Integrated Leadership and Management For Performance Increase

By

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Abstract

The aim of this research is to examine how the integrated model of leadership and management with tools influences the organization's performance.

A longitudinal case study research method was used in the SKF factory in Poland over the period of 2014 – 2017.

The study confirmed the research hypothesis that the integrated model's application increases performance at the delivery level. It reveals the relationships between the application of the integrated model and the level of safety at work, as well as between the application of the integrated model and effectiveness of working in a two-person team called a dyad, and between the application of the model and the level of the horizontal leadership practices in the everyday managing of the case study organization.

The study suggests that implementation of the integrated model supports transformation of the organization culture, securing the performance improvements at the delivery level.

The research contributes to the area of the applied business in introducing a new model of integrated leadership and management with tools, not explored by scholars yet.

Keywords: Leadership, Management, Performance, Business case for leadership and management integration, Safety, Dyads, Horizontal leadership

Introduction

Skills in leadership and management, when practiced together tend to enable managers to deliver performance results above average. Using both skills simultaneously is not common. In 2017 Zenger and Folkman analysed "360-degree assessment data from more than 60 000 leaders" and revealed "only thirteen percent of leaders (…) ranked in the top quartile on both driving for results and people skills" (p. 3).

These two aspects of the supervisory activities could be seen at three levels: strategic (what's to be achieved), operational (what's to be done) and delivery level (how it's to be done). Adapting Drucker (2010, p. 15) leads to the visual combination's proposal of the two skills and the three levels in Table 1.

Table 1. *The Conceptual Combination of Drucker's Views on Three Jobs of Managing*

	Leadership		Management		
	Enterprise managing as commercial institution	Society managing as non-commercial institution	Daily managing as three jobs at the same time.	Time - Future	Time – Present
Strategic level (*what is to be achieved?)*	Managing the business			↓	↑
Operational level *(what is to be done?)*		Managing managers Managing workers and work		↓	↑
Delivery level (*how is it to be done?)*			Managing the business Managing managers Managing workers and work	↓	↑

Adapted from *"The Practice of Management"* by P.F. Drucker, 2010, p.15

Leadership and management are different, and such a claim can be based for instance on the literature in which these activities have been named and described differently for many years. A good example supporting this opinion is a bibliometric research of Haskel and Westlake (2018). They indicate that in 1950-2000 leadership and managment appeared as two separate terms, and leadership was mentioned approximately 12 times less often than management in 1950-1960, up to five times less often in 2000.

The integration of both leadership and management is not present in the research at the delivery level, and even at the strategic level it is scarcely represented. Researchers such as Castro et al. (2015) and Zenger and Folkman (2017), after examining the HBR bibliography between 1968 and 2013, concluded that very rarely anyone dealt with leadership and management as a common issue, especially in regard to performance results.

Thus, integrating skills in the two competencies, applying them, and relating this integration to performance, seem to lack the methodological support both in the literature and in the research, which suggests that a research gap exists. The position of this gap inside the research field is visualized in Table 2, which presents the research area.

Table 2. *The Research Area, Research Field, Research Problem,*

Strategic level (what is to be achieved)	Specific	Pearce and Conger (Shared Leadership, 2003)	Henry Mintzberg. (Simply managing, 2013)				Blake and Mouton, Managerial grid, 1994
	Universal		Henry Mintzberg. (Simply managing, 2013)	Beer and Nohria (Theory O and Theory E)	Peter G. Northouse (Leadership Theory and Practice), 2004)		
Operational level (what is to be done)	Specific	Fernandez et al., Leadership and Public Sector Performance, 2010	Sveiby, Collective Leadership, 2011				Kim and Mauborgne (Blue Ocean Strategy tools)
	Universal		Kouzes and Posner (Leadership practices) 2002				Keller and Price (Universal Five "A" frames tools) 2011
Delivery level (how to do it)	Specific					**2. Research field**	
	Universal	Anicich et. al. Mount Everest expeditions, 2014	Deming 2018 (Management: Plan Do Study Act)				**3. Research gap area**
1. Research area – two dimensions		No tools	Tools	No tools	Tools	No tools	Tools
		Management OR Leadership		Sequential Leadership Then Management		**Integrated leadership and management. 4. Research problem**	
		A proposal of the integration continuum in the approach to development and implementation of leadership and management in the integrated form.					

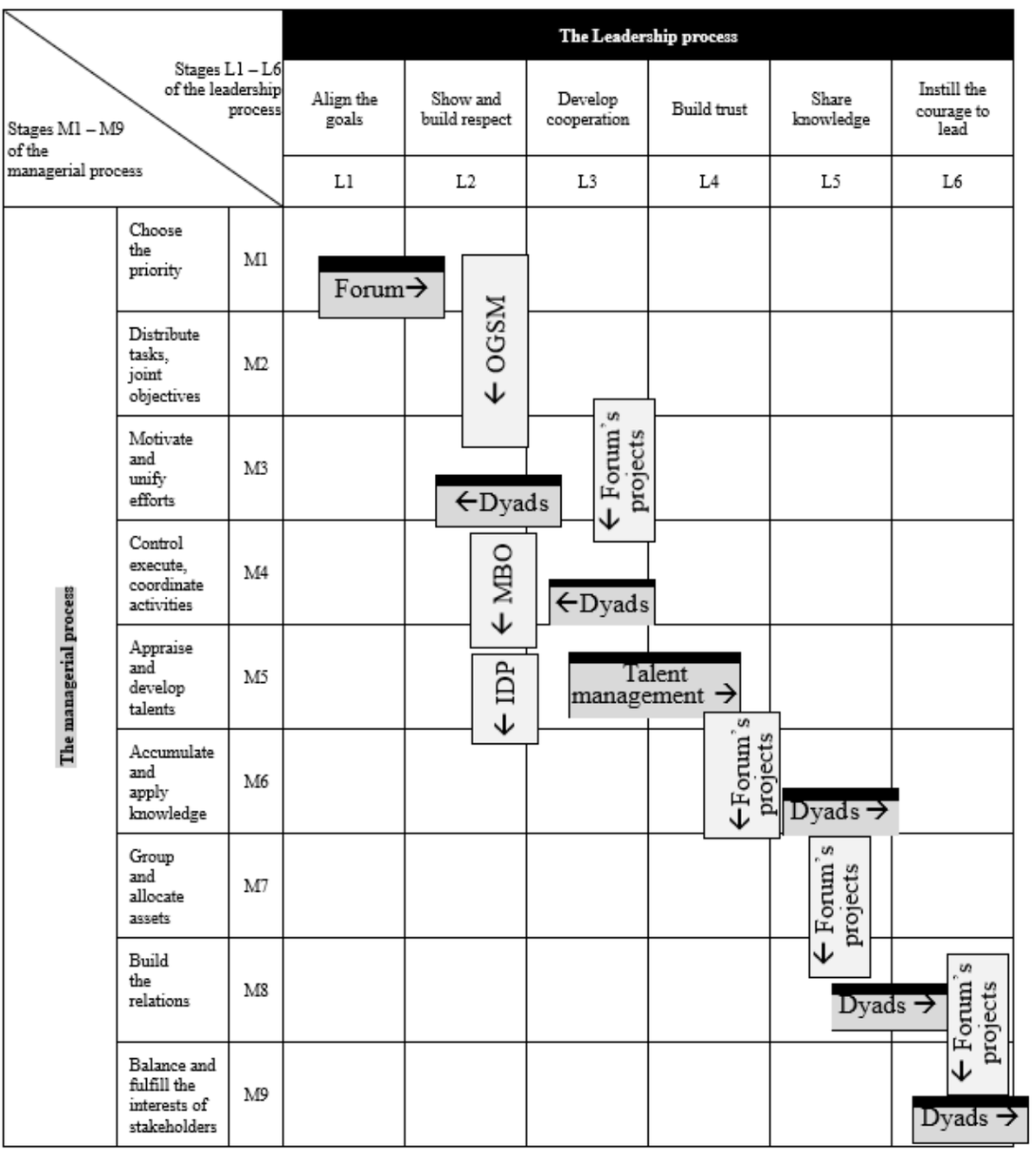
Note: This table was created with material from Pearce and Conger (2003) and other authors. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

A map of publications distributed on the model reveals that literature has not been focused on the research field and the research gap. Thus there is neither a practical methodology nor tools available at the delivery level to practice integrated leadership and management on a daily basis.

