Human Learning for Productive and High-Performance Workplace

KONGKITI PHUSAVAT

ToKnowPress

Human Learning for Productive and High-Performance Workplace

Human Learning for Productive and High-Performance Workplace

Kongkiti Phusavat

ToKnowPress
BANGKOK • CELJE • LUBLIN

Human Learning for Productive and High-Performance Workplace
Dr. Kongkiti Phusavat

Published by ToKnowPress
Bangkok · Celje · Lublin

ToKnowPress is a Joint Imprint of
Kasetsart University, 50 NgamWongWan Rd. Ladyao
Chatuchak Bangkok 10900, Thailand

International School for Social and Business Studies
Mariborska cesta 7, 3000 Celje, Slovenia

Maria Curie-Skłodowska University
Pl. Marii Curie-Skłodowskiej 5, 20-031 Lublin, Poland

Distributed by
Kasetsart University, 50 NgamWongWan Rd. Ladyao
Chatuchak Bangkok 10900, Thailand

www.toknowpress.net

1st Edition · 2021

ISBN 978-83-65020-38-3 (print)
ISBN 978-83-65020-39-0 (pdf)

https://doi.org/10.53615/978-83-65020-39-0

Contents

List of Figures

List of Tables

Overview

Industrial engineering and the term Industrial Revolution are closely interrelated. The growth in the numbers of large factories and production facilities reflected the era of Industrial Revolution. Thanks largely to the colonization, abundant supplies and workers became available to support this continuous expansion. Potential workers from the agricultural sector migrated to the cities so that they could work in these factories for more stable incomes. In addition, higher production volumes meant more people would be needed for a larger production capacity.

Despite more demands for products, the initial attention to the workers (e.g., tasks, workload, and working environment) was very minimal. Working conditions were poor and sometimes dangerous with long-working hours. Insufficient lighting, dust and particles, heat, and unsafety workplace were not perceived to cause a disruption on work and operations. The workers were expected to perform the tasks based on their best ability. At that time, productivity and quality were not explicitly embedded in management practices and engineering methods.

Instead of focusing on a development of more powerful machinery in the factories, the discipline of industrial engineering emerged and took a drastic step from a previously-prevailing philosophy in placing the well-being and readiness of the workers as the priority. Ensuring that work and working environment would fit with a worker as opposed to having a worker forcefully fit with work and working environment became the guiding philosophy of industrial engineering. Focusing on a worker would lead to continuous productivity and performance improvement in a workplace was the main idea.

In the late 1920s, the attention was on blue-collar workforce through the applications of work (i.e., motion and time) study as well as the issues relating to safety and health. Scientific management with work breakdown into an activity level, motion economy, use of stopwatch to achieve productivity gain, standardization of work, and continuous training on work standards became the trademark of industrial-engineering practices. As production and manufacturing became more advanced along with increasing competition and international trade,

minimizing operational wastes developed into one of the primary objectives of an organization. This was further driven by the fluctuation of currency exchange rate (e.g., Japanese Yen to US$ during 1980s and 1990s) which had led to massive efforts on waste reduction to ensure lean operations and continuous productivity improvement. Thus, a lot of efforts aimed to tackle waste (known as the Seven Wastes as first advocated by Toyota Production System) in an organization.

As the transition from manufacturing to service and eventually knowledge economy took place in early 2000s, the focus on improving a productivity level remained essentially the same. The study on white-collar workforce was made by industrial engineers and scholars from other academic disciplines. This was because workplace productivity could be impacted by many technical and non-technical factors. Specifically, the non-technical factors included psychological effects from attitude, mindset, and motivation. Such factors affected productivity directly and indirectly. At the same time, technology was increasingly viewed as a key component to ensure and sustain a productive workplace. As a result, standardization of work, occupational safety and health, incentive and motivation, and technology had been vital for productivity management.

About two decades ago, the term knowledge workforce replaced white-collar workforce as the pivotal issue facing productivity management for an organization. This shift reflected the ever-increasing significance of knowledge (e.g., information, expertise, experiences, and skills) in a workplace. Flexibility, autonomous work, and collaboration were some of the initial descriptions of the nature of work being performed by knowledge workers. As a result, industrial engineers began to shift the research attention, in collaboration with industrial psychology and others, into the surrogate that would reflect and effect workforce's productivity.

The surrogate scheme in this context was to adapt the idea that, instead of measuring productivity of knowledge workers directly, it was essential that any aspect that would reflect productivity could be identified and assessed. This is the reason that the term quality of work life was closely examined and subsequently received a lot of consideration as one of many productivity surrogates. It was presumed that, when knowledge workers felt positive about their work and workplace, they would become more productive. With better quality of work life, knowledge workers were expected to use existing knowledge and experiences

more productively when performing their work. This notion was based on the premise that positive feeling and motivation were instrumental to the commitment in a workplace.

In current business environment today, many problems have become complex or even wicked without a specific solution. These problems have happened on a regular basis and will likely increase with time due to many drastic changes in business circumstances and environment. For instance, there have been several disruptions caused by the pandemics, natural disasters, and geopolitical conflicts over the past two decades. In the past, many organizations failed to effectively utilize the talents in their workforce by relying on external knowledge as well as expertise and experiences from the executives. It was presumed that it would be sufficient to handle and overcome the disruptions. Given global operations for many large international firms (or a domestic firm with multiple operational locations), this failure cannot be ignored. Due to the need to become more responsive when faced with these disruptions, learning to generate new ideas, solutions, and knowledge began to receive a lot of attention.

As an organization needs to quickly adapt to business disruptions, learning has been perceived as a critical success factor. Knowledge can be quickly obsolete as what have in the past worked well may not be effective today in a new business environment. Fast learning by the workers or individuals within an organization can replace obsoleted knowledge while promptly adding new knowledge to deal with these disruptions. Thus, the significance of learning in a workplace begins to emerge and is now recognized as an important competitive advantage for all organizations today. Due to the history and past success in working closely with an organization's workforce, minimizing the waste in underutilizing workplace talents and fostering human learning have been the frontier of the research for and practices of industrial engineers. Many relevant topics, e.g., feedback, engagement, psychological safety, motivation, quality of work life, behavior, empathy, and emotion, have been included in contemporary industrial-engineering research.

The subjects relating to human and workplace learning have gained a lot of interests among scholars, researchers, and practitioners due to the long-term positive impacts on productivity and competitiveness of an organization. Human learning is no longer about education and training but relates to how learning takes place and how to support and sustain this learning on a continuous basis. Gaining insights into

human learning can minimize the waste stemmed from underutilizing the talent from the workers which is common at all levels within an organization. It is hopeful that this textbook will provide excellent insights into how to sustain human learning and to maintain effective workplace engagement.

Forewords

Kongkiti Phusavat's book *Human Learning for Productive and High-Performance Workplace* is a testimony that continuous learning and unlearning are a necessity for all organizations. Digitalization, climate change prevention actions, coping with pandemic and other global challenges ask for new ways of thinking and acting both at personal and organizational levels. The book is based on the author's extensive international academic activity, scientific research and personal interests in the areas of human learning and performance. The author has taken here a very long perspective in looking for the ideas of organizational performance improvements starting from the times of Frederik Taylor more than 100 years ago. The book looks learning both from the perspectives of individuals and organizations. Supporting author's perspectives with results from research gives high credibility to this book.

This is indeed an excellent book for those who are interested in human learning as the source of business success and long-term competitiveness. Performance and competitiveness are often considered to be dimensions for private companies only. Kongkiti Phusavat has extended his views of performance in workplace from private companies to public and social sector organizations as well. This book shows very nicely that they are very relevant elements of the public and social sector workplaces as well. It is not limited to this area, and I can recommend this book to all those who are interested in developing organizations to perform better to achieve their short and long period objectives. The original research paradigm for this book comes from the discipline of Industrial Engineering. However, this goes beyond the limits of one discipline. I think this book can be one tool for people from various disciplines to find a common ground for discussions on organizational development.

Pekka Kess, Professor (retired),
Oulu University, Finland

The book is based on the author's past research on human learning and development. The author is an internationally renowned academic known for his research efforts, academic abilities and achievements, which he disseminates among his students as well as various interested publics, also in the form of books such as the present one.

Human learning has become not only essential for managing workplace, but also the foundation for long-term business success. We are aware of human and machine learning as part of an attempt for digital integration into a workplace. Even through machinery and technology have replaced the use of workers in many operations, it cannot be a substitute for all human activities. A workplace still needs to employ the workers who are expected to learn and improve their tasks on a continuous basis.

Today, more frequent business disruptions can be expected as we have witnessed natural disasters such as volcanic eruptions and hurricanes which negatively affect global, regional, and national operations. The speed in which an organization can adapt to these impacts requires learning among its workforces. Learning can no longer be about training and education which are too slow when responding to the rapid changes in business environment. The current pandemic of COVID-19 further highlights this premise. Facilitating learning among the workers should help tap the underutilized talents so that the adaptation could be made more easily.

The book reveals many useful insights that can be applied without difficulty. They include the recognition of the diversity of learning among an organization's workforce. Appropriately, not everyone in an organization is equally engaged and motivated. Dealing with those who are disengaged should not be the same when supporting learning from more engaged workers. Feedback, communication, and engagement are recognized for their interrelationships. On the contrary, many organizations have unfortunately undervalued the importance of feedback. This book also incorporates many contemporary concepts about learning and motivation such as informal learning which can be helpful for not only the researchers but also the practitioners. Lastly, the author recognizes the similarities between school and workplace. This is an important viewpoint that can potentially have lasting influence on future studies of workplace learning.

Dušan Lesjak, Professor, University of Primorska
and International School for Social and Business Studies, Slovenia

The times of clouds computing and economy 4.0, despite the dynamic and very wide application of information and communication technologies, constantly require continuous learning. New technological solutions and the development of advanced, highly automated production or logistics systems paradoxically require higher competence from their users. These competences refer not only to the current use of technology, but also to planning their development and creating a competence potential that will enable efficient use of these solutions in the future. Despite the very wide use of robots and cobots, a man remains at the center of business management processes. Competence, the ability to learn and human interest in the continuous expansion of knowledge and skills related to a modern work environment constitute and will be a key factor in the success of undertaken activities.

The book is based on the author's research and personal interests in the areas of human learning and performance. Why is it worth reading Dr. Kongkiti Phusavat? Of course, not only because he is an outstanding representative of science, with considerable international achievements, cited more than 1100, with the H-17 index. It is very important. But the most important thing, in my opinion, is that the book was written by a scientist whose character traits, international scientific and business experience, as well as broad knowledge, various interests and openness to cooperation constitute a unique mix of competence and knowledge. These are reflected in the content of the book, which may inspire many scientists interested in developing new concepts of human learning in the international environment.

Dr. Kongkiti Phusavat refers to the historical research of Frederick Taylor and Frank and Lillian Gilbreths. They created the basis for the development of new concepts for the improvement of industrial processes in the 20th century. The famous work of F. W. Taylor titled *The Principles of Scientific Management* (1911), or the research by F. and L. Gilbreths on the so-called Therbligs (anagram from the authors' names) contributed to better organization of work processes in industry, as well as to smarter processes scheduling and realisation. I am deeply convinced that the considerations of K. Phusavat presented in this book will contribute in a similar way to the development of employee learning processes and better use of their competence and knowledge in modern industrial processes management and organisation.

Zbigniew Pastuszak, Professor,
Maria Curie-Sklodowska University, Poland

Introduction

Industry 4.0 often brings the image of a smart factory and seamless operations with the use of advanced digital technology. The term Industry 4.0 is a continuation from Industry 3.0 which represented the initial use and integration of computer technology and automation within the manufacturing sector which began in 1970s. Knowledge, expertise, and skills were viewed to be the critical success factors to complete the tasks required by an organization. Training and education were still a viable option to upgrade for a worker's capability-skills and knowledge. Closed monitoring and evaluation became the key mechanism to ensure the effectiveness of these training and education on skill and knowledge developments.

The transformation from Industry 3.0 to Industry 4.0 was completed when robots, Internet of Things, machine learning, 3D printing were effectively and comprehensively embedded into a workplace in the late 2000s. In addition, rapid developments and applications of unmanned technology (e.g., unmanned aerial vehicle) have been widely deployed and have become eventually an integral part of operations. Despite the advancement in technological applications and their integrations into routine operations, industrial engineers still recognize the importance of the human component in a workplace in achieving and sustaining productivity improvement and high performance.

Instead of focusing on possible job losses and replacement when dealing with Industry 4.0, industrial engineers have paid a great deal of attention to the transformation of an organization's workforce. Industrial engineers realize that Industry 4.0 has brought rapid changes in how individuals interact in a workplace and often cooperate with key players outside an organization such as customers, suppliers, regulators, and competitors. Some of these rapid changes are inevitable due to the convergence in business operations. For instance, customer's expectation has changed very quickly due to the familiarity with many convergences such as technology (e.g., communication to lifestyle devices) and service (e.g., hospitals to hotels). Some have experiences service enlargement (e.g., airline in collaboration with hotels, car rental, and insurance).

