allows for a common, repeatable implementation process that is operational in weeks, versus other technologies that require time-consuming and disruptive custom implementation.

Once data streams are established, all data is collected from the sensors and is communicated to the cloud over standard internet connections. This eliminates the need to purchase and manage servers and the associated IT footprint typical of legacy on-premise solutions. User access to the cloud applications and data are facilitated through iOS iPads and iPhones over Wi-Fi for the most performant and user-friendly system on the market.

Frontline Communication Platform

Redzone is built on a digital communication platform that empowers frontline team members with a collaboration solution that significantly increases plant productivity by creating an environment for teams to instantly react to unplanned issues on the field of play. The solution delivers the following outcomes supported by the bulleted capability benefits.
- *Everyone-to-Everyone Communication* - to connect frontline workers with all levels in the plant
- *Team-of-Teams Collaboration* - to enable Production, Quality and Maintenance teams to quickly work together to resolve issues
- *Team Celebration* - to recognize good performance for encouragement and pride

Redzone Productivity Module

Redzone's Productivity solution significantly increases plant productivity in 90 days by creating the environment for front line teams to eliminate waste and solve problems impacting the shift's performance! The solution delivers the following outcomes for the Production team as supported by the bulleted capability benefits.
- *Visual Factory* – so everyone knows if they are winning or losing against targets
- *Problem Solving* – to ensure that reported issues get addressed in a timely manner
- *Kaizen* – to address larger scope issues that go beyond normal activities

Redzone Compliance Module

Redzone's Compliance solution dramatically reduces waste and giveaway through better material utilization by transforming your Quality Assurance Program from reactive to proactive. The result is improved food safety and quicker, more impactful audits. The solution delivers the following outcomes for the Quality team as supported by the bulleted capability benefits.
- *Paperless Quality* – to eliminate the time and errors from manual, paper-based processes
- *Statistical Process Control (SPC)* – to monitor and alert when specs trend out of tolerance
- *Audits and Checklists* – to always be *audit-ready* with data in the database, not on paper

Redzone Reliability Module

Redzone's Reliability solution significantly reduces unplanned downtime (DT) by engaging operators to become more intimately involved in maintaining equipment and detect issues early so the Maintenance team can focus on preventative maintenance (PM). The solution delivers the following outcomes for the Maintenance team, as supported by the bulleted capability benefits.
- *Operator Care* – to off-load mundane clean, inspect, and lubrication tasks to operators
- *Operator Sense* – to extend the visibility of maintenance with operators' eyes, ears, and noses
- *Work Orders and PMs* – to prioritize maintenance activities that will increase uptime
- *Breakdowns* – to reduce lost time and product when an unplanned breakdown does occur

Coaching

Redzone solutions are different in that coaching is a fundamental component of the whole. Technology on its own changes nothing without ensuring that users' behavior is updated to take advantage of the software capabilities. Companies experience sustained results when they incorporate new skills in a way that enables teams to systematically improve their own performance. The Redzone 90-Day Program includes:
- A short preparation phase to get you and your environment ready for improvement
- Development of an agreed-upon success plan that is attainable and relevant
- A *Win the Day* phase to align your teams on activities that deliver immediate improvement
- *Problem Solving* phase to implement skills that address the top recurring issues
- Celebration for the whole company to reward your teams for their successes

Redzone