Model of Integrated Leadership and Management

The research gap can be formulated as the lack of the tools at the delivery level (Table 2), Thus, the authors decided to build up the model of integrated leadership and management with tools shown in Table 3, and to test statistically its validity and reliability for performance increase.

Table 3. *The Model of Integrated Leadership and Management with Tools*



Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Un-published doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

Table 4. *The Managerial Process*

	Managerial process stages.		
	By Hamel (2008, p.20)	By authors	Note: the following indication means that the authors' suggestion is based on inspiration from general practice/ sources unknown
1	Setting and programing objective	Choose the priority	
2		Distribute tasks, joint objectives	Inspired
3	Motivating and aligning effort	Motivate and unify efforts	
4	Coordinating and controlling activities	Control execution, coordinate activities	
5	Developing and assigning talents	Appraise and develop talents	
6	Accumulating and applying knowledge	Accumulate and apply knowledge	
7	Amassing and allocating resources	Group and allocate assets	Inspired
8	Building and nurturing relationships	Build the relations	
9	Balancing and meeting the stakeholders' demands	Balance and fulfill the interests of stakeholders	

Adapted from "The Future of Management," by G. Hamel and B. Breen, 2007.

Element of Management in the Integrated Model

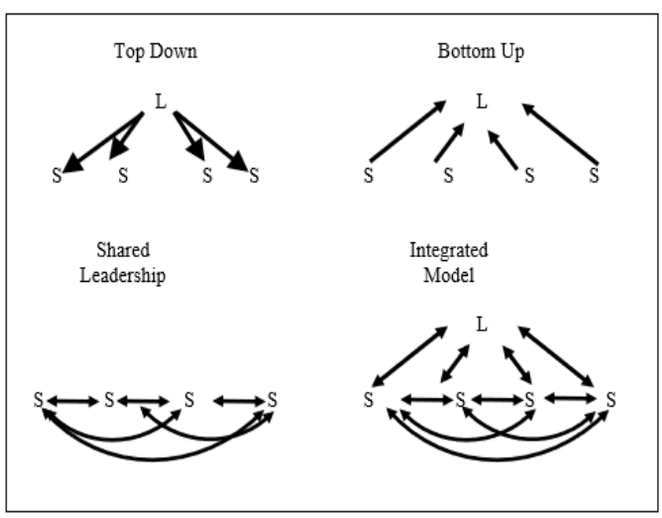
Management is proposed to be seen as a process as shown in Table 4.

The sequence of the managerial process had originally been taken from Hamel and Breen (2007), and later enriched by the authors based on their professional experienc in management and coaching. The management team of the SKF Factory in Poland, in which the longitudinal research took place, had applied a nine-stage process described in Table 4. Implementation of the process required a number of trainings, workshops, and individual coaching and tutoring, conducted by the authors with the management teams of different levels as well as with individuals. All those educational activities increased the skills levels of the managers and allowed them to consciously apply actions appropriate to the circumstances and tasks performed.

Element of Leadership in the Integrated Model

The starting point in developing the leadership element for the integrated model was Locke's proposal in Pearce and Conger (2003, p. 272). In 2003 Locke presented the following leadership models (Figure 1).

Figure 1. *Four Leadership Models*



Note: L stands for Leader, S stand for Subordinate. Adapted from "Shared Leadership. Reframing the Hows and Whys of Leadership," by C. L. Pearce and J. A. Conger, 2003.

In 2014, when the research study began, the level of leadership skills, and particularly the awareness of the leadership role in everyday managing of teams amongst the managers of the case study company, was low. Similarly to the application of the management element of the model, the leadership skills and awareness had been gradually built up, mainly by introducing the tools of the integrated model, which is presented in Table 3, as well as by more traditional

educational means such as trainings and workshops. Overall the organization had a chance to cover the path from the Top-Down through Bottom-Up up to Shared Leadership structure, which eventually became a dominant leadership and management model in the company, corresponding to the business challenges it was facing at the time.

Shared Leadership

Fitzsimons (2016), explains the reasons why "organizations today" (…) need "leadership that is shared, rather than concentrated in a single, charismatic individual" (p.2). The concept of horizontal leadership is discussed in multiple sources, eg.: Badarraco (2001); Pearce et al. (2007); Hamel and Breen (2007), who present different definitions and measures. According to Pearce et al. (2007) "shared leadership is a predictor of high performance of change management teams" (p. 176), therefore it was incorporated into the integrated model.

The literature research revealed that none of the leadership scholars proposed a shared leadership process that could serve as a ready-made model to adopt and apply in an organization. Therefore the authors decided to develop a shared leadership process based on Karl Sveiby's (2009) findings regarding a generic power-symmetric framework for collective leadership, in which the role of a temporary leader-task expert rotates depending on the task, situation, and context, leading to conjoint actions to achieve a collective outcome. In the next publication in 2011, Sveiby points to direction, alignment and commitment as three leadership practices to achieve a long-term outcome, (p. 397).

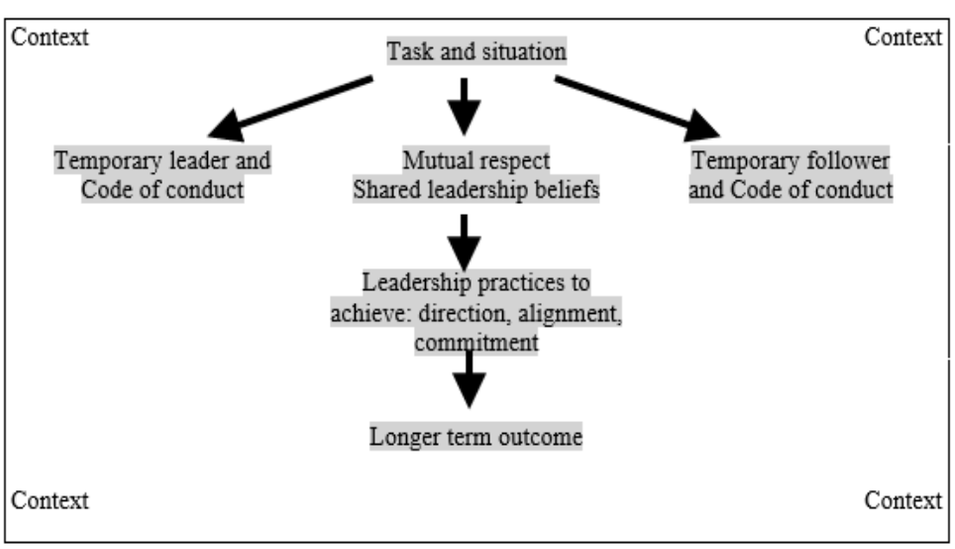
The framework presented in Figure 2 below became the basis for developing the leadership component for the integrated model of leadership and development.

The leadership process used in the integrated model of leadership and management had been developed by the Action Science method in a number of facilitated sessions by the case study management team. Inspired by Sveiby's approach and taking into consideration their business objectives and challenges, the management team defined a six-stage leadership process and called it Horizontal Leadership. Each attribute of the process (L1-L6 in Table 3) was described in the behavioural dimensions, uniformly understood by all managers.