Thus, many new problems facing an organization are becoming

more complex and wicked. Transforming a workplace to deal with these ever-changing business environment and circumstance while achieving continuous productivity improvement have been the forefront of industrial engineers.

The term work within the context of Industry 4.0 has dramatically shifted from a traditional viewpoint which has emphasized the use of technical skills and knowledge to how the individuals can create their own knowledge. This shift signifies a different set of skills, especially learning how to learn, learning by teaching, etc. Moreover, the workers are expected not only understand how to perform the tasks but to continuously learn and improve their work. This new viewpoint highlights that they have enough talents to recognize improvement possibilities. Thus, learning becomes an integral part of work within the context of Industry 4.0. For instance, a worker is expected to provide a solution to a problem without having to wait for or to rely on training and education organized by an organization. They are expected to understand the needs of individual customers by learning through repeated observations and interactions. Ongoing trends in customization and individualization of products and services require workplace learning to be effective for long-term business success and competitiveness.

During Industry 4.0, an organization is required to adopt the use of advanced technologies such as Big Data and Artificial Intelligence. An organization needs to be capable of planning under turbulent business environment, operating under intense competition, achieving excellent performance under more scrutiny by customers, thriving under more regulatory restrictions, and developing a solution to complex problems in a timely manner (PWC, 2016). Organizational success in interconnected business environment depends on learning capability to become more flexible, agile, and adaptable. In fact, 72% of manufacturing companies are using data analytics to strengthen internal and external business collaboration for quality and customer services. Learning is viewed to be even more important to ensure this adaptation and subsequent continuous productivity and performance improvement in more turbulent business environment.

Connectivity in digital technologies has impacted a great deal on inter-operational management. For example, faster delivery time for new product or service development to customers or faster response time for customer complaint handling are expected. This impact highlights the significant changes of how various functional units within an

organization operates and interact which also include the partnership with suppliers, contractors, regulators, civic groups, and customers. In addition, digital technology is often associated with better intelligence for decision-making and problem-solving. The expectations of being fast, flexible, proactive, and responsive imply the different roles and expectation of traditional workers in today workplace.

New expectations on the workers such as multi-tasking and learning have become more common when referring to a future workforce for Industry 4.0. Training and education appear to be too reactive for a workforce's preparation due to the slow responses when faced with a problem or a crisis. Although the foundation of knowledge is important, higher expectation on learning capability becomes prevalent in a workplace today. Utilizing digital technology to support learning of a worker has been predominant. For instance, user-generated contents by a worker have been encouraged since it is faster to help improve a worker's performance than a traditional classroom training.

A development of a social platform (part of informal learning) to strengthen knowledge sharing and transfer is nowadays common for many organizations. Informal learning has replaced formalized training and education when dealing with business crises. This development points to the need to reexamine how the workers learn in an organization and also how fast they can learn. Therefore, a successful organization during Industry 4.0 is how to facilitate and sustain learning of the workers.

Recognizing the value and contributions of learning (e.g., creative idea and suggestion and an ability to teach other workers) that a worker can bring into a workplace is a drastic shift. Current and future workers realize that learning can take place anywhere and all the time (e.g., interacting with colleagues, conversation with customers, learning by experiences, learning by teaching others, etc.). Trans-disciplinary interventions to help facilitate and sustain learning has gained more acceptance among the scholars and practitioners alike.

For an organization to succeed in Industry 4.0, the workers, who can learn and are motivated to learn, are expected to constant innovate how they work. Moreover, due to learning capability, there is an expectation that these workers can bring up creative ideas to help enhance the value-added provided by an organization to its customers. Value-added is an economic term to express the difference between the value of goods and the cost of materials or supplies that are used in produc-

ing them. Simply put, value added reflects a creation of wealth (Value Added = Sales – Bought-in Materials and Services). Wages, salaries, interest, depreciation, rent, taxes and profit reflect the term value added (Asian Productivity Organization, 2015). New ideas and suggestions from the workers are important for both adding the value of goods (which is reflected by what customers are willing to pay) and an improvement on how an organization handles its cost of materials (e.g., a compatible substitute, sourcing, etc.).

Facilitating workplace learning cannot be regarded as a simple and straightforward proposition. This is because training and learning are vastly different. Workers are expected to follow what they are taught during training. Training is often used when a problem is simple and understood and its solution is known and accepted. Thus, training tend to overlook for the workers' ability to learn (i.e., overlooking the potential talents). Furthermore, training cannot be expected to catch up with the speed of change and new knowledge emerged during Industry 4.0. In fact, more than 75% of the executives express their concern about the ability to learn and grow whether it is fast enough to keep up with the needs and future of a business (Cross, 2015). Industrial engineers need to understand that an interconnected workplace offers an opportunity for individual workers to learn from each other. This understanding and the recognition of a new role as a learning facilitator will be crucial for industrial engineers for years to come.

Finally, many relevant issues in education and psychology can contribute to effective workplace learning. These issues contribute to the need to work across different academic disciplines. In fact, the transdisciplinary has become more common in tackling a problem in ever-increasing complex working environment and business circumstance. Thus, both education and psychology are expected to play a significant role for engineering-designed support to sustain human learning in a workplace. The reason is that learning relates to behavior and motivation. The upcoming challenge of transforming various types of workforces (i.e., blue-, white-, and knowledge workers) into learning workers represents a new frontier of the research and academic work in industrial engineering.

References and Further Reading

Asian Productivity Organization. (2015). *Handbook for SME productivity measurement and analysis for NPOs*. https://www.apo-tokyo.org/

publications/wp-content/uploads/sites/5/Handbook-for-SME-Productivity-Measurement-and-Analysis-for-NPOs.pdf

Cross, J. (2015, 20 October). *The Rise Of Informal Learning.* eLearning Industry. https://elearningindustry.com/rise-of-informal-learning

PWC. (2016). *Industry 4.0: Building the digital enterprise.* https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf

Chapter One

Productivity Management in an Organization

Highlights and Key Points

- High-performance organizations can be influenced and explained by many factors and characteristics such as technology, adaptability, and workplace learning.
- Workplace learning has become a critical issue due to the recognition of the potential contributions by a workforce when faced with rapid changes in working and business environment.
- The underutilization of the workplace's talents has been added to the traditional Seven Wastes for learn operations.
- Organizational waste on the underutilized talents of the workforce has been driven notably by the feeling of workplace disengagement by the workers. Approximately, about 15–20% of employees are actively engaged in a workplace (Gallup, 2017).
- Dealing with and overcoming workplace disengagement becomes one of the priorities in lean operations and long-term business competitiveness.
- Facilitating workplace learning is important for sustaining a productive workplace.
- Workplace diversity is an important issue that should be recognized by industrial engineers before dealing with workplace learning.
- Disengaged workforce approximately costs the US firms around $450–550 billion in productivity and creativity losses annually (The Conference Board, 2021).
- Successful workplace engagement shows 21% higher on profitability and 17% higher on productivity (Sorenson, 2013).

Introduction to Productivity

Productivity reflects how much work is completed, given a certain sum of resources over a specific period. When a workplace functions, productivity should be at the maximum potentially. To reach this potential, it is important to recognize that "a company is only as good as its

people."[1] Regardless of the best machinery and the latest technology to come up the most innovative product and service in the most competitive market, an organization must have the most capable workforce to make this achievable. This makes a productive workforce as one of the main deciding factors for a success of an organization. Poorly motivated and uninspired workers can negatively affect both short- and long-term business success.

Productivity is one of the main organizational performance areas considered by many academic disciplines, namely engineering, accounting, industrial psychology, and business management. Practically, all organizations have formalized steps and procedures for defining, collecting, analyzing, and reporting productivity. In many countries, productivity is part of national information regularly released. Many benchmarking efforts often focus on productivity as part of continuous performance improvement. Note that productivity is defined as a total output per one unit of a total input. Productivity simultaneously reflects efficiency of resource utilization and effectiveness in fulfilling objectives and goals.

High-performance organizations in an era of Industry 4.0 have been described as adaptability, agility, and perseverance. These characteristics are necessary to help overcome the dynamics of customer expectation, competition, regulatory restriction, changes in technology, and transition to digital and circular economy. Despite the reliance on the use of digital technology, business leaders have expressed the importance of workplace learning when they contemplate many methods and practices to increase the productivity and subsequently performance level.

Being one of several productivity factors (i.e., labor productivity), the human component can greatly contribute to the value-added generated by an organization. Some of these contributions include a new idea for product improvement, a new suggestion on faster service delivery, and a new initiative to improve customer communication. This development has led to more popularity of the term value added such as value-added labor productivity (i.e., total product revenue less total material purchases divided by employees). As a result, this human component is no longer about technical and manual skills but needs to incorporate learning skills and higher cognition into consideration.

1. See https://www.brainyquote.com/quotes/kathryn_minshew_541224.

Adding more value through better customer experiences is recognized as a competitive advantage. To enrich customer experiences, each interaction between an organization (through its workforce) and customer represents an opportunity to learn and identify needs and pain points for product and service improvement.

To remain competitive in an era of Industry 4.0, productive workplace needs to show how well all eight categories of wastes are handled. Minimizing wastes has been a core principle in lean operations for the manufacturing and service sectors. Being lean indicates the ability to remove waste from an operation. In a typical firm, being lean is a prerequisite for profitability as waste represents poor planning and an unnecessary use of resources. In other words, waste represents an expense which does not add value to products and services.

Previously, the seven wastes were recognized as the key contributors to performance-related problems in an organization. These wastes negatively affected quality, productivity, and profitability. For many years, they included defects, overproduction, waiting, transportation, inventory excess, motion, and excess processing (ASQ, n.d.). The concept of seven wastes was based on Toyota Production System. Recently, a new category was added due to the need to look beyond production and operational processes. This addition clearly highlights the importance of human capability and learning in a workplace. It is referred to as an underutilization of the talents which largely reflects the management's inability to effectively utilize human capital in an organization.

The eighth category of waste does not relate specifically to production or manufacturing-related processes. It generally focuses on continuous waste on the talents which can be less visible but continuously occurs anywhere in an operation. It is important to recognize that this waste of the human talents cannot be measured directly. Thus, prevention is advocated and encouraged. The main reason, that contributes to this underutilization, is a failure by an organization's management to recognize the importance of active workplace engagement and learning. This failure can subsequently lead to low motivation, poor behavior, and lack of creativity.

Disengaged behavior can be simply detected and observed as the employees are not interested in solving problems and making progress in their careers. Carelessness and ignorance of a task instruction, tardiness, absenteeism, and turnovers are some of the obvious indications of a disengaged worker. Usually, a disengaged worker does not imme-

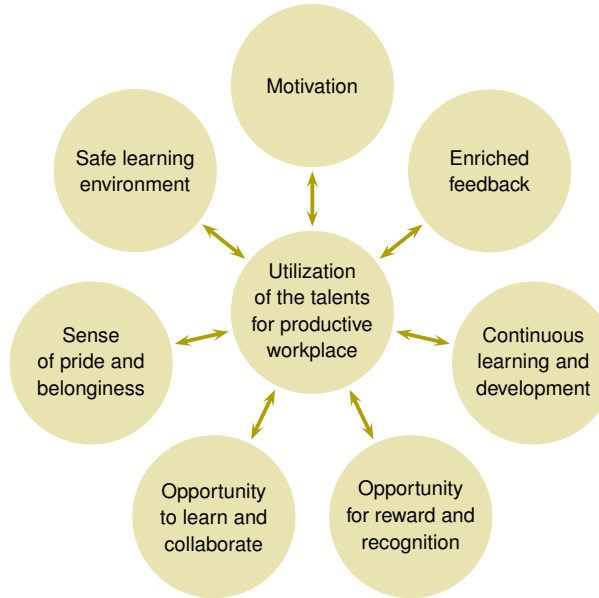

FIGURE 1.1
Workforce Talents and Productive Workplace (adapted from OECD, 2017)

diately cause problems at first but becomes more argumentative and difficult as time passes.

This talent waste is added to the original seven wastes so that an organization can comprehensively include human learning as part of lean operations. By effectively engaging the workers, their talents and capability can be better utilized. Being motivated to learn is important in ever-changing customer requirements and intense competition. Thereby, viewing an employee as a learner is one of the latest developments for industrial engineering within the context of lean operation. Learning from a mistaken, a co-worker, a supervisor, a subordinate, a customer, a supplier, and an outside source can affect the level of performance.

Poor communication and feedback during work, failure to provide safe learning environment, lack of proper motivation on learning and development, lack of participation and employee engagement, and insufficient understanding of how an individual learns are some of the examples from the inability to utilize the talents in a workplace. This waste repeatedly takes place due to a lack of empathy, communication, and engagement.

Finally, a discussion on labor productivity cannot be completed without an emerging use of the term employability. Employability is viewed as the transferable skills and mindset needed by an individual to complete a task, to cope with a task's requirements, and to be willing to learn new tasks. It highlights the willingness to learn and points to a set of skills, knowledge, and personal attributes that helps a person perform a task and is satisfied with task completion. Employability today requires a higher level of an individual's cognition and learning. This development underlines the importance of learning in a workplace. For business today, an individual needs to be recognized as a learner who can learn, unlearn, and relearn. This is due to the changing expectation of the workers in a workplace-working and learning at the same time.

Productivity and Industrial Engineering

Productivity is the term associated with industrial engineering from its inception. Productivity represents the relationship between the outputs (e.g., goods and services) generated from a system and the inputs (e.g., labor, materials, machines, capital, energy, and data) provided to create those outputs. A continuous improvement of productivity (i.e., output per unit of input) is vital to the success and competitiveness of an organization. Historically, productivity improvement played an important role in the growth of the US automotive industry in the 1920s (i.e., Ford's Model T). Through motion and time study, coupled with financial incentive and motivation, it took less resources (e.g., labor hours) to assemble one car. Becoming more productive meant the reduction of a unit cost which led to more affordable purchase for consumers. In other words, being productive allowed more cost competitive which would enable future business success and expansion.

The development of industrial engineering as an academic discipline started with the recognition of the importance of the workers in an organization. Industrial engineers have often been referred to as "engineering with people." Some has even substituted industrial engineering as human engineering due to the earlier focus on standardization, specialization, balance of man–machine, layout, fatigue, stress, and occupational health and safety. Charles Babbage (based on 1835's *On the Economy of Machinery and Manufacturers*) and Frederick Taylor (based on 1911's *Principles of Scientific Management*) recognized as the pioneers in industrial engineering, openly stressed the importance of labor in an

organization's operations when the focus was on primarily machinery and technology.

Frank Gilbreth, who was recognized for his contributions in advancing the principles of industrial engineering, shaped and developed the roles of industrial engineering in a workplace. Frank Gilbreth focused his efforts on reducing the wasteful and needless motions of a worker during work. Lillian Gilbreth advocated the need to apply and adapt psychology (e.g., social and emotional needs) into motion and time study. In fact, together with her husband (Frank Gilbreth), Lillian Gilbreth had published many studies and influenced how efficiency (with less unnecessary motion) and subsequently productivity could be greatly improved with reward and other economic incentives. Another important founder was Henry Gantt who raised the awareness of more systematic planning for productivity improvement. Later, coordinating with time and activities became an important tool for industrial engineers in project and program management.

To support productivity improvement, a lot of initial efforts on a design of work aimed to reduce the cycle time and to raise the outputs. Design of workspace and consideration into working environment were widely recognized as the key contributor that affected productivity. Subsequently, the focus further included psychology-related subjects on motivation, emotion, and behavior. Incentives and motivation through many concepts and practices such as reward systems were strongly advocated and promoted in a workplace. From the viewpoint of this development, many incentive frameworks and programs have been derived from industrial engineering and industrial psychology. They include Scanlon Plan (for gainsharing—a gain from cost saving), Maslow's Hierarchy of Needs Theory, Herzberg's Two-Factor Motivation Theory, Goal-Setting Theory, Equity Theory, and Expectancy Theory.

As product variety and diversity through more customizations became more prevalent in the 1990s for most businesses, the focus on labor productivity began to expand beyond work, workplace, and working environment. Productivity improvement started to incorporate intrinsic-related issues such as quality of work life into consideration. It was presumed that higher quality of work life would increase innovation and creativity. Issues relating to the workers such as autonomy, flexibility, and participation to ensure positive feeling and attitude in a workplace were given a lot of attention. It was believed that focusing

on both quality of work life and innovation/creativity would lead to a higher level of productivity.

During the past two decades, a workplace began to experience more drastic and rapid changes due to the advancement of automation and the integration of information and communication technology. This digitalization clearly pointed to an opportunity of human learning as an integral part of productivity-improvement efforts. Digitalization highlights an interconnected workplace which can be personalized with a great deal of autonomy and flexibility for informal learning. It allows an organization to better utilize social interactions and learning among the workers which could lead to more productive workforce. Note that a digital workplace indicates the high proportion of an integration of mobility services and digital technology to enhance how the individuals complete their work.

For the service sector, productivity improvement has been actively undertaken like the manufacturing sector, especially in both wholesale and retail operations. Many initial programs dealt with the use of digital technology to streamline work processes. Duplication of work, miscommunication, delays, and mistakes contributed to the need for the digitalization of work processes. Utilizing customer data (e.g., data science and data analytics) more effectively has recently become one of the primary outcomes from the digitalization within an organization. Predicting the intention and behavior of the customers is part of this effort.

Aviation industry has extensively employed many industrial engineers and industrial-engineering techniques and practices. Turnaround time of low-cost carriers during operation and maintenance, through motion-time study and scheduling, has been the key result area which reflects productivity improvement (e.g., higher aircraft utilization and revenue-to-available seat miles or kilometers). In addition, productivity improvement through employee satisfaction (e.g., profit-sharing scheme, stock-ownership option, autonomy, teamwork, etc.) was also one of many successful strategies. The success in productivity management has made Southwest Airlines as the world's first, largest, and most profitable low-cost carrier.

Southwest Airlines developed an excellent reputation as a productive company through strong emphasis on asset productivity, life-cycle cost management, and quality of work life (e.g., treating employees like customers). Specifically, for quality of work life, it had led to new sug-

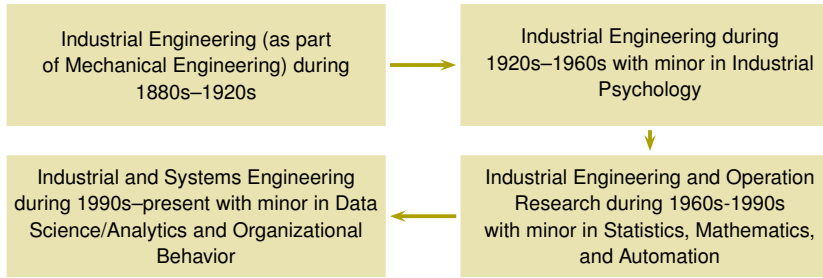

FIGURE 1.2 Development of Industrial Engineering

gestions to improve service quality and reduce waste such as passenger boarding and disembarkation. The former CEO of Southwest Airlines once mentioned the following: when an employee was happy, a motivated employee would become productive and creative. This same motivated employee would also treat customers well. When customers were happy, they would keep coming back. This development underlines the roles of industrial engineers within the context of the human component in an organization. Even with the name changes from industrial engineering to industrial engineering and operation research and later to industrial and systems engineering, being productive for an organization represents the cornerstone for industrial engineering.

Finally, a lower productivity indicates there are wastes in resource use and time which will subsequently increase the unit cost of product and service. This increase hinders an organization's ability to compete. Note that productivity can be calculated as the ratio of the volume of output to the volume of inputs (or Productivity = Output/Input). Due to Its importance for national, industrial, and business success; productivity has attracted many studies and research from various disciplines, including economics, engineering, business administration, and psychology. The goal of industrial engineers as a profession is to always improve productivity at the individual, operational, and organizational levels.

Productivity and Organizational Performance

Productivity has always been an integral part of the term performance used by an organization. In addition to productivity, performance often includes quality, quality of work life, innovation, efficiency, effectiveness, and profitability. The Balanced Scorecard concept advocates

learning and development of an organization's workforce, productivity in work and operational processes, quality and customer satisfaction, and profitability as the basis for performance. To achieve high performance, strong leadership and empathy for its workforce are needed. Strong leadership indicates the commitment which is needed when trust is critical to sustain and improve organizational performance.

Empathy is stressed more nowadays within an organization since human capital is the key driver for high-performance. The term human capital implies the value that is generated by a workforce through salary compensation, training, and learning and capability to adapt. Return on human capital can be calculated as the division between net revenue (gross revenue subtracted by operating expenses) and the cost of salaries and benefits. The two important enables for human capital development are workplace engagement and learning.

Productive workplace and workforce have significantly contributed to high performance. For instance, the concept of performance criteria (introduced earlier by Sink and Tuttle in 1989) states that labor productivity is sustained by continuous improved quality of work life and learning. The 1996 Balanced Scorecard recognizes that learning and growth of a workforce directly impact internal business processes. For the newer practice, the key result area refers to an area of desirable outcomes within business operations which highlights the responsibilities of and contributions from all individual units within an organization. This concept of key result area underlines the essential areas of business that need to achieve excellent performance, and to survive and grow in the business. Productivity is one of the key result areas that is constantly monitored.

For the past decade, it is generally accepted that productivity improvement cannot rely entirely on the use of technology and machinery. Learning can also contribute to this improvement. A shift in a national economy (shifting from industrial to service and later to knowledge, digital, shared and green economy) underlines the need for learning for productivity improvement. This shift signifies that a future organization needs to be more responsive, adaptable, and creative for ever-increasing competition. Navigating successfully through these challenges requires productive workers with the commitment to their work and with the motivation to learn.

When dealing with workplace learning, quality of work life cannot be ignored. How the individuals in an organization feel about their work-

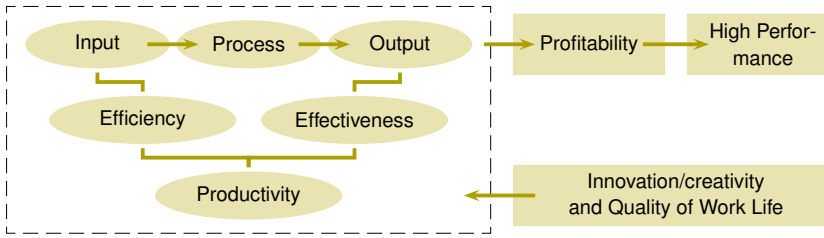

FIGURE 1.3 Productivity and Performance

place (e.g., task, culture, participation, pay and compensation, relationships with co-workers, etc.) contribute significantly to the willingness to learn and develop. Quality of work life, motivation, learning, and productivity are believed to be closely related. This positive feeling is part of quality of work life which is clearly interrelated with productivity. Many programs to improve the quality of work life play a key role in increasing labor productivity and an overall level of operational and organizational productivity.

More traditional practices relating to open door policy and occupational safety and health (e.g., physical health such as daily exercises, and psychological health such as social activities) are now expected. Recent efforts to deal with quality of work life have become more innovative such as no-dress code, flexible working hours, and work from home. Informal learning through an organization's digital platform has become a norm to promote social interactions and learning within a workplace. An overall aim for these programs is to ensure that a workplace is a second home for a workforce—providing safe (and creative) learning and working environment.

In essence, being productive indicates an efficient use of resources or inputs (e.g., manpower, materials, machinery, capital, facility space, etc.) while effectively meeting the targets or contractual agreements on products and services (representing an output). The focus on innovation/creativity and quality of work life are believed to help sustain productivity improvement. Since productivity affects operational cost competitiveness, it contributes to profitability and long-term business competitiveness.

Other concepts such as the Balanced Scorecard also highlight, in a typical strategy map, the interrelationships between productive processes and learning and growth within an organization. For instance,

the learning capability of the workers is important for maintaining and improving the productivity level. In this current business environment with expected and unexpected disruptions (e.g., regulatory restriction and pandemic), the knowledge and the capability to learn and adapt become even more critical. The strategy map, representing the interrelationship among each of the four perspectives (i.e., financial, customer, internal business process, and learning and growth), shows the impacts and contributions from human learning and development. Note that, in the recent years, learning is viewed to be more than simply training. Learning incorporates more than what to learn (for planning and preparation of training) but also why there is a need to learn, how to learn, and how to adapt what is learned for improvement.

Productivity and Productive Workforce

The waste of the workforce talents recognizes the importance of employability within an organization (i.e., better utilization of the talents should lead to more effective lean operations which subsequently result in higher productivity). Employability in a workplace reflects more than technical and soft skills as well as knowledge. Being employable means that a worker is able to continue learning so that task improvement is part of his or her work. Thus, employability and productivity are often discussed in a mutual manner. Strengthening how an individual learns has become one of the most impactful interventions for workplace learning.

Human learning becomes a more urgent issue due to constant changes in technologies, digital applications, task requirements, customer expectations, and working structure and cultures. Self-managed team and use of team-based approach in process management has become more common. Within this context, it is important for a worker who is often referred to as a learner to realize the existing level of knowledge (what you understand?), the required skills (what you do with what you understand?), and the attitudes (how you view and handle a task). This is the reason that there have been several interrelated terms being applied today in a workplace such as intellectual capital and human capital.

Even though, during Industry 3.0 and 4.0, productivity improvements were made through automation, digitalization, and value chain collaboration; productive workforce remains essential to sustain these improvements. Recently, it is agreed that, in addition to knowledge

and skills, productive workforce needs to have learning capability—indicating an ability to learn and work at the same time (Stempel & van der Vyver, 2014). However, a key roadblock to demonstrate this learning capability lingers. It is widely accepted that "traditional learning and development programs, which typically sprinkle training across the organization, are simply not dynamic enough." Organizing a training session on learning is a challenge since peer and hands-on learning is more effective today.

The responsibility of learning and learning capability of the workers as well as their impacts on productive workplace are the issue that have been scrutinized and studied intensely. Given more complex (or even wicked) problems which an organization is increasingly faced today, one of the most crucial failures to sustain human learning within an organization is a failure to recognize learning diversity. Workforce diversity can present a challenge for learning since, traditionally, this term indicates the vast spectrum of workforce in terms of age, educational and family background, ethnic groups, and task difficulty.