Tools of the Model

The tools, their source and description, and the sequence of introduction to all managerial levels of the organization are listed in Table 5. Highlighted rows indicate tools included in the research program.

Figure 2. *A Framework for Horizontal Leadership in a Context*



Adapted from "Collective Leadership with Power Symmetry: Lessons from Aboriginal Prehistory" by K. Sveiby, 2011, p. 397.

Table 5. *The Schedule of the Introduction of Tools to Different Management Levels*

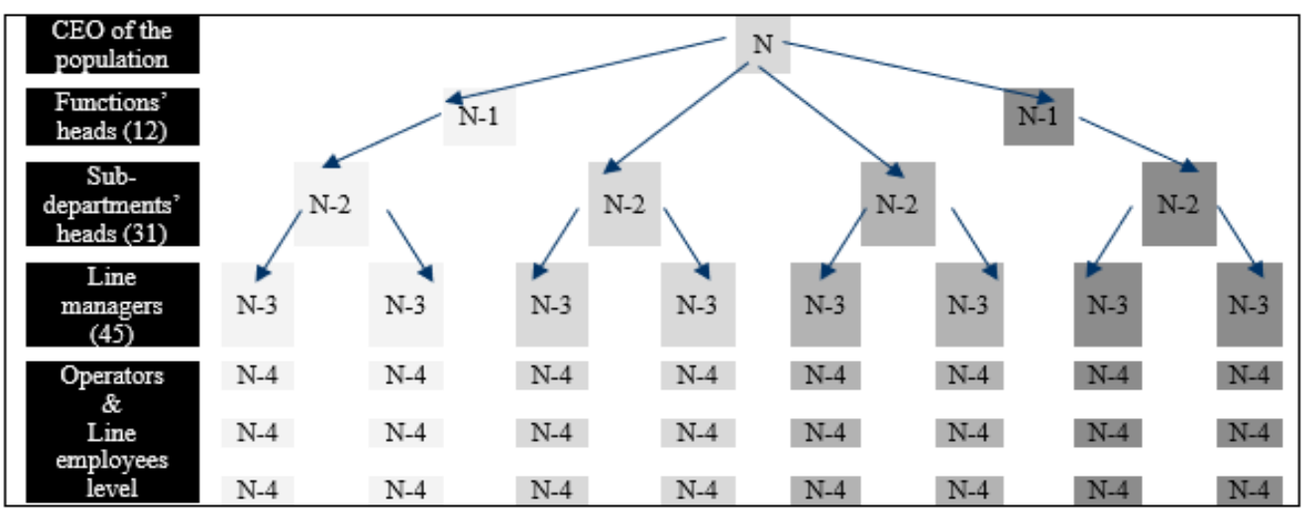
Tools of the Integrated model of Leadership and Management				Year of introduction			
				N-1	N-2	N-3	N-4
	Tool	Source	Nature				
1	Forum	ANK Konsulting	A one-day workshop for a team or department	2014	2014	2015	
2	Forum's projects	the author of this dissertation	The forum's output serves as an input to OGSM	2014	2014	2015	
3 3.1	OGSM (Hoshin-Kanri methodology)	Witcher and Butterworth (2000, p.12)	A two-day workshop for a team or department	2014	2016	2017	
3 3.2	Goals' fairs	ANK Konsulting	A method of aligning goals between departments by including representatives of all departments together in an OGSM session.	2014	2014	2015	
4	Dyads	BMPS	Longer-term work of a pair of employees of the same or various departments to achieve a common goal with the leadership support of their supervisors	2015	2015	2015	
5	Management by Objectives (MBO)	SKF	A method of annual goals setting and performance appraisal of managers	2014	2015	2016	
6	Individual Development Plan (IDP)	SKF	The MBO support method by eliminating the manager's deficits, which may negatively affect the achievement of goals	2014	2015	2016	
7	Talent's management process	BMPS	An assessment method to see the talents during their participation in projects and follow their progress	2014	2015	2015	2015

Note: Created from company data and a number of sources indicated in the columns. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

Organizational Levels of Application of the Integrated Model

Figure 3 illustrates the dependencies between various management levels of the case study organization, commonly used labeling, and the number of managers at each level

Figure 3. *The Schematic Organizational Chart of the Researched Company*



Adapted from the company's historical data.

The deployment of the model took four years, beginning with the highest N-1 level consisting of department heads. In the subsequent years the model was introduced to the next management layer using the upper level as teachers and coaches. This approach allowed embedding the leadership and management culture, described in the model (Table 3) and consciously practicing the tools by the entire management of the case study company.

The Effectiveness of the Integrated Model of Leadership, Areas of Performance

The integrated model of leadership and management was applied in the case study company to

1.The safety process,

2. Work in Dyads,

3. Horizontal leadership development.

In 2015-18 the case study company implemented the safety management process; through forums and OGSM the process was cascaded down to individual managers involved in managing safety in the organization. Therefore the integrated model (Table 3) covered almost the whole company. As a result a number of dyads were formed, mainly either

1. between two managers of two different departments to stimulate the activities in the safety process across the departmental boundaries, or

2. between a manager and a subordinate to formalize the support in the daily practicing of the new safety process.

Then all participants of both types of dyads got their annual targets allocated in the Managing By Objectives (MBO) system, (L2/M4 junction in Table 3), then their Individual Development Plans (IDPs) got adjusted to the goals and challenges each of them had to meet (L2M5 junction in Figure 3). The next step was to continuously support and control the progress using the Talent management tool (L3/M4 junction Table 3). These MBO tasks included both individual work results as well as shared objectives assigned to dyads. In 2017 the MBO tasks of the top management team (N-1) also included goals to develop and improve the level of horizontal leadership attributes.

Area of the Performance of the Managerial Process of Safety

The safety process was based on Heinrich's (1931) research, which revealed that elimination of the root causes of 300 near misses prevents one serious accident.

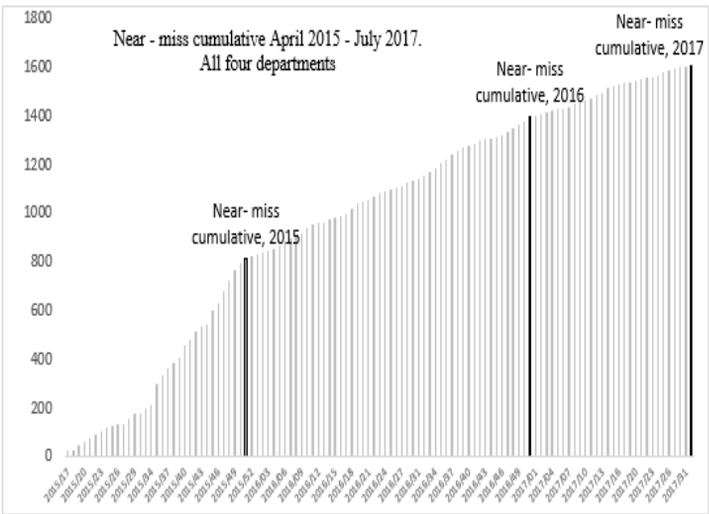
Table 6. *The Schematic Flow of the Safety*

	Near miss reported	Near miss escalated	Near miss in progress	Near miss root-cause eliminated	Recognition and closing of the leadership loop
Phase 1-5 of the process	1	2	3	4	5
A. Activity	Operator fills in the report form of the near miss observed	Operator and supervisor agree on the validity of the report	The manager of the relevant department proposes to the operator and his supervisor the final solution.	After the root cause of the near –miss eliminated the manager provides feedback to the operator and to the supervisor.	Operators who reported the biggest number of near miss is recognized
B. Objective	To collect observations near miss	To make a decision whether to further pursue the near miss solution	To agree on the final solution and begin the improvements.	To confirm that the near miss root cause is eliminated	To praise and to give example to others.
C. Expected results	Operator starts the process & initially proposes the solution	Engaging the operator and the supervisor in the Safety process Dyads	Eliminating the near miss	The confirmation of the operator that the roots cause of the near miss is eliminated. Increasing involvement of the operator to achieve the operator driven change. Increasing performance of the safety process.	Increasing participation rate of the operators
D. Comments to performance tracking	Near- miss observations collected	Near miss in the electronic data base	Near miss in the work-in-progress to eliminate it.	Feedback to the operator	Conscious celebration

Note: Created from empirical-inductive process based on company data.

Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

Figure 4. *Near Misses Reported by Employees of all Four Departments: Absolute Scores*

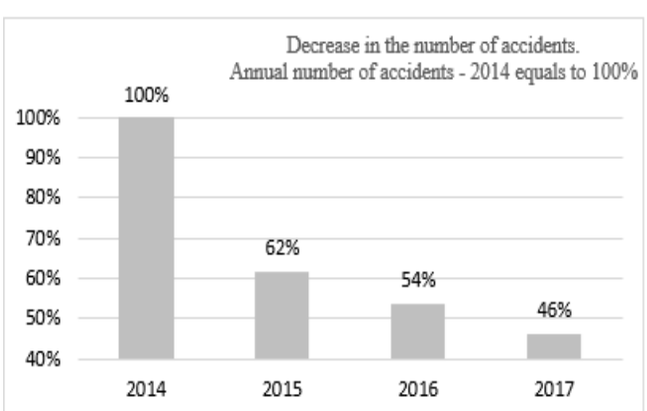


Note: Created from historical company data. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

The Results Achieved in the Performance Area of Safety

The integrated model of leadership and management covered the managerial process of safety, is what might have resulted in the decrease of the number of accidents per year for the period of 2014-17 (Figure 5).

Figure 5. *A Decreasing Trend of Accidents. Combined Results of all Departments*



Note: Adapted from the company data.

The results achieved in the performance area of Dyads Table 7 illustrates the extent to which working in dyads helped to change the deficit of cooperation between peers among N-1 and N-2 managers, who formed two-person teams to meet shared objectives. Their performance was measured by the company's Personal Performance Appraisal (PPA) system. The first appraisal year of the Dyads performance was 2015. Dyads performance based on the PPA system is discussed in the Statistics section.

In addition, the authors conducted individual interviews with twelve departmental heads (N-1), and the questions as well as results are presented in Table 7.

Table 7. *The Results of the Interviews on the Dyads' Role of N-1 Managers*

	Question	2015. 32 Dyads	2016. 39 Dyads	Change '16 – '15
1	How many dyads were created in 2014-2015 and 2015 -2016 *Note: Not every dyad created in 2014 ('15) survived in 2015 ('16)*	30 / 15 / 0 20 (2014), 12 (2015)	30 / 15 / 0 19 (2014), 20 (2016)	"Younger" dyads increased from 12 to 20 by 67%
2	Do you rate that more dyads solved the challenges inside or across the silo walls?	30 / 15 / 0 20 (Silo), 12 (Across)	30 / 15 / 0 16 (Silo), 23 (Across)	The number of the dyads working across silos increased by 92%
3	Do you rate that more dyads were communicated informally or through the HR forms?	30 / 15 / 0 20 (Informal), 12 (Formal)	30 / 15 / 0 12 (Informal), 27 (Formal)	Dyads that worked formally increased More than 200%
4	Do you rate that more dyads represented the change in the field of behaviors or in performance?	30 / 15 / 0 16 (Performance), 16 (Behaviors)	30 / 15 / 0 20 (Performance), 20 (Behaviors)	Every interview indicated the equal share of the performance and behavioral change caused by the dyads
5	Do you rate that more dyads made the change possible through empowerment or through coordination?	30 / 15 / 0 15 (Coordination), 17 (Empowerment)	30 / 15 / 0 13 (Coordination), 24 (Empowerm...)	The percentage of the dyads which indicated empowerment as the change method increased by 41%
6	Do you rate that the dyads represented the change in performance as more beneficial to a supervisor or a subordinate?	30 / 15 / 0 14 (Subordinate), 18 (Supervisor)	30 / 15 / 0 22 (Subordinate), 18 (Supervisor)	Change in performance was more beneficial to a subordinate in the second interview by 57%
7	Do you rate that the dyads represented the change in behaviors as more beneficial to a supervisor or a subordinate?	30 / 15 / 0 14 (Subordinate), 18 (Supervisor)	30 / 15 / 0 21 (Subordina...), 18 (Supervisor)	Change in behaviors was more beneficial to a subordinate in the second interview by 50%

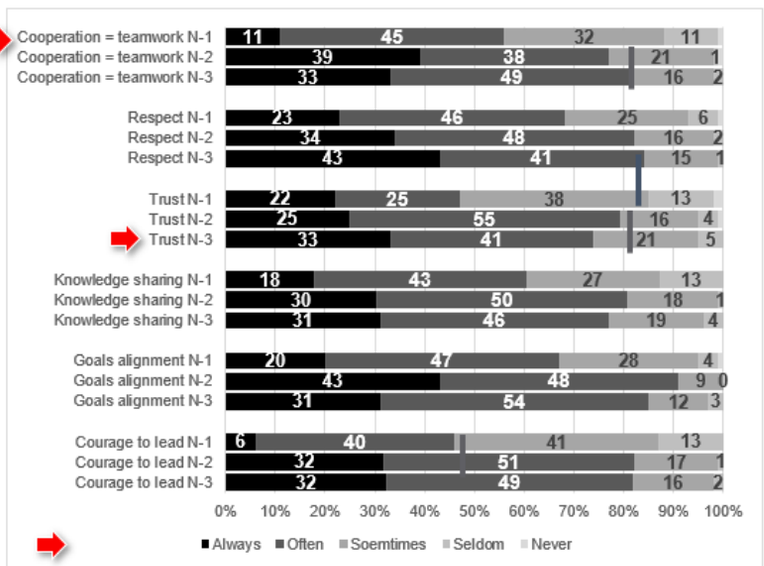
Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

As shown in Table 7, working in dyads led to performance increase indicated by several parameters. It is worth mentioning that after two full years of working in dyads the managers solved more problems across the silo's borders than inside the silos, and changed their leadership style from cooperation to empowerment focused.

The Area of Performance of Horizontal leadership

To measure the performance of horizontal leadership the authors developed a questionnaire and tested the population of twelve top managers and 70 second and third layer managers (N-1, N-2, and N-3 in Figure 3 respectively)[1]. The raw scores of all attributes of horizontal leadership are presented in Figure 6. The scores of the top-level managers are significantly lower than the scores of their subordinates, i.e. the subordinates implemented the horizontal leadership attributes in every day managing faster and fuller than their bosses. In case of the N-1 managers all attributes except Respect required further development.

Figure 6. *The Questionnaire Results of Horizontal Leadership by Management Levels*



Note: Created from company's historical data. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

Research Program

Research Hypotheses

Three null and three alternative hypotheses refer to the relation between the application of the integrated model of leadership and management and performance in the managerial process of safety, working in dyads, and horizontal leadership. The choice of these areas corresponds to the performance deficits the case study company had to address: work safety, lack of cooperation between individuals, and among team members, and between teams.

Null Hypothesis Ho #1

• Null hypothesis Ho #1 states that:

There is no relationship among the performance of different departments in regard to the safety management process if the safety management process is implemented in these departments using the integrated model of leadership and management.

• Alternative hypothesis Ho #1 states that:

There is a relationship among the performance of different departments in regard to the safety management process if the safety management process is implemented in these departments using the integrated model of leadership and management.