It is very uncommon to include learning and motivation as part of workforce diversity. This is due to a general assumption that training could help remedy the discrepancy in educational background. Thus, it was acceptable to view that all workers could have the same level of skills in a workplace. As previously mentioned, when adaptability and responsiveness become critical for business success, training can become reactive measure. Training is not fast enough to help prevent and tackle a problem facing individual workers. Nowadays, their ability to learn and deal with this problem is perceived to be more crucial than training (which needs to wait for a problem to become serious before a training session is organized).

The integration of learning as part of workforce diversity reveals the principal symptom which hinders the utilization of workforce talents. It is workplace disengagement. Workplace disengagement has many negative consequences. For instance, uninterested or disgruntled workers have been detrimental to productivity-improvement efforts. As a result, how fast individuals can learn and adapt determines the competitiveness and even survivability of an organization. The organizations that neglect the disengaged workforce or fail to engage their talents, they can expect poor reputation and image, increased attribution or turnovers, high-cost burden, and revenue loss.

Lack of active workforce engagement is part of the underutilization

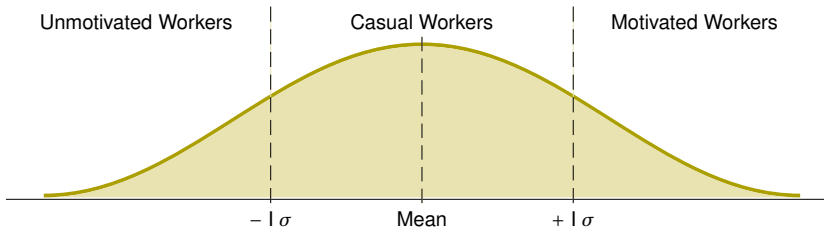

FIGURE 1.4 Diversity within the Context of Workplace Learning

of the talents in a workplace. Negative impacts from this lack of engagement have included morale, well-being, belongingness, and productivity. Moreover, there is a risk of losing talented workers when the lack of engagement becomes more serious and visible. The organizations with engaged employees have consistently experienced an average of 21% higher profitability through higher productivity and innovation/creativity relatively to those with disengaged workforce. Workplace disengagement is a serious issue that almost 70% of American employees consider themselves as part of the not-engaged to actively-disengaged groups. They are considered as casual and unmotivated workers. On the other hand, merely 12% of business leaders describe themselves as being happy with current levels of employee engagement within their organizations (Lead Inclusively, n.d.). From the viewpoint of industrial engineering, workforce engagement can positively affect innovation/creativity and productivity which subsequently contribute to the profitability of an organization. Recognizing the importance of workforce engagement has encouraged the research in industrial engineering to focus on the diversity in learning among the workers.

Productivity, Workplace Learning and Industrial Psychology

Industrial psychology examines human behavior in a workplace. This behavior is studied along with working environment, working relationship with others, and organizational culture to improve labor productivity and organizational performance. Practitioners in industrial engineering and industrial psychology have long worked together to improve workplace productivity, attitude, motivation, health and safety, and physical and social well-being of a worker. A balance between work-life in a workplace for productive workforce is important for both industrial engineering and industrial psychology.

Behavior and interactions in a workplace need to be constantly ob-

served as they reflect an early indication of possible feeling of disengagement. Engaged workers with higher satisfaction on positive working environment and work-life balance are 12–30% more productive and 2 to 3 times more creative (Achor, 2012). Like industrial engineering, industrial psychology also stressed the importance of financial incentives and rewards as part of many factors for increasing the level of motivation in a workplace. Lastly, industrial psychology focuses on changing and improving behaviors and attitudes so that the workers remain productive throughout their careers in an organization.

When improving the level of labor productivity, both industrial engineering and industrial psychology have paid closed attention to how workers' emotions and informal relationships with their peers. This attention includes work stress, safe working environment, conflict management, communication, physical and mental health, physical and psychological safety, aggressive behavior and violence, appraisal and assessment, etc. For instance, work stress is likely caused by these following factors: excessive workload, limited career advancement, lack of social support, lack of engagement, poor communication, and unclear expectations. Stressful workers can exhibit negative behavior which affect others in an organization.

When dealing with workplace learning, physical and mental health can be a major hurdle. A lack of perceived psychological safety further contributes to the fear of being punished or humiliated when openly discussing the ideas, questions, concerns or mistakes. Psychological safety represents an enabling condition for interactions, feedback, and learning which needs to be carefully fostered within a workplace. Furthermore, physical and psychological safety cannot overlook harassment and violence in a workplace. These harassment and violence can be a single event or a series of continuous incidents. If the above circumstances remain unresolved, mental fatigue and poor workplace experiences are expected. Often, this condition is cited as a major contributor to workplace disengagement.

From the viewpoint of industrial psychology, understanding the behavior from workplace disengagement is important—why they behave the way they behave and what contributes to this behavior. There are many issues relating to productive and counter-productive behavior. Productive behavior highlights the desirable behaviors which contributes positively towards an organization's policies, goals, and objectives. Often productive behavior indicates an ability to effectively

perform while being motivated to learn as part of workplace improvement. On the contrary, counter-productive behavior diminishes the positive effects of productive behavior in the organization. The level of negative impacts (i.e., counter-productive behavior) is sometimes overlooked due to the preference to assess and evaluate the positive side. Counter-productive behavior signifies workplace disengagement. Often, this behavior leads to alcohol and drug abuse, harassment, theft which negatively affect the level of productivity. Some of past interventions from industrial engineering and industrial psychology have focused on the personal relationships and interactions within a workplace.

Recently, the focus on motivation has underlined the balance between extrinsic value (e.g., pay and compensation, title and position, and status) and intrinsic value (e.g., responsibility and accountability, autonomy, feedback for learning, and interesting and challenging work). An intrinsic reward reflects intangible reward that an employee receives from task completion. This reward is largely psychological and is based on a person's own initiative based on the belief in his or her ability and efforts. Thus, an intrinsic reward can bring out positive emotional reaction and behavior changes since this type of reward can provide powerful message or feedback to a worker. One of the major stumbling blocks to overturn workplace disengagement is a presumption that a worker with counter-productive behavior has no interests of performing and learning. This presumption has resulted in a more focus on extrinsic reward which may be more effective for performing the tasks. However, learning is less tangible and visible. The intrinsic reward recognizes the importance of inner-feelings within the individuals. Empathy becomes an essential foundation when developing intrinsic rewards.

Conclusion

The overview of historical development of industrial engineering within the context of productivity is illustrated. From the beginning, productivity was the focal point of the efforts, research, and practices by industrial engineers. The reason is that being productive is the foundation for profitability, business competitiveness, and high-performance of an organization. For the past decades, to maintain productive workplace, the waste from underutilizing the talents of an organization's workforce has been recognized as very critical for lean operation and

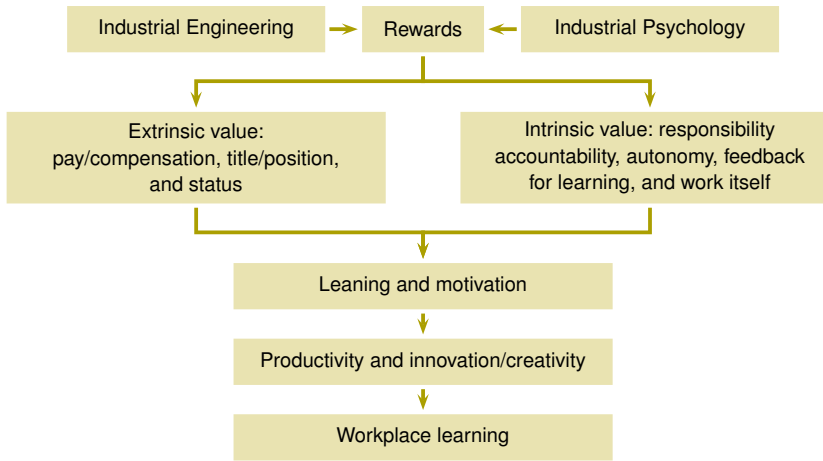

FIGURE 1.5 Impacts from Industrial Engineering and Industrial Psychology on Productivity

long-term business success.

Industrial engineers recognize that a successful lean organization with a degree of robustness and agility cannot rely on or should be driven entirely by digital technology. Agility is the ability of an organization to renew, adapt, adjust, and thrive in a rapidly changing, dynamics, and turbulent environment. Black swan event,[2] competition, customer expectation, shift in technology, transition into a new economy, stringent regulations, and rapid decline of workforce are some of the factors that underline the importance of better utilizing human talents within an organization.

Instead of focusing on standardization and specialization in the early 1900s, industrial engineers are now advocating more autonomy and flexibility, especially when dealing with white-collar and knowledge workers. Learning, motivation, innovation and creativity, and high performance have become interrelated in a recent trend when focusing on workplace productivity. As it was the circumstance almost a century ago (when dealing with blue-collar workforce), industrial en-

2. See https://corporatefinanceinstitute.com/resources/knowledge/finance/black-swan-event/. The term Black Swan represents an exceptionally negative event that is almost impossibly difficult to predict. The ongoing COVID-19 pandemic is recognized as the Black Swan event along the 1997 Asian financial crisis, the 9/11 terrorist attack, and the 2011 earthquake and tsunami in Japan.

gineering and industrial psychology need to work closely together to help overcome the underutilization of the talents within an organization and workplace disengagement. Better use of these talents will lead to productive workplace and higher performance.

References and Further Reading

Achor, S. (2012). Positive intelligence. *Harvard Business Review, 90*(1–2), 100-102.

ASQ. (N.d.). *What is lean?* https://asq.org/quality-resources/lean

Gallup. (2017). *State of the global workplace: 2017 Report.*

Lead Inclusively. (N.d.). *US employees are disengaged. Now what?* https://leadinclusively.com/2019/07/12/employee-engagement-tactics-2019/

Muhos, M., Kess, P., Phusavat, K., & Sanpanich, S. (2010). Business growth models: Review of past 60 years. *International Journal of Management and Enterprise Development, 8*(3), 296–315.

OECD. *Better use of skills in the workplace: Why it matters for productivity and local jobs.*

Phusavat, K., Chindavijak, C., Meeampol, S., Kess, P., & Hidayanto, A. N. (2017) Key Elements for Achieving an Enterprises Performance in the Areas of Sustainability. *International Journal of Management and Enterprise Development, 16*(4), 275–290.

Phusavat, K., Comepa, N., Sitko-Lutek, A., & Ooi, K. (2013) Productivity management: Integrating the intellectual capital. *Industrial Management & Data Systems, 113*(6), 840–855.

Phusavat, K., Fankham-ai, K., Haapasalo, H., & Lin, B. (2011) Achieving enterprise competitiveness through an effective management process. *Human Systems Management, 30,* 115–124.

Phusavat, K., Kanchana, R., & Lin, B. (2009). Information requirements for managerial decisions in manufacturing. *Business Process Management Journal, 15*(2), 267–285.

Sorenson, S. (2013, 20 June). *How employee engagement drives growth.* Gallup. https://www.gallup.com/workplace/236927/employee-engagement-drives-growth.aspx

Stempel, J., & van der Vyver, B. (2014, 7 March). *The quest for workforce capability: Create a global skills supply chain.* Deloitte. https://www2.deloitte.com/us/en/insights/focus/human-capital-trends/2014/hc-trends-2014-workforce-capability.html

The Conference Board. (2021). *DNA of engagement: How organizations create and sustain highly engaged teams.*

Chapter Two

Productivity, Industrial Engineering, and Workforce

Highlights and Key Points

- Industrial engineers have contributed to productivity improvement in all three conventional types of work—blue-collar, white-collar, and knowledge work.
- Due to the automation and digitalization, more work and jobs require social, emotional, creative, or relational skills. Higher cognitive skills will be required for most jobs by 2030 (Jezard, 2018). Included are non-routine tasks- service occupation (e.g., personal care, healthcare, advisory, designer and developer etc.). Thus, human learning will be essential for the future workers.
- Gradual decline of the impacts from training on work completion has been very significant— from 75% of knowledge needed to complete a task was provided directly by an organization in 1986 to about 8–10% in 2006 (Morrison, 2010).
- The ability to learn by a worker will be crucial since learning can generate new knowledge for work completion.
- Approximately 84% of the executives viewed learning as an important (40%) or very important (44%) issue while recognizing that ongoing activities, initiatives, and programs for learning and development are not currently effective (Pelster et al., 2016). Training with knowledge and sharing and transfer is no longer sufficient in a workplace today.
- Almost 50% of workers express their enjoyment and excitement about learning new skills and knowledge during work or working hours (Roddy, 2019). In other words, they are receptive to learning while working at the same time.
- In general, at work, only about 10% of workers in an organization are considered active learners while an estimated 60% of employees are passive learners. The remaining 30% of the workforce is considered as blocked and closed off from learning anything new for personal and organizational growth (Chief Learning Officer, 2013).
- The expectation from a future worker has shifted from merely doing the things right (by following an instruction) to focusing more doing

the right things (learning and searching for a better way for his or her work).

Introduction and the Shift from Skilled/Knowledge to Learning Worker

Improving the performance of the workers has always been the primary purpose of applying industrial engineering principles, techniques, and practices. The roles of industrial engineers in raising their level of productivity and performance have changed in accordance with the shifts in management's philosophies, society, and economy. In the early 1900s, for the classical perspective of management, industrial engineers focused on physical and economic needs when a worker performed the required tasks. Motion and time (or work) study was the key mechanism in achieving productive workplace.

In 1930s, industrial engineers began to blend the humanistic perspective into improvement efforts. The humanistic viewpoint recognized the need to add social needs of a worker. Incentive and motivation through social needs and scientific interventions to fulfill physical (e.g., safe workplace) and economic (e.g., wages and bonuses) needs were part of the development of a productive workplace. For the decade after World War II, the workforce became more specialized and compartmentalized due to the division of various functional units within an organization. Continuous applications of physical, economic, and social needs remained visible in a workplace.

In 1970s, the service sector began to have a more prominent role than the manufacturing sector as most countries shifted towards the service economy. Many service industries such as healthcare, education, finance, transport, and hospitality experienced a sustained growth during this period. For instance, led by Southwest Airlines as the first low-cost carrier in the US, the practices to embrace the creativity of the workers into the improvement of productivity and quality was adapted. The airlines focused the efforts on quality of work life. As a result, psychology was very essential for the company' success. Despite the differences in their operations, many service providers (e.g., healthcare, finance, transport, etc.) require productive workforce like their counterparts in the manufacturing sector.

During 1980s, successful total quality management required sound leadership from top management and strong commitment from ev-

eryone in an organization. This strong commitment from the workers stems not only from financial incentives but also intrinsic reward such as being part of a team, personal growth, gaining more trust from supervisors, etc. To ensure a worker's commitment, the level of enthusiasm that a person has towards work and the issues relating to quality of work life cannot be overlooked. This is because this commitment reflects the positive feeling that a person has towards the goals, mission, and vision of an organization.

Many studies have shown that the positive relationship between strong employees' commitment and an increase in productivity. In addition to the popularity of total quality management, many organizations employed more computers and automations to help facilitate their work processes. This integration of these computers and automation began an era of Industry 3.0. Due to this emphasis, less attention was made about learning while more focus was on training and development of the workers. Training on how to properly operate computers and automation was a priority during this period.

In early 2000s, speed and responsiveness came to be part of an organization's competitive business advantage. Instead of relying on internal research and development teams to design and come up with new products and services, many organizations recognized the importance of open collaboration to accelerate the speed of new product and service development. Integrating digital technology in a workplace became more common. The digitalization would allow better flows of information and knowledge within an organization and with outside entities. This development led to what we are now referring to as Industry 4.0.

Use of technology in a workplace implied that a good idea and concept could be more visible anywhere within and outside an organization. Technology-driven workplace was no longer about streamlining and simplifying work and related processes. Due to the need of speedy responses to a problem, the viewpoint on a worker again began to shift. This shift highlights the expectation of both learning and working in a workplace instead of only working. In fact, the term knowledge worker was replaced more often by a new description of learning worker.

In general, this development stems from the premise that a worker would learn and gain more understanding and knowledge based on hands-on experience instead of the knowledge from training and development. Due to rapid change in technology and business environment,

existing knowledge may become obsolete swiftly. Facilitating and encouraging learning in a workplace allows a worker to have up-to-date knowledge continuously. Thus, in a workplace today, learning is expected to be an integral part of work.

To support this notion, many surveys generally indicate the change of perceived roles of a worker from a performer (who completes task assignments) to both a performer and a learner. This new expectation is important for an organization within the context of open collaboration. Learning indicates a worker who is expected to use accumulated experiences and skills during work to learn, adapt, and apply their evolving knowledge to a new challenge and situation. A learning worker is viewed to be more impactful since he or she can help an organization adapt more effectively to a changing business environment. Thus, an urgent challenge facing an organization today is how to engage with its workforce for continuous learning and improvement.

Since 2010s, the following three components (i.e., work, workplace, and working environment) have experienced many drastic changes. In several countries where the workforce shortage (because of a declining birthrate) is imminent, the extensive adaptation of digital technology and automation was viewed as a solution to maintain high performance in a workplace. However, given a growing acceptance of remote work, the perceived roles of a worker have been looked at differently. Instead of relying on the knowledge and skills based on formal education and company's training (also known as a knowledge worker), an ability to learn for a worker emerges as a critical success factors for many organizations. Informal learning has become an integral part of working environment.

As previously, when business environment is more complex and dynamics, learning inevitably becomes more important. For instance, faced with a shortening turnaround time for new product and service development as well as an increasing number of variants need to be developed in a shorter timeframe, many organizations emphasize learning as a solution to this complex situation. Despite the importance of knowledge as the foundation, learning is viewed to be more beneficial over a long period of time—the belief that a worker can acquire knowledge faster through learning than training. This viewpoint also signifies the importance of workplace engagement due to a need for 2-way communication for learning, and the responsiveness of an organization when having to deal with a problem complexity or a business crisis.

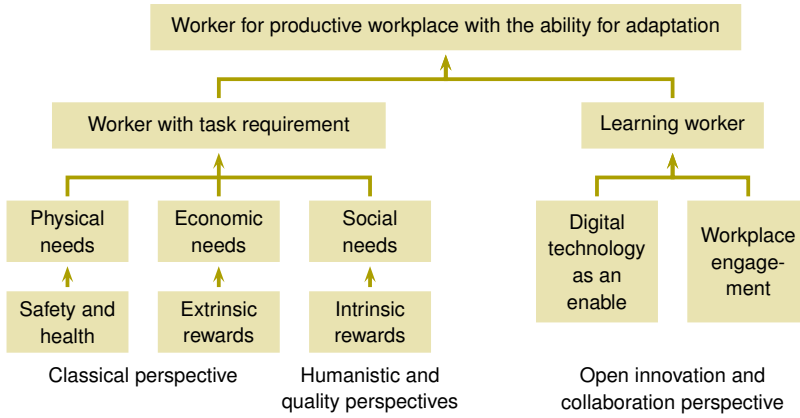

FIGURE 2.1 Roles of Organizational Workforce from Past to Present

For instance, the cycle time to develop and launch a new Volkswagen Golf has decreased dramatically from Golf I in 1974 which took about 9 years to commence the second model to only about 5 years from a previous model to Golf V. The newer model was introduced in 2008. On the contrary, the variants on the market have risen steeply which can be demonstrated the current availability of 28 models for Mercedes-Benz today while there were only 5 models for the consumers in the early 1980s (MB Collaborations, n.d.).

Currently, the ability to learn new things (e.g., idea, practice, process, concept, technique, and technology) and to apply them has been viewed more valuable than simply knowledge possession. The reason is that learning means additional knowledge to existing one on a continuous basis. Although technical knowledge and skills are crucial in a workplace, an ability to add to this foundation is necessary today. Learning allows new knowledge to be created or formed which can be later shared and transferred to others (as part of informal learning). Focusing on how to sustain learning by the workers becomes essential for long-term business success and competitiveness. Thus, learning should not be treated as a separate activity which merely belongs to education and training in a workplace.

Finally, it is important to recognize that, based on this development, an organization no longer leave workplace learning to traditional human resource management and administration. It is important to note that training remains significant since informing the workers about

new rules and regulations (i.e., corporate orientation) is needed. When a problem is understood and a solution is accepted, training to implement this solution is preferred. On the other hand, learning can take place anytime and anywhere without a need for a formal training program. Given this awareness, practitioners in industrial engineering need to examine how to sustain and facilitate learning in a workplace.

Productivity for Blue-Collar Work

Blue-collar work indicates the work which requires physical or manual capability due to the need to perform repetitive or routine work. Completing the tasks within blue-collar work can be physically exhausting which results in fatigue and weariness. Without any interventions, work-related fatigue will likely lead to stress, carelessness, near-miss incident, and eventually accident and injury. Blue-collar work involves demanding and physical tasks which generally take place in agriculture, manufacturing, construction, mining, maintenance service, and even some of the tasks in healthcare operations. Labor-intensive work is often associated with blue-collar work.

For blue-collar work, industrial engineers began productivity-improvement initiatives in the early 1900s. The motion and time study, an integral part of scientific management, helped identifying and searching for the most productive way of performing the tasks. The aim was to minimize time and the use of motion for task completion (e.g., producing one unit of output). Minimizing the motion helped reduce or eliminate fatigue and physical exertion. A more balance between a worker and a workplace (e.g., workstation) would lead to higher productivity with more manageable workload. In addition, improving working environment (e.g., illumination, temperature, and air circulation) while blending a financial incentive scheme noticeably reduced work stress and raised a level of work commitment.

Traditionally, industrial engineers would break down a task to be performed into a series of smaller tasks or elements. Capturing and recording the motions were necessary for motion analysis. Then, a standard time was used when completing these smaller tasks. Any wasteful motion would be removed through motion economy and workplace improvement. A worker would be given appropriate training and education through a standardized description. This was to assure a uniformity and consistency of work which translates into a productive workstation. Process stability could be expected because the workers

were required to comply with a standard or work instruction. Financial incentive would play a role since a worker was to be paid based on the number of items produced within a specific period. It was often referred to as a piece-rate pay (Kemp, 2013; Baumgart & Neuhauser, 2009).

The practice of the motion and time study was widely accepted in the early 1900s for its contributions to better pay and higher productivity. One example that has been repeatedly mentioned is the work of 75 men at the Bethlehem Steel Company (formerly considered as one of the largest steel-producing and shipbuilding companies located in Bethlehem, Pennsylvania, USA). Their work was to primarily move pig iron by shoveling all day. With a careful analysis through motion and time study, the productivity was raised from 12.5 to 47 tons of pig iron moved per day by one person with an increase in pay from $1.15 to $1.85 per day. Additional improvements on working environment were also included. Repetitive work was benefited by less unnecessary motions, reduced time for work completion, and better working environment which extended beyond manufacturing firms (e.g., automobile) and later included healthcare and airlines (in the late 1970s).

Based on this premise, it is important to point out that the philosophy of scientific management emphasized an ability of the individuals to complete the work when it was divided into smaller and manageable tasks. Use of technology at that time included a camera which recorded the movement of a worker so that the unnecessary motion could be eliminated. New arrangement of a workplace and new inventions to help handle the tasks more conveniently were later developed. The primary expectation of a worker was to merely perform his or her work in accordance with a standard (i.e., known as one-best-way) which had been earlier developed by an industrial engineer. In other words, improvement efforts and interventions were mostly made by an industrial engineer. Learning by a worker on his or her work was neither required nor expected.

Financial incentive to increase the level of motivation was used to support and sustain an attempt to increase the productivity of a worker. It was presumed that this incentive would address a worker's personal or economic need. A piece rate which was computed by a time study was made with proper training to help a worker meet a production target. This procedure was viewed as fair and appropriate to both managers/supervisors and workers. Two-way communication

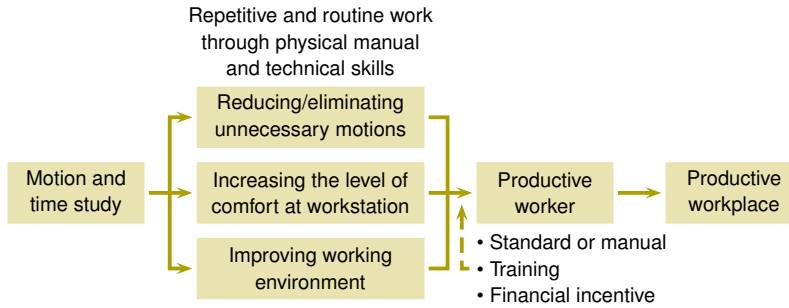

FIGURE 2.2 Industrial Engineering, Productivity, and Blue-Collar Workforce

was achieved through a numerical goal from a scientific experiment, number of units produced, work instruction or standard, and training.

It is important to recognize that the use of motion and time study had many advantages which clearly contributed to higher productivity, better pay and compensation for workers, and improved working environment. Furthermore, it was observed that, when a well-defined goal was objectively established with the clarity on financial compensation, a worker reacted more positively. This observation led to the need to incorporate workplace psychology into any productive-improvement schemes and efforts.

Despite the success, a closer examination revealed an important drawback in motion and time study. It was a lack of active two-way flow of information and communication. Although this was not considered as serious or detrimental at that time due to the prevalent physical and economic needs of the workers, this circumstance could become problematic in a today workplace. It is important to point out that, for motivated and enthusiastic blue-collar employees, the positive impacts are as follows: 65% less likely to leave, 48% fewer accidents, 21% more productive, 22% more profitability to an organization, 6% higher net profit margins, and five times higher shareholder returns (Keswani, 2020).