Null Hypothesis Ho #2

• Null hypothesis Ho #2 states that:

There is no difference in performance between the employees of the same department who work in dyads and the employees who do not, when the dyads' work implements the integrated model of leadership and management.

• Alternative hypothesis Ho #2 states that:

There is a difference in performance between the employees of the same department who work in dyads and the employees who do not, when the integrated model of leadership and management implements the dyads work.

Null Hypothesis Ho #3

• Null hypothesis Ho #3 states that:

The implementation of the integrated leadership and management model does not affect the increase of the horizontal leadership level.

• Alternative hypothesis Ho #3 states that:

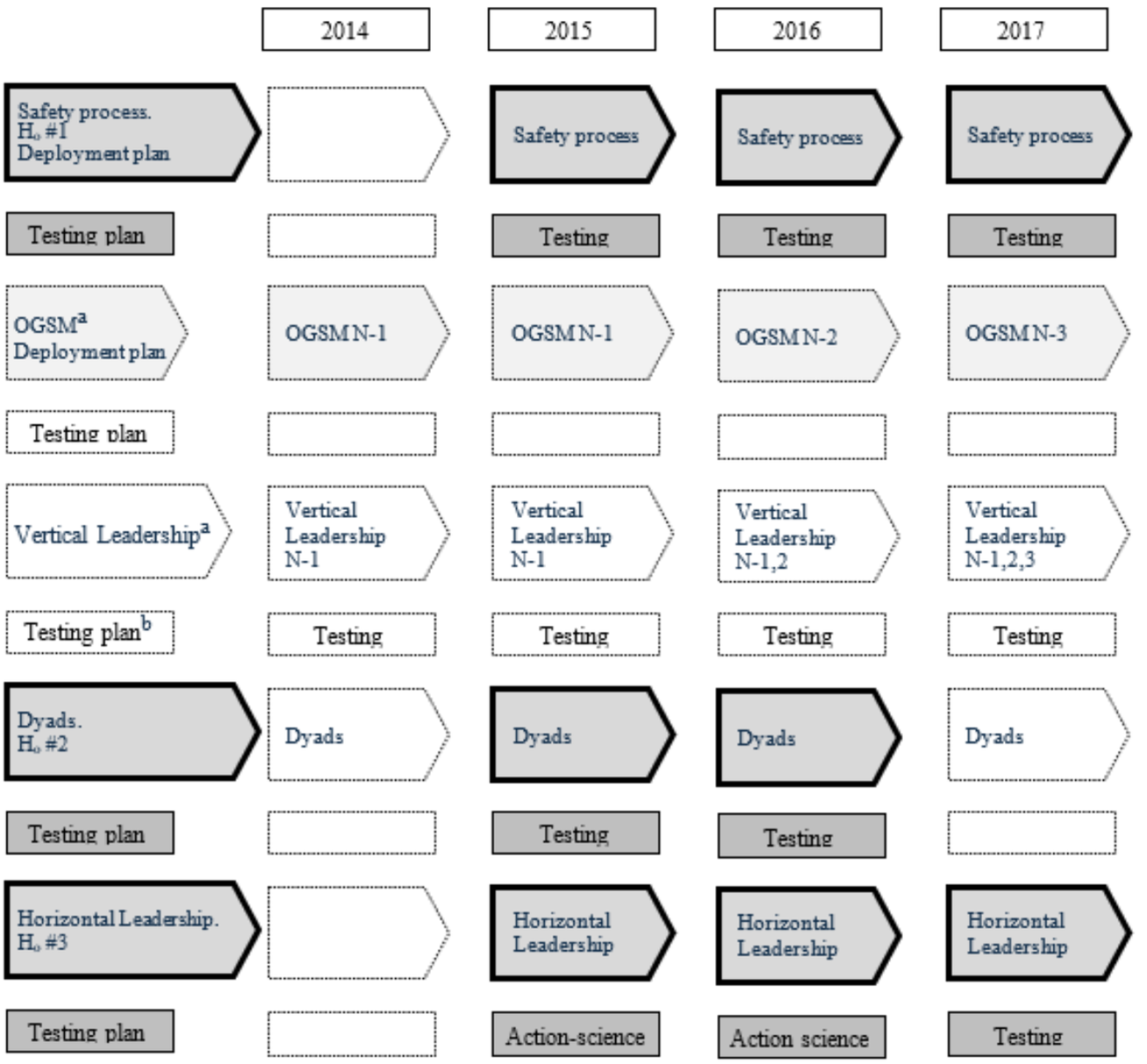
The implementation of the integrated leadership and management model affects the increase of the horizontal leadership level.

Research Flow

The research flow of three hypotheses represents a longitudinal application of the selected tools of the integrated model.

1 The questionnaire and the results of the statistical inference can be requested directly from the authors as separate PDF document

Figure 7. *The Map of Implementation of Tools and Tests Covered by the Research*

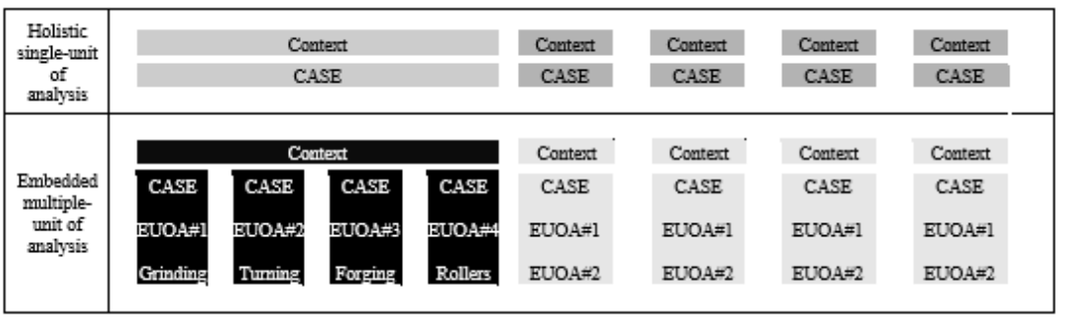


Note: [a]The vertical leadership and OGSM were deployed as tools but were not included in the research. [b]The testing plan of vertical leadership was deployed yet its results are not included in the research. Adapted from historical company data.

Research Design Overview

The three-year longitudinal research program, based on a case study design (Yin, 2014) is presented in Figure 8. It consists of two components: an Embedded multiple Unit Of Analysis (EUOA) and a Single-case design.

Figure 8. *The Design of the Case for Testing Three Null Hypotheses*



Adapted from "Case Study Research. Design and Methods", by R.K.Yin,2014, Figure 2.4.

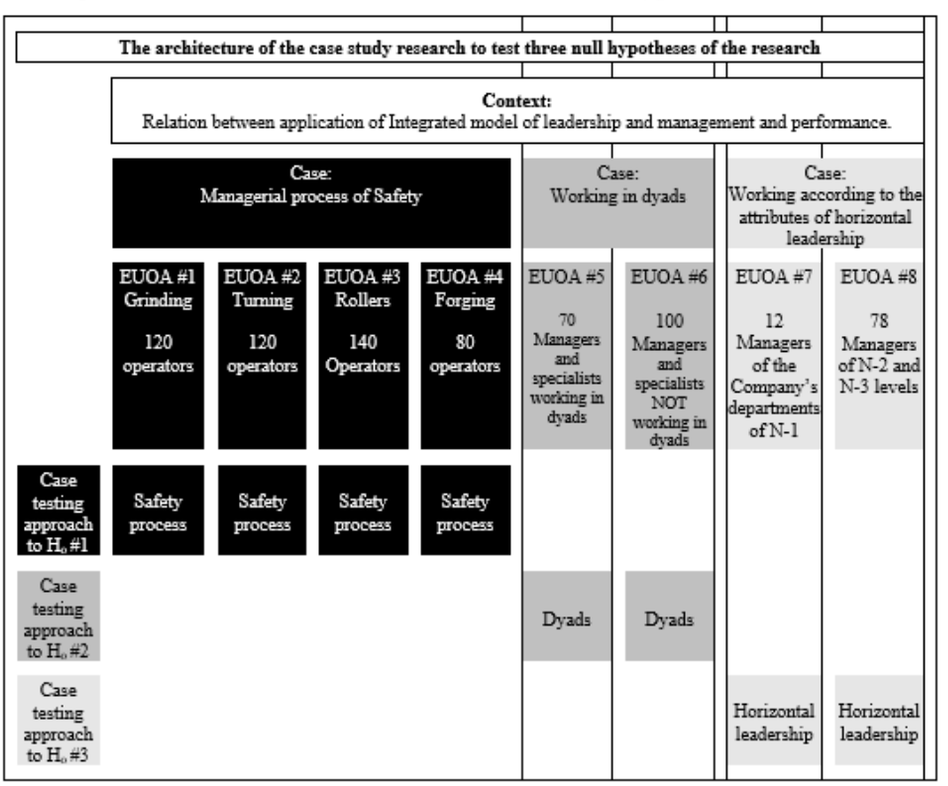
Research Design of Ho #1 in the Safety Area of Performance

Figure 8 illustrates both the general research design of the case study and the design for testing Ho #1 in the safety area of performance. Four EUOAs recall four production departments, Grinding, Turning, Forging, and Rollers, in which Ho #1 hypothesis was tested using the Managerial Process of Safety shown in Table 6.

Research Design of all Three Hypotheses Ho #1, Ho #2, and Ho #3

Figure 9 presents the architecture to test three null hypotheses: Ho #1 in the safety area of performance, Ho #2 in the dyads area of performance, and Ho #3 in the horizontal leadership area of performance.

Figure 9. T*he Architeture to Test Three Null Hypotheses*



Adapted from Research Flow, Figure 7.

Table 8. *The Population and Sample. Data Collection Methods*

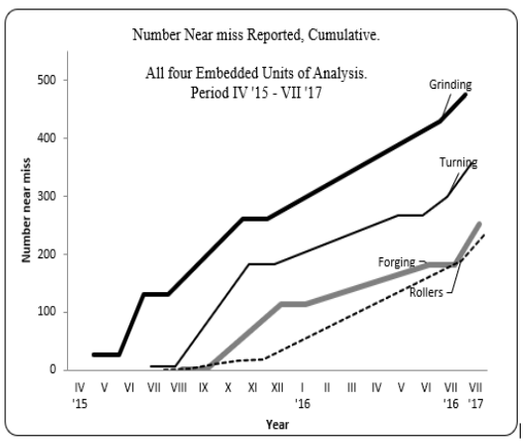
Tested null hypotheses Ho below	Level below	Embedded Units of Analysis (EUOA)							
		Embedded umit of analysis #1	Embedded umit of analysis #2	Embedded umit of analysis #3	Embedded umit of analysis #4	Embedded unit of analysis #5	Embedded unit of analysis #6	Embedded unit of analysis #7	Embedded unit of analysis #8
H_0 #1	N-4	120 Operators of the department #1	120 Operators of the department #2	140 Operators of the department #3	80 Operators of the department #4				
H_0 #2	N-2,3					70 Managers and specialists working in dyads	100 Reference sample of not working in dyads		
H_0 #3	N-2,3								70 Managers and specialists
	N-1							12 Managers of the departments	
Area of performance increase		Safety Process				Dyads	No dyads	Horizontal leadership	
Statistical methods		ANOVA				t-test		chi-square test	
Population		120	120	140	80	100	100	12	70
Sam-ple		120	120	140	80	70	100	12	70
Sampling		The historical performance records of the managerial process KPIs				The historical personal performance appraisal records of Human Resources (HR) department of the company		All managers in the population	All managers in the population
Data collection methods		The withdrawing of the raw data from the electronic database of the process performance.				The HR electronic database. The withdrawing of the historical raw data of employees' performance		Survey questionnaire	Survey questionnaire

Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

Statistics

Four distributions of scores of near miss reported by the operators of four Embedded Units Of Analysis (EUOA) are shown in Figure 10.

Figure 10. *The Distribution of the Near Miss in the Embedded Unit Of Analysis #1, #2, #3, and #4, April 2015 – July 2017*



Adapted from historical company data.

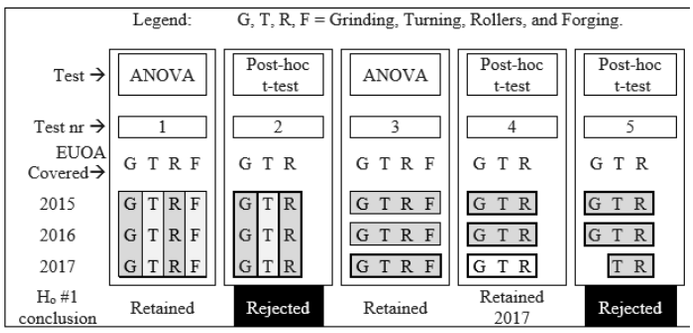
Ho #1 Statistics: Three Steps

A three-step statistical inference was applied, with a number of ANOVA and post-hoc t-tests at each of the steps, as shown in Table 9.

S*tep one: Conclusions*

Figure 11 shows the results of five statistical tests applied in the first step to explore the relationship between and among distributions of the raw scores of near misses in all four Embedded Units of Analysis. The detailed discussions of the results of each of the tests are presented further down in the article.[3]

Figure 11. *Results of the Statistical Inference of the Distributions of Near Miss Scores*



Note: Created from company historical data. G = Grinding, T = Turning, R = Rollers, F = Forging, EUOA = Embedded Unit Of Analysis. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

Null hypothesis Ho #1 was rejected in tests 2 and 5. For these two tests it was then revealed that distributions of near miss scores covered by these two tests belong to the same population, therefore there is a relationship between performance and application of the integrated model of leadership and management.

Based on the results of tests 1 and 3, all distributions of near miss scores of the EUOA of Forging required a separate analysis, presented in step two. Based on test 5, the distribution of near miss scores of the EUOA of Grinding in 2017 required a separate analysis, presented in step three.

Table 9. *Three-step Statistical Inference of Ho1 Hypothesis*[2]

	Step one		Step two			Step three
EUOA	G T R F	G T R F	F	F	F	G T R
Area	Safety	Safety	Safety	Safety	Safety	T R Safety G Quality case study
Test	ANOVA	post-hoc t-tests	ANOVA	post-hoc t-tests	ANOVA p=01	ANOVA

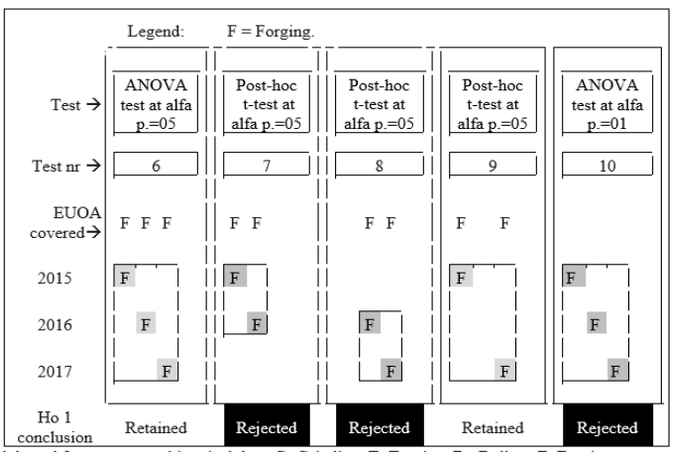
Note: Developed by authors based on Company data. G = Grinding, T = Turning, R = Rollers, F = Forging, EUOA = Embedded Unit Of Analysis

2,3 The results of the statistical inference can be requested directly from the authors

Step two: Conclusions

Step two and its five tests numbered 6-10 were applied exclusively to the Forging department, and their results are presented in Table 10.