Productivity for White-Collar and Knowledge Work

White-collar work is opposite to blue-collar work. Although the level of work stress may be similar, white-collar work tends to involve routine administrative work which requires less physical effort. The use of reports, documents, and data are essential for the routine white-collar work. The growth in white-collar work corresponds to the shift towards

the service economy in the 1970s. Main operations of the service sector traditionally involve data- and document-related processes (e.g., collection, sorting, entry, analysis, and reporting). Thus, instrument and equipment replace machinery while experiencing relatively less physical and manual requirements. Nevertheless, work stress is believed to be compatible (or even more for white-collar work when comparing with blue-collar work). The outputs from white-collar work can be less tangible and are not easily quantified and measured. Nevertheless, the outputs and the expectation relating to these outputs for white-collar work are clear.

Due to less tangible outputs, the standard time to complete a task may not be applicable. Note that some administrative work can apply the time element to indicate workplace productivity such as routine document work (e.g., approval time for planned machine repair request). Despite white-collar work often takes place in an office, some industries may include field work such as on-site inspections and regular meetings with clients and customers. To complete white-collar work, the workers need to have proper education and training. This is because the work is clearly defined, and its needed instruments are provided. As a result, white-collar workers are expected to perform the tasks as soon as their employment starts. Constant update and upgrade through formal training are usually needed due to a change in work processes, and office technology. Target or quota can be applied, based on a worker's past performance and/or a current level of competition to help provide work-related incentives.

On the contrary, knowledge work describes the work (and the profession) that generates unique and specific knowledge which requires distinctive skills for task completion. Knowledge work differs from white-collar work due to non-routine tasks and uncertainties such as research, experiment, design and development, problem-solving and analysis, etc. Unlike white-collar work, there is no pre-defined procedure or instructions for knowledge work. Therefore, constant learning is needed. Simply put, a knowledge worker is required to think, reason, and learn as part of knowledge work. It is important to note that, when comparing with blue-collar work, knowledge work greatly differs from blue-collar work. On the other hand, like white-collar work, blue-collar work often has the pre-determined standard. Physical and manual work is the pre-requisite for successful work.

When examining the roles of industrial engineers in improving the

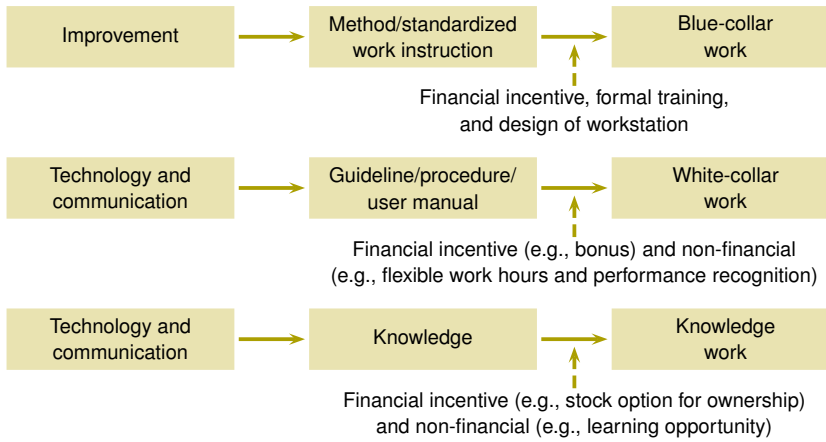

FIGURE 2.3 Blue-Collar, White-Collar, and Knowledge Work

productivity of all three types of work, the use of incentives for motivation has consistently been applied. Industrial engineers have integrated the efforts with industrial psychology to enhance quality of work life. A work-life balance is presumed to be a positive contributor to productivity improvement. This development reflects the importance the health and well-being of workers. Given the drastic shift in today workplace, productivity improvement cannot solely rely on the investment in technology and machinery. Recently, a worker is required to use his or her knowledge (e.g., data and information, expertise, and experience) to perform the work. Also, as previously mentioned, both complex (a problem is understood but has many possible solutions) and wicked (a problem is not well understood and has many possible solutions) problems becomes more common in a today workplace. Because of this development, not only knowledge has become a primary asset for successful work but also learning is recognize as an integral part of work. Thus, the workers are expected to constantly innovate.

Nowadays, a worker in all three types of work is expected to continuously come up with new and better ideas to perform his or her work (Drucker, & Zahra, 2003). The reason is that an organization needs to rely more on the inputs from a worker. Today, the workers are expected to know more about their work than anybody in an organization. Instead of doing the things right (i.e., following a work instruction, procedure, and manual), he or she is also expected to do the right things—indicating learning and completing the work at the same time. It means

that a worker should perform a task (and work) in the best way possible and with a minimum use of the resources. Given informal learning within a workplace, it is believed that a current working environment is poised to allow the talents to be used more effectively.

Finally, this development has led to the question whether all workers should be viewed as multitasker-learning and performing the work. Even highly routine work which does not require the use of discretion and judgment, the workers can generate creative solutions which result in incremental improvement. This is known as Kaizen. Kaizen is vital for continuous improvement within an organization which stresses the need for learning for all workers. For instance, many Japanese auto manufacturers actively began to search for the ideas for incremental or gradual improvement from their assembly line workers in the 1980s. Quality and productivity improvement were the tangible outcomes from this practice.

Productivity and Quality of Work Life

Quality of work life reflects how people feel toward their workplace. This feeling is driven by many factors such as pay, safety, culture, relationships with co-workers and supervisors, flexibility, autonomy, etc. In general, it has long been accepted that, when quality of work life is acceptable, productivity and quality are expected to increase in a sustainable manner. Slowdown and turnover contribute to work stoppages and defects. Quality of work life has been considered by industrial engineering since its inception in the early 1900s. Industrial engineers viewed physical and economic needs such as safety and workload as the key enables for productivity improvement. Late on, bonus and other financial incentives became a major contributor to better quality of living.

In 1930s, reducing work stress was part of the efforts to address poor working condition and environment. Use of engineers and experts (e.g., industrial psychologists) to suggest the improvement ideas of working condition was common since stress and fatigue would impact physical well-being and mental health. Safety (to tackle workplace injury and accident) was the priority at that time for quality of work life. However, a lack of active engagement and worker participation highlighted a circumstance that any improvement still needed the experts in industrial engineering and industrial psychology.

From 1950s until 1970s, addressing quality of work life was primarily

about workplace dissatisfaction since it negatively affected a worker's productivity. Dissatisfaction stemmed from boredom and frustration. Many techniques and practices were adapted to deal with this dissatisfaction such as goal setting, clarity of work expectation, and perceived fairness for reward and recognition. However, overcoming workplace dissatisfaction was not sufficient. The reason is that the terms dissatisfaction and disengagement were not identical. Although it was certain that dissatisfaction would lead to lower productivity and quality, satisfaction alone would not assure continuous productivity and quality improvement as well as workplace learning (as it is required today). The reason is that satisfaction can be temporary (to be discussed more with the Hawthorne Effects). A dissatisfied worker was used to describe a person who was unhappy and performed the tasks inconsistently. This person would not show any interests in self or workplace improvement. During this period, the terms satisfaction (or dissatisfaction) and engagement (or disengagement) began to gather initial interests from industrial engineers.

During 1980s–1990s, due to the success of Japanese manufacturing firms, the focus was primarily on workplace satisfaction (while engagement did not receive a lot of interests). The rise of Japanese automotive and electronics firms in this decade showed that improving job satisfaction could lead to more improvement ideas and suggestions from the workers. Elimination of wastes for lean operations was driven by worker satisfaction. For instance, Kaizen approach relied on effective teamwork and active participation from team members. Knowledge about work was viewed as an asset to a workplace. As previously mentioned, workplace satisfaction was based on the quality perspective which advocated a worker as human capital.

The term human capital brought a new perception on the need to constantly invest in the workers. This investment indicates the prevalent belief that the return from the workers could (and should) be more than simply a completion of the tasks or work. Sustaining the improvement in workplace productivity was more than the use of digital technology and the search for expert recommendations. Utilizing the knowledge from individual workers more effectively became synonymous with industrial engineering research and practices. Gradually, even though the emphasis on quality of work life at the forefront of productivity improvement remained strong, the shift into learning and how to foster learning environment for the workers started to take

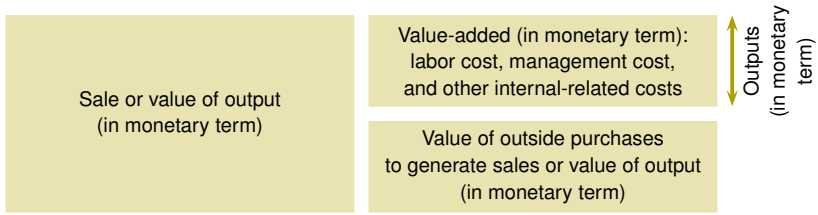

FIGURE 2.4 Computation of Value-Added as a Substitute of an Output

place. This shift indicated the importance of industrial engineers in facilitate learning in a workplace.

To further highlight the importance of human capital, the concept of value-added was adapted as a substitute for an output in early 2000s. The primary reason for using the term value-added was that the outputs (i.e., measuring the units produced) from an organization started to diversify with customized products through a pull production system. Product and service variety and customization implied the need to reexamine how to better capture the output of an organization. One of the simple descriptions of value-added is as follows (Asian Productivity Organization, 2015). It is the difference between the sales or output value component and the purchases from outside such as materials, energy, outsourced services component. The term value-added pointed to the value created into products and services by an organization.

To increase this difference, an organization needed to be creative in raising the sale or output value— the willingness for a customer to purchase. This indicated a match between a value of what an organization's offer and a customer's willingness to pay. Learning and analyzing customer needs and understanding customer's pain points could not be made without a learning worker. Learning from an interaction with a customer could reveal insightful information (as part of the practice in Customer Delight) on these pain points.

Thus, an ability to learn by a worker became essential as customer needs could change very often and rapidly. On the other hand, a worker could find a way to reduce the use of resources such as materials and energy. This circumstance showed the need to effectively take an advantage of the potential from and talents of all workers. Due to its meaningfulness, many organizations have used value-added labor productivity as their key performance indicator, known as value-added di-

vided by labor. The value-added popularity underlines the importance of industrial engineers in assisting and facilitating a transformation from a traditional worker into a learning worker.

Learning Diversity in Workplace and Challenges

Labor productivity and organizational profitability are to some extent driven by quality of work life. Overlooking the importance of quality of work life can negatively impact the value added generated by an organization. More importantly, poor quality of work life can lead to eventual workplace disengagement. Feeling of disengagement contributes to disinterested workers. They typically show the fixed or defeated mindset and the behavior of defiance. The fixed mindset implies the belief among the workers that only a formal training represents a primary source of skill development and knowledge instead of learning capability. In other words, a person with the fixed mindset does not have the confidence in his or her learning capability and therefore is skeptical of a possibility to improve how the work is performed based on own ideas and suggestions. Therefore, he or she likely avoids learning and relies on clear instruction and procedure, and training.

In addition to happiness and satisfaction, industrial engineers often incorporate safe learning environment into consideration of quality of work life (Morgan, 2016). Positive feeling cannot simply take place without an ability to learn and to engage with others. Enabling a learning worker to improve a workplace is now a challenge facing industrial engineers today and the future. With only 10% of the workers is classified as an active learner, how to successfully engage with the remaining 90% of an organization's workforce will determine whether productive workplace can be achieved. Future business success and competitiveness of an organization more than ever depend how learning can be successfully facilitated.

From the viewpoint of business competitiveness, an organization cannot simply rely on 10% of its workforce to be active in learning for productivity and performance improvement. These active learners usually show their willingness to learn with positive attitude. Growth mindset is needed to become an active learner. This growth mindset illustrates that a person believes that he or she can increase the knowledge and improve the skills by relying on his or her learning capability. This person views learning as part of work routine which takes place in continuously. It highlights the belief that improving how the work is

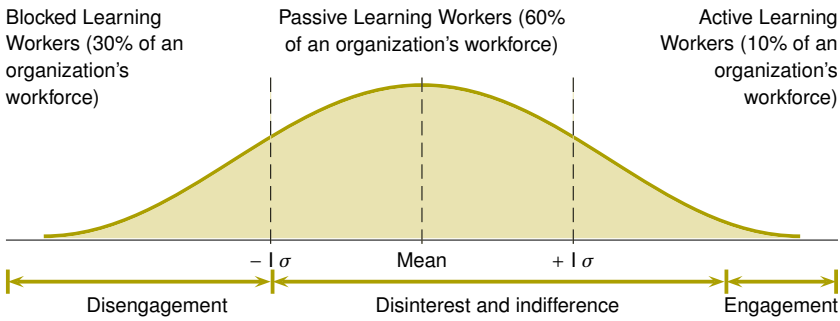

FIGURE 2.5 Diversity in Learning within a Workplace

performed is part of what constitutes the term work. Thus, an active learner can adapt and work anywhere and is equipped to deal with any problem.

A passive learning worker can sense new ideas to improve his or her work but often choose not to learn, understand, and adapt (these ideas). A passive learner slowly and quietly takes in new information and knowledge but is reluctant to utilize this information to fully benefit a workplace. More importantly, he or she does not actively engage with others in a workplace. Thus, when an organization has many workers who are passive, a rate of performance improvement in productivity, quality, innovation, and quality of work life tends to be slower and often trails behind its competitors.