Table 10. *Results of the Statistical Inference of the Distributions of Near Miss Scores*



Note: Created from company historical data. G = Grinding, T = Turning, R = Rollers, F = Forging, EUOA = Embedded Unit Of Analysis. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

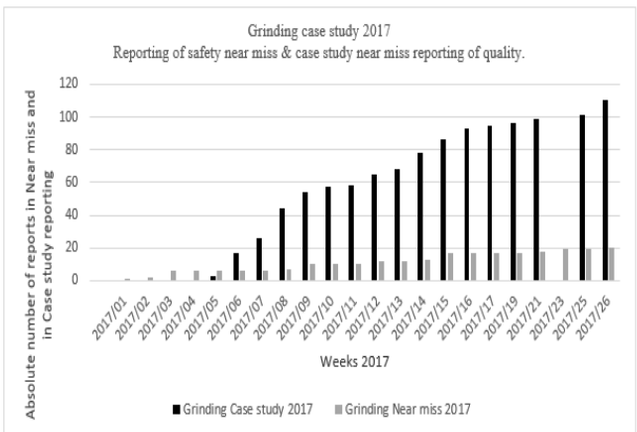
The results of tests 6 to 9 revealed that three distributions of near misses of the EUOA of Forging do not belong to the same population, with p. =05.

However, based on the results of test 10, which was inferenced with p. =01, it was concluded that Ho #1 might be rejected, thus there was a relationship between application of the Integrated leadership and management model and the performance of safety in the Forging department. The need to apply p.=01 was associated to the unstable context (Table 11) of the EUOA of Forging due to changing of its manager both in 2016 and 2017.

Step three: Conclusions.

For business reasons, a quality improvement process based on the same principles as the safety management process (Table 6) has been launched in the EUOA of Grinding in 2017, in parallel to the safety process initiated in 2015. The operators collected scores of failures in the area of quality (similarly to the near misses used in the safety process), thus the EUOA of Grinding became a case study research area. Figure 12 illustrates the distributions of the near miss scores of the safety process and the scores of the case study quality improvement process in 2017 of the Grinding department.

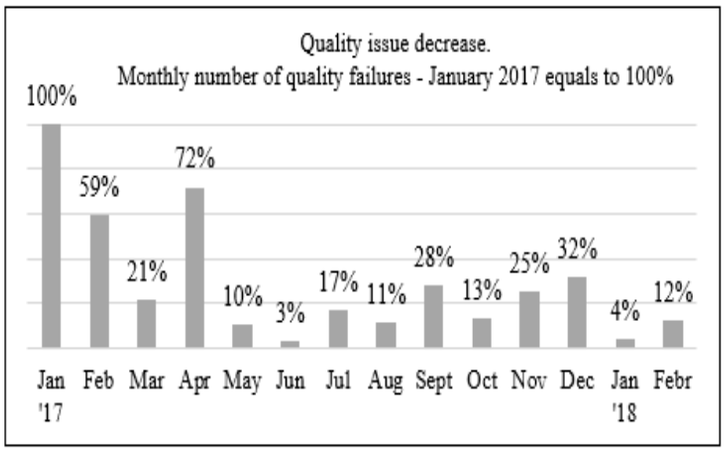
Figure 12. *Distribution of Score of Safety and Quality Processes of the EUOA of Grinding in 2017*



Note: Adapted from company historical data.

Administering simultaneously two management processes in two different areas (safety and quality) in the same population negatively affected the level of response in one of them. As shown in Figure 12, the number of responses in the safety process significantly decreased in favor of a high response to the quality issues. That brought the improvement of quality, so the new quality process influenced the performance increase as shown in Figure 13. The number of the quality failures significantly decreased during the research period.

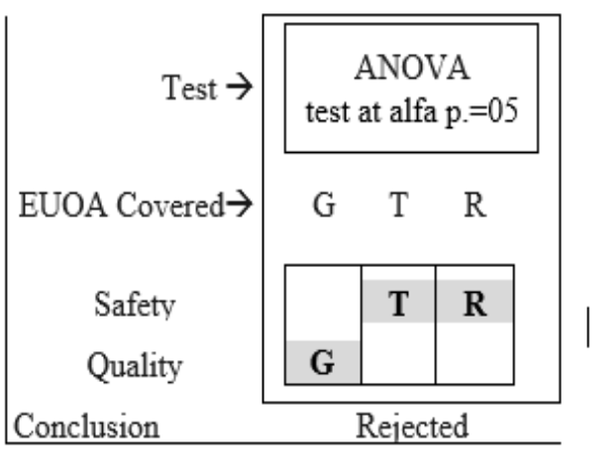
Figure 13. *Decreasing Trend of Quality Failures. Result for the Grinding EUOA*



Note: Adapted from company data. EUOA = Embedded Unit Of Analysis.

Table 11 presents the design of the ANOVA test and the conclusion of the inferential statistics of step three: the distribution of the safety near misses in the EUOAs of Turning and Rollers, and the quality failure scores of the Grinding case study.

Table 11. *Results of the Statistical Inference of the Distributions of Near Miss Safety Scores at the EUOA Turning and Rollers, and Distribution of Quality Scores at the EUOA Grinding*



Note: Created from company historical data. G = Grinding, T = Turning, R = Rollers, F = Forging, EUOA = Embedded Unit Of Analysis. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

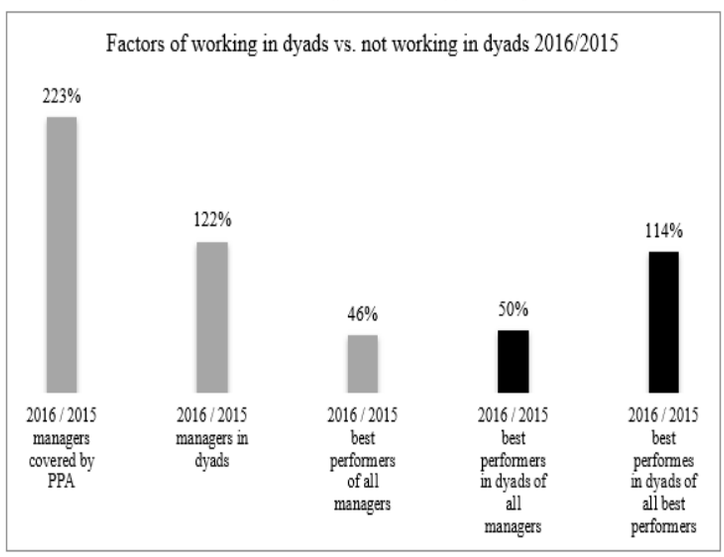
As visible in Table 11 the null hypothesis was rejected; these three distributions belong to the same population, thus the relationship between performance increase and application of the integrated model of leadership and management in the field of quality was revealed.[4]

Ho #2 Statistics

Figure 14 shows that relation exists between the result of annual Personal Performance Appraisal and working in dyads. The proportion of high performers working in dyads to the high performers in total is at least stable high or growing.

In the second year of the research the number of managers covered by the Personal Performance Appraisal (PPA) system was doubled, while the number of managers involved in working in dyads increased by 22%. While the number of best performers as measured by PPA was 46% higher as compared to the previous year, the number of best performers working in dyads was 50% higher. The numbers of best performers in dyads in the second year of the research was 14% higher than in the first year.

Figure 14. *Results of 2016 Compared to 2015 of Selected Factors of Working in Dyads*



Note: Based on the scores of annual Personal Performance Appraisal pulled from the company's historical data.

The annual performance review was gradually extended from N-1 population in 2014 to N-2 in 2015 and N-3 in 2016. The following numbers of managers participated in the process:

1. 8 N-1 managers in 2014

2. 41 N-1 and N-2 managers in 2015

4 The results of statistical inference can be requested directly from the authors as separate PDF document

3. 94 N-1, N-2, and N-3 managers in 2016.

To explore the null hypothesis Ho #2 the t-test was applied.[5]

The discussion concerning the test allows concluding that P value of two-tail statistical inference equals 0.07, which is larger than the rejection criteria of 0.05. The difference between the means of these two distributions is 5.7 %. The relationship between these two distributions is significant. The performance means (M= 4,21 and M=3.96) are close, (*t* [135] =1,8171<t crit =1,977, p>0.05).

Therefore, the application of integrated leadership and management in 2015 and in 2016 returns a similar influence on employees' performance. This leads to a conclusion that there is a relationship between the application of integrated leadership and management and the performance level of the dyads.

Ho #3 Statistics

Research Program Description

Questionnaires were administered to the population of managers of four production departments and twelve supporting/functional departments. The horizontal leadership questionnaire was tested for validity and reliability (Cronbach- alfa test) in the Turning department. The population of the Turning department was excluded from further research.

Table 12. *The Rate of Returned Horizontal Leadership Questionnaires*

		N-1	N-2	N-3	Total
1	Administered	12	31	45	88
2	Returned	10	30	36	76
3	Rate returned	83%	97%	80%	86%
4	Not qualified (errors, not fully filled)	0	2	3	5
5	Qualified	10	28	33	71
6	Rate qualified	83%	90%	73%	80%

Adapted from historical company data.

Results of Descriptive Statistics. Performance of Horizontal Leadership

The results of the questionnaire (Figure 15) of N-2 and N-3 managers were higher than the results of N-1 managers, from 1.80 in Courage to lead to 1.22 in Respect. Authors propose the possible conclusion that the more stable the exposure to the integrated leadership and management, the higher the scores of the horizontal leadership. Managers of N-2 and N-3 levels practiced horizontal leadership in the more stable context than their supervisors (N-1), as the fluctuations they experienced were lower (10% vs. 4% vs. 50% respectively, Figure 15).

Figure 15. *Horizontal Leadership Questionnaire's Scores of Always and Often and Fluctuations*

		A	B	C	D	E
		N-1	N-2	(N-2) / (N-1)	N-3	(N-3) / (N-1)
1	Courage to lead	46%	83%	1,80	81%	E 1,76
2	Trust	47%	77%	1,63	74%	D 1,57
3	Cooperation	57%	77%	1,35	82%	C 1,43
4	Knowledge sharing	61%	80%	1,31	77%	B 1,26
5	Goals alignment	67%	91%	1,35	85%	B 1,26
6	Respect	67%	82%	1,22	84%	B 1,25
7	Changes on the positions					
8	2014: Number / %	2	-		-	
9	2015	1	1		-	
10	2016	1				
11	2017	2	3		2	
11	Total changes	6	3		2	
12	Questionnaires administered/ returned	12 / 10	31 / 30		45 / 36	
13	Total changes / administered	50%	10%		4%	

Note: Created from company's historical data. Adapted from "Integrated Leadership and Management for Performance Increase," by G. Sobiecki, 2018, [Unpublished doctoral dissertation]. SBS Swiss Business School, Zurich, Switzerland.

Conclusion of the Chi-Square Test of the Horizontal Leadership

The chi-square test had been chosen to examine the non-parametric distribution, especially in case of a new theory to be checked. (Spatz, 2011).

The value of the chi-square calculated of 4. 1455 is lower than 18.307 found in Table E (Spatz, 2011, p.393). According to Spatz, "to be significant, the X2 obtained from the data must be equal or greater than [emphasized by Spatz] the value shown in the table", (2011, p.393).

5,6 The results of the statistical inference can be requested directly from the authors as separate PDF document

Therefore the null hypothesis Ho #3 must be rejected. The only hypothesis that is left is the alternative hypothesis Ha .

The relationship between the horizontal leadership level measured by the questionnaire scores and the application of integrated leadership and management was confirmed and it is not accidental due to the probability of p. = 0.05

Conclusions, Recipients of this Article, and Future Research.

The aim of this research was to check how the implementation of the integrated model of leadership and management influences performance increase. To achieve this aim authors built the model of integrated leadership and management with seven tools (Table 3), applied the tools of the model at a real factory in a three-year longitudinal research from 2014-2017, and tested statistical relations between the application of the model and the actual performance increase.

Three performance fields chosen for the research were: safety at work, working in two-members teams – dyads, and application of horizontal leadership. This choice was driven by the need to address the genuine performance gaps of the research company: an excessive number of accidents at work, a low level of cooperation between peers, and the absence of cooperation among teams across boundaries of organizational departments.

The actual number of accidents at work dropped by 40% in the three-year period of the longitudinal research due to implementation of the safety management process, which aimed to continuously collect reports of accidents - near misses from the production staff. The 1750 near misses reported by 460 operators of four production departments allowed for eliminating the root causes. Application of the ANOVA test and several t-tests proved that the distribution of near miss scores of all four departments belong to the same population.

Seventy managers working in dyads achieved higher scores on the annual performance appraisal in two consecutive years as compared to the scores of their 100 peers not working in dyads. By application of the t-test it was revealed that the two distributions of annual performance scores in 2015 and 2016 of the dyads-members statistically belong to the same population.

The scores of the Horizontal Leadership questionnaire returned from 71 managers revealed that the personnel permanence (low fluctuation) at the managerial positions results in better practice of horizontal leadership behaviors amongst various management teams. The chi-square test applied to check the stability of the distribution scores of the questionnaire confirms the findings.

There are two groups of recipients of this research: managers, and researchers in the field of applied business. The authors of this article intended to provide the business management professionals with practical tools, enabling them to improve performance by implementing the integrated leadership and management model, and the researchers with an area worth further investigation.

For the managers the authors propose the following conclusions:

1. Managers who face the challenges of performance increase could use the model of integrated leadership and management in daily practices, introducing the full model and focusing on applying selected tools, most relevant to their specific needs. This research was responding to the intention and the objectives of the case study company to increase performance in work safety, cooperation between individual managers, and cooperation among teams.

2. It was revealed statistically that there is a relationship between the application of the integrated model of leadership and management and performance improvement, though the research has been made in a stable context (Figure 11), i.e. in a defined area of business (e.g. safety and quality processes in the case study company) with invariable contextual dimensions.

3. In case of an unstable context (Table 10) the relationship between the application of the integrated model of leadership and management and performance increase was also found. Alternations in th context, e.g. replacing management staff, revealed that performance improvements still take place although with a lower probability, as in case of the Forging department during the safety process implementation (Table 10), or the performance level can be lower as in N-1 group during the horizontal leadership implementation (Figure 15).

For the fellow researchers the authors revealed a research gap (Table 2), built a research model of integrated leadership and management with seven tools

(Table 3) and tested it in a genuine company to close its performance deficits. Although the authors managed to achieve their own research goals, research continuity is needed to fill in the research gap with results of explorations of the influence of the remaining set of tools of the integrated model of leadership and management on performance increase.

It will be interesting to assess the effectiveness of the integrated model of leadership and management in the research design of multiple cases crossed with embedded multiple-unit of analysis (Figure 8), for example in several companies of various profiles in one country to compare the results among industries in a homogenous culture background, or in companies of the same industry branch in various countries to compare the results among different cultures.

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