There are two implications when passive learning prevails at a workplace. One is a negative effect on productivity and performance of an organization. The second implication is a likely transition from a passive to a blocked learner. A blocked learner is the term used to describe the behavior of a worker who has no emotion attached to a workplace. He or she has no interest to new ideas and practices. Unfortunately, about 30% of the workforce simply refuse to learn. That is the reason for referring to the individuals who rebuff learning as a blocked learner. They can threaten the survival of an organization due to the rapid changes in business environment.

Even though digital technology has made it easier for the workers to interact and communicate and even to participate in learning, especially informal learning, changing the behavior of passive and blocked learners is one of the latest challenges for industrial engineers. In fact, a proportion of the passive and blocker learners has not drastically

changed over the past decade. This circumstance points to the need for more gain more insights into motivation and learning which is now regarded as the frontier for industrial engineers when improving productivity in an organization. It is hopeful that a passive and blocked learner can become more active in learning so that continuous improvement can take place.

Conclusion

Productivity improvement has been the cornerstone of worker, work and working environment. Despite the constant advancement of technology and machinery in a workplace, sustaining organizational productivity has not been successful in as sustainable manner without an integration of the human element. The elimination of the movement waste in motion and time study was one of the most successful productivity improvements in the early 1900s. Coupled with the financial incentive, the idea of doing the things right by training to rigorously follow an instruction (as the best way) designed by an industrial engineer became essential for productivity improvement of blue-collar work. Tackling physical (e.g., safety and workload) and economic (e.g., pay and bonus) needs were also very instrumental for this improvement.

To further strengthen workplace productivity, gaining more insights into social needs of the workers (e.g., acceptance and recognition, sense of belongingness, etc.) became a norm for many organizations, especially with the emerging importance of the service economy. Training was primarily used to prepare and strengthen knowledge and skills to perform the tasks. An organization relied on training and education to sustain productivity improvement.

Due to the pressure with time and other factors which have made business today more complex (e.g., new product development, customer handling, supplier management, etc.), an organization recognizes that it would be difficult to keep up with and adapt to this ever-increasing pressure. As a result, knowledge stemmed from training and education would be too reactive and probably too slow. Instead, knowledge based on accumulated experiences and expertise that a worker has learned can become valuable to help an organization maintain its business success and adapt better to change, more complex business environment, and more intense competition in the future.

Today, recognizing the diversity and the spectrum of the workforce

is needed to avoid common mistakes such as standardized training. Informal learning which could help the workers learn from mistakes, improves how the work is performed, reframes the mindset about the work (i.e., performing and learning) can play a more useful role in developing an organization's workforce. Therefore, more organizations have invested in digital technology and infrastructure to improve workplace learning.

Finally, it is a challenge for industrial engineers to reverse the attitude and mindset of the passive and blocked learners. Working environment (e.g., safe learning environment) should clearly support workplace learning. Facilitating this learning with both passive and blocked learners (or workers) based on the attention to quality of work life, psychology, emotion, and empathy is a challenge that needs to be overcome. Learning diversity in a workplace needs to be carefully considered when developing an approach for workplace engagement with these learners. This challenge has a potential upside since productivity loss could become potential productivity gain.

References and Further Reading

Asian Productivity Organization. (2015). *Handbook for SME productivity measurement and analysis for NPOs.* https://www.apo-tokyo.org/publications/wp-content/uploads/sites/5/Handbook-for-SME-Productivity-Measurement-and-Analysis-for-NPOs.pdf

Baumgart, A., & Neuhauser, D. (2009). Frank and Lillian Gilbreth: Scientific management in the operating room. *Quality Safety Health Care, 18,* 413–441.

Chief Learning Officer. (2013). *Engage passive learners.* https://www.chieflearningofficer.com/2013/01/10/engage-passive-learners/

Drucker, P., & Zahra, S. (2003). An interview with Peter Drucker. *The Academy of Management Executive, 17*(3), 9–12.

Helo, P., Takala, J., & Phusavat, K. (2009). Productivity measurement for knowledge work in research and development. *International Journal of Productivity and Quality Management, 4*(1), 39–54.

Jezard, A. (2018, 1 June). *The 3 key skill sets for the workers of 2030.* World Economic Forum. https://www.weforum.org/agenda/2018/06/the-3-skill-sets-workers-need-to-develop-between-now-and-2030

Kemp, L. (2013). Modern to postmodern management: Developments in scientific management. *Journal of Management History, 19*(3), 345–361.

Keswani, D. (2020, 27 April). *The secret to boosting engagement within blue*

collar workers. Amity. https://www.ekoapp.com/blog/the-secret-to-boosting-engagement-within-blue-collar-workers

MB Collaborations. (N.d.). *Developing modular systems in collaboration – Successfully reducing complexity.* https://mb-collaborations.com/en/modular-system

Morgan, J. (2016, 7 June). *Say goodbye to knowledge workers and welcome to learning workers.* Forbes. https://www.forbes.com/sites/jacobmorgan/2016/06/07/say-goodbye-to-knowledge-workers-and-welcome-to-learning-workers/?sh=24edff82f93b

Morrison, M. (2010, 14 September). *Training, learning and development is dead – knowledge workers.* RAPIDBI. https://rapidbi.com/training-learning-development-is-dead/

Pelster, B., Haims, J., Stempel, J., & van der Vyver, B. (2016, 29 February). *Learning: Employees take charge.* Deloitte. https://www2.deloitte.com/us/en/insights/focus/human-capital-trends/2016/fostering-culture-of-learning-for-employees.html

Roddy, S. (2019, 26 August). *How should companies deliver employee training and development opportunities?* Clutch. https://clutch.co/hr/staffing/resources/employee-retraining-development

Phusavat, K., Anussornnitisarn, P., Sujitwanit, S., & Kess, P. (2009). Profile-based circumstances for productivity measurement. *Industrial Management & Data Systems, 109*(6), 825–839.

Phusavat, K., Comepa, N., Sitko-Lutek, A., Ooi, K. (2013). Productivity management: Integrating the intellectual capital. *Industrial Management & Data Systems, 113*(6), 840–855.

Phusavat, K., Lertritwittya, A., & Helo, P. (2015). Use of intellectual capital as a surrogate for productivity measurement. *International Journal of Productivity and Quality Management, 15*(3), 357–380.

Sutton, R., Hornsey, M., & Douglas, K. (2012). *Feedback: The communication of praise, criticism and advice.* Peter Lang.

Takala, J., Suwansaranyu, U., & Phusavat, K. (2006). Proposed white-collar workforce performance measurement framework. *Industrial Management & Data Systems, 106*(5), 644–662.

Tikkanen, T., Hovdhaugen, E., & Støren, L. (2018). Work-related training and workplace learning: Nordic perspectives and European comparisons. *International Journal of Lifelong Education, 37*(5), 523–552.

Chapter Three

Productive Workplace and Workplace Learning

Highlights and Key Points

- An organizations can no longer view workplace learning as a series of training programs and courses. Industrial engineers needs to constantly search for an enable that allows the workers to sustain his or her learning.
- The term learning worker describes the need to continuously improve how one works in a more dynamic business environment. Work today appears to be gradually converged in terms of what is expected from a worker. Despite the differences among each of the three types of work (i.e., blue-collar, white-collar, and knowledge work), learning is part of work in a workplace.
- Learning has become one of the critical employability attributes. Learning includes an ability to customize own work, a willingness to share information, and a mindset that helps find a creative way to maintain collaboration and communication.
- Effectiveness of employee engagement depends on the recognition of different types of learners (and workers). It has become common to refer a worker as a learner or learning worker in an organization.
- Unfortunately, based on the Gallup poll, there are a lot more non-engaged and disengaged workers than engaged workers (Adkins, 2016). Workplace disengagement contributes to a lack of learning and productivity loss.
- For a worker who has had hands-on experiences and has enjoyed collaboration, and conversation with others represents about 90% of learning while training and education reflects about remaining 10%. It is important for industrial engineers to recognize that learning becomes an integral part of work and understand the significance of intrinsic rewards which are embedded in the 90% proportion of the 70–20–10 framework.

Introduction and the Convergence of Work

The development from blue-collar to white-collar and subsequently to knowledge work underlines the transforming role of a worker. As previ-

ously mentioned, shifting from primarily performing the tasks to both performing and learning recognizes the importance of human learning. This learning capability is essential for productivity improvement in a workplace. Unfortunately, based on the surveys of the past two decades, only 20–30% of the workers are believed to be engaged while the remaining 50–55% and 15–30% of the workers are non-engaged and disengaged, respectively. Feeling the disengagement is one of the main contributors to a lack of workplace learning.

Given the large proportion of two groups (i.e., non-engaged and disengaged workers) in a workplace, how to sustain and motivate continuous learning of the workers becomes an ultimate concern in many organizations today. Industrial engineers through empathy and past experiences in productivity improvement can understand the workers' needs. Industrial engineers are expected to enhance workplace's communication which could facilitate learning among these workers. In addition to human learning, the convergence of work has added the pressure to workplace learning.

Convergence of work does not specifically imply the characteristics and skill requirements to complete the work's tasks will be the same. In other words, the convergence indicates the essential role of learning in all types of work. Initially, blue-collar work focused more on following an instruction through physical efforts. The improvement of blue-collar work mostly came from industrial-engineering interventions through time and motion study. It was believed that standardized work instruction and intensive training with financial inventive and workplace safety would be sufficient to improve the workforce's productivity. At the start, industrial engineers assume the roles of a learner and information disseminator to the workers. Slowly, the workers began to provide their inputs for work analysis and improvement. Due to the success of Kaizen, it is generally accepted that the blue-collar workers can effectively learn from their work and contribute to the improvement efforts.

For white-collar work, despite some flexibility in a guideline/procedure/user manual, the knowledge to perform the tasks was critical and could be further strengthened by continuous training and education. Both the clarity of work and the standardized work processes were deemed to be essential for productivity. Addressing social needs (e.g., participation, responsibility, and rewards and recognition) were applied to motivate white-collar workers. Learning began to be recog-

nized as critical due to the circumstances when judgement and evaluation were required. Unlike the blue-collar counterpart, the workers in the white-collar work are by and large expected to learn and voice their opinions about their work. This expectation helps explain that, earlier, many organizations employed a suggestion box (before the digitalization of a workplace) to reflect this learning potential and capability.

Knowledge work views knowledge as an asset when performing the tasks. As work in general becomes more complex and dynamics (e.g., technology, regulation, customer expectation, and competition), the knowledge needs to be adaptable to these changes. Adaptability indicates the ability to learn which has become the most significant skill for employability (Hiner, 2018). Learning how to learn is acknowledged as part of the so-called employability.

For instance, for Kano's Model on customer, there are three crucial perceived categories as quality of products and services (DeLayne Stroud, n.d.). The basic- needs category represent the minimum or threshold attribute(s) that customers expect which allows an organization to be qualified when entering a market. Often, some of the attributes can be part of the regulatory requirements. The performance-needs category represents the performance attribute(s) which can increase a level of satisfaction of a customer. Usually, this category allows an organization to maintain its market competitiveness in a current business environment. However, providing the attributes in this category does not necessarily translate to customer loyalty. The primary reason is that what an organization offers is like other competitors in a market. Customer often cannot differentiate among the products and/or services being offered.

Lastly, the excitement-needs category represents the surprise or excitement that delights customers. Simply, the excitement category represents what an organization constantly learns from customer interactions and continuously becomes more creative in developing products and/or services which exceed the current and anticipated future expectation of customers. Learning is the foundation to reach the excitement-needs category. Achieving the level of customer delight (excitement) allows an organization to excel and become world class. Reaching the level of excitement or delightfulness and continuing to be creative about new ideas to maintain this excitement require effective human learning from an organization. What individual workers learn from their interactions with the customers is probably the most critical

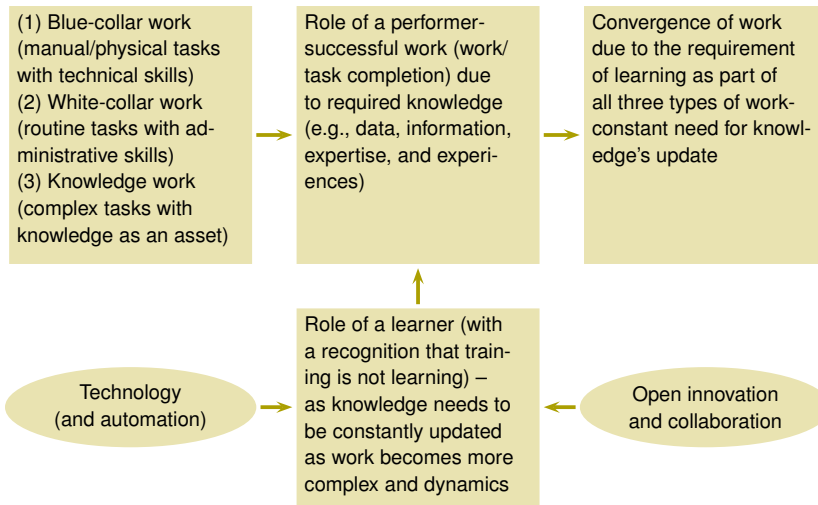

FIGURE 3.1 Role of Learning for the Convergence of Work

information. Supporting their learning has become the major goal of industrial engineers.

For instance, the excitement was reached when a commercial airline offered a door-to-door service for a business or first-class passenger. This was possible when this airline had learned from a freight carrier about door-to-door pickup and delivery. Instead of a terminal-to-terminal service like the competitors, this offer brought the sensation of wow-feeling to customers. However, when other airlines began to have a similar offer, the level of excitement declined and is now regarded as one of performance attributes. Thus, learning and developing new ideas begin again. From this illustration of the excitement-needs category, learning never stops and new excitement ideas are possible by continuous learning from customer interactions. Learning about customer needs and want is possible with empathy, conversation, and observation. Observing and interpreting customer behavior, body language, and facial expression underlines the importance of learning while working. Finally, there are at least three issues when an organization needs to deal with its customers—who the customers (current and potential) are, what they want, and how they want it. The how question requires continuous learning from the workers. What a person knows now is referred to as knowledge but, with learning, this current knowledge can continue to be evolved, expanded, and developed.

Workplace, Work, and Learning

Industry 4.0 requires a workplace today and in the future is expected to become more collaborative and value driven. The workers need to be inspired and motivated endlessly as the underutilization of the talents is recognized as the waste of all wastes in an organization. Thus, workplace engagement has been as one of the forefronts issues facing industrial engineers. Despite the extensive investment in digital technology, industrial engineers have continued to examine a potential enable for the workers to work and learn productively together. The reason is that the tasks within this future workplace will be more non-repetitive and can possibly be different almost every time. Unique ways to perform a task are expected instead of the one-best-way that has been practiced by industrial engineers.

Future work is expected to grow enormously in the areas of service occupation[1] (i.e., it is a job that involves providing a service for an individual, a group, or a company). Service occupation work is performed by a lawyer, an accountant auditor, a safety inspector, and a consultant. Moreover, health-related service occupations have been growing at the rapid rate over the past two decades, especially, occupational therapy, homecare, childcare, and elder care. Even lifestyle and wellness service occupations have experienced a continuous growth recently. These types of service occupations require constant learning and improving to remain competitive (Boudreau, n.d.).

Together with the use of digital technology, learning among the workers is limitless. For instance, in a hospital, the use of digital technology can forecast a demand level and a type of care needed which enable the workers to be more prepared. Even for senior care, digital technology and artificial intelligence provides timely information so that personal attention can be prepared and provided. This technology can reveal useful insights into the who-, what-, when-, and where-questions about customers. With learning from empathy and enriched experiences based on interaction and observation, the how- and why-questions can be answered.

For the manufacturing sector, automation and robotic technology have contributed to safer and less physically-demanding efforts and movements for blue-collar workers. Through carefully-designed incentives, the use of this technology has allowed these workers more time

1. See https://stats.bls.gov/oes/1998/oes_def6.htm.

to reflect and contemplate on how to improve their work. The popularity of e- and m-Commerce has pointed to a new type of blue-collar work such as storage and warehouse, transportation, and delivery. The notion that the use of technology replaces the workers may be true for unsafe, physical, and repetitive work. Nevertheless, with the recognition of learning capability for the individuals, new work opportunities will emerge. The reason is that current blue-collar work relies more on the workers to initiate their improvement ideas than in the past.

It is generally accepted that providing training is no longer sufficient as it is too reactive for a current business environment. One of the greatest workplace challenges today is for a worker to be aware of his or her learning responsibility while performing the required tasks. Acknowledging the need for integrating learning (especially individualized learning) as part of work is the first step in familiarizing a worker with the reality and potential of his or her work in Industry 4.0. Often, fear of learning needs to be systematically tackled as the first step to connect with non-engaged and disengaged workers for all three types of work. Turning these non-engaged and disengaged workers (i.e., corresponding to passive and blocked learners respectively) in a workplace into engaged workers (or active learners) will remain the important goal for industrial engineers in the next decades.

Such issues include how a worker learns? How to motivate a worker to learns? How to sustain learning and motivation of a worker? How learning helps a worker increase knowledge and skills? What experience a worker can learn from? Learning can happen in various ways so it is important that a worker can determine how he or she learns. These issues reveal the importance of finding a way to support workplace learning. In addition, effective learning among the workers will allow an organization the flexibility to deal with a looming labor shortage in many traditional industries.

It is believed that learning will not only help minimize the impacts from labor shortage but also allows for flexibility in work rotations in the future. Many segments which require blue-collar work in the manufacturing sector have experienced serious labor shortage as construction, and repair and maintenance work (i.e., about 60% of company's executives in the US believed that their sector would experience the labor shortage). With learning capability, blue-collar workers can easily adapt to new technology which is expected to be embedded on the work for Industry 4.0.

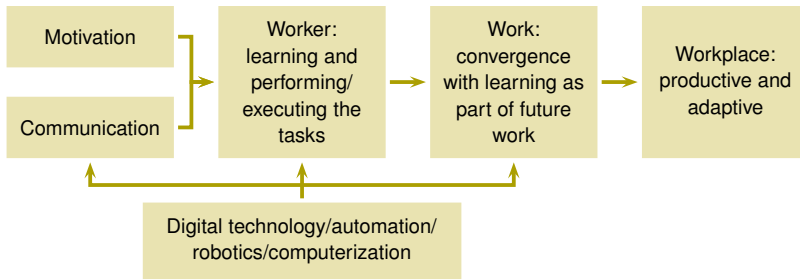

FIGURE 3.2 Learning as an Integral Part of Communication, Worker, and Work

To successfully facilitate learning for the workers, working environment needs to be safe and creative. This environment needs to allow more sharing of ideas and information. This includes a collaboration with the co-workers and others outside an organization. The reason is that effective learning requires constant communication and collaboration. Thus, how the workers learn and how to sustain this learning become essential for industrial engineers. This ability to learn and apply the new ideas, ways, and things to different situations will be necessary for future work and workplace. Instead of relying on what the workers previously learned in school and training, a future workplace will continue its focus on learning. Simply, learning is no longer about formal education and training.

Effective learning requires constant communication and feedback, including asking questions, observing, interacting, mentoring, sharing, and reporting. To make certain that learning is part of work, a worker should be aware that technical, functional, and administrative knowledge acquired in the past or present can become obsolete in a short time. Relentless changes in business environment have contributed to this challenge. As a result, a worker needs to constantly unlearn and re-learn. As previously mentioned, from a worker' viewpoint, learning capability has becomes more valuable asset than the knowledge itself.

Learning and Human Capital

Turning a workforce into human capital has been an essential task for industrial engineers. In the past, industrial engineers attempted to transform blue-collar work through vigorous training on the best way to perform the tasks. Productive workforce was the primary objective. This is due to the positive contribution to more cost-competitive oper-

ations of an organization. Training was viewed to be sufficient for this purpose. This viewpoint began to change when industrial engineers also sought additional inputs from the workers on many issues such as possible improvements on workstation and working environment. Their ideas on safety and health at work were deemed to be useful. This development paved the way for the importance of observing and learning among the workers.

Human capital indicates the return from a worker in terms of financial and non-financial values. In the beginning, the financial return due to higher productivity was the primary focus. For instance, a suggestion on cost saving or an idea on eliminating unnecessary steps was obtained from a worker. As the nature of business and competition had increased, the non-financial return from an organization's workforce became as important. This non-financial return underlines the recognition that a worker has the potential to contribute more than simply the completion of work In 1980s, Japanese manufacturers successfully applied the Kaizen technique for more cost savings and higher quality based on the workers' ideas and suggestions. This success highlighted the importance of the workers' talents with proper encouragement, support, and motivation. Thereby, many organizations started to shift the attention on the non-financial value.

From the industrial engineers' viewpoint, moving a worker from an investment zone to a return zone has been an integral part of productivity-improvement efforts. An investment zone indicates a situation when an organization starts investing in a person's development through formal training and education. On the other hands, the return zone reflects the benefits from an employee through improved skills and knowledge with learning capability and positive feeling about a workplace. For the workers to become human capital, they need to part of the return zone. Careful planning during the investment zone needs to be carefully formulated due to the focus on learning and motivation instead of training.

The human capital framework highlights the interrelationship between engaged workers (or active learners) and their expected contributions (which is referred to as the return zone). On the other hand, non-engaged and disengaged (or passive and blocked learners respectively) are not expected to provide positive contributions beyond what is required. In fact, the disengaged workers are expected to be a negative contributor due to their behavior and attitude which can affect en-

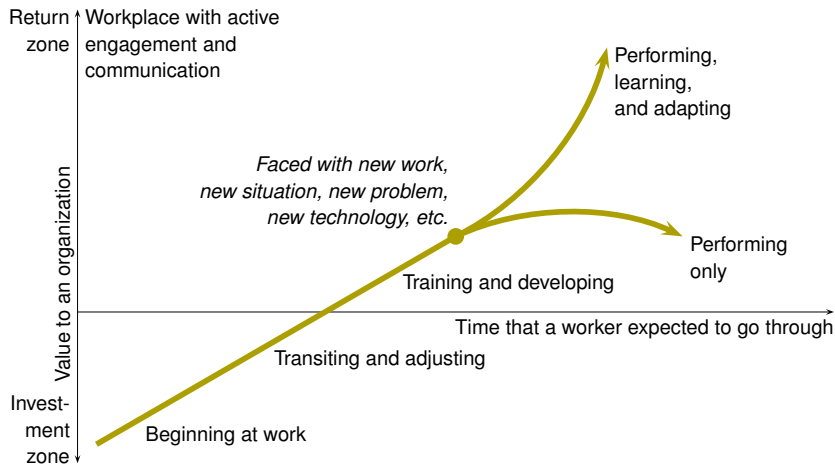

FIGURE 3.3 Impacts of Human Capital on an Organization's Performance (adapted from Bersin, 2013)

gaged workers. In addition, this framework points to the need of maintaining workplace engagement and sustaining learning and motivation due to the importance of the return zone (i.e., avoiding loss of productivity, poor workmanship, low work commitment).

During the past decade, learning is recognized as one of the key components for the workers to remain productive in the return zone. This is consistent with the suggestions that human capital, not only can provide financial and non-financial returns to an organization but also should be considered as an appreciating asset. It means that a worker who stays longer in an organization can become more productive due to his or her learning capability. This learning can solve existing problems or can help prepare an organization for future challenges. From a learning perspective, a challenge is to ensure that a worker can rapidly reach and remain in the return zone. This challenge is that how a worker who could be passive and unproductive can learn and become more valuable.

One of the major shifts in human capital is based on the following. Initially, human capital was largely determined by education, training, qualification, knowledge, and work experiences. Due to less turbulent business environment (e.g., paced instead of rapid change in digital technology, internal development instead of open innovation, less internationalization for business operations and competition, etc.), the

determinants of human capital had remained largely unchanged for many decades.

On the contrary, given foreseeable current business environment and conditions (which is expected to be more turbulent), learning has become the factors that define and determine the value of human capital. A worker needs to become creative and is expected to innovate his or her work. A learning worker has strong understanding of this future role in a workplace. A learning worker is used to reflect the ability to learn new things and apply them to new scenarios and environments. For motivation, a learner worker is willing to innovate, share, and contribute to workplace improvement.

Engaging Learning Workers

Given the importance of learning in a workplace in Industry 4.0, there is a need to recognize how a worker learns. To gain more understanding on this subject, the objectives of learning need to be clarified and understood. To build safe and creative learning environment, it is important that what is expected from a worker needs to be unmistakably communicated. Learning how to learn is no longer about what a worker knows by training or from knowledge transfer. For industrial engineers, supporting a learning worker and avoiding the underutilization of the talents have been their challenge during the past decade. It is a challenge that requires a paradigm shift (from standardization, training, and knowledge sharing and transfer in which the knowledge is mainly from the experts) to the belief that a worker can learn and improve.

Becoming a learning worker indicates that continuous learning no longer stems from taking a series of training courses and workshops. To be regarded as a learning worker, an educational level should not be used as a determining factor since everyone who works can be a learning worker. However, for learning workers, work-based experiences are viewed to be critical for the continuity in learning and development. Sustaining this learning is crucial due to the need to incorporate psychology and well-being along with safe and creative learning environment. In other words, for a future workplace, work must include learning (Jarche, 2012). Furthermore, the responsibility of learning has shifted from the main scope of human-resource function to the individual workers.

Industrial engineers are aware that productive workplace depends

on the effectiveness of learning. Workplace learning is now about encouraging and supporting a worker's own learning. Workplace learning has been accelerated by better connectivity among the workers which can lead to more inclusive and effective informal learning. This connectivity allows continuous flows of information (including experience, expertise, and knowledge) anytime. This circumstance means that learning and teaching among the workers can take place continuously anywhere at any moment. For instance, using a mobile phone to record how to complete a task and upload it to an organization's platform for others to learn can be easily prepared and shared. Sharing can further stimulate communication which is essential for workplace learning.

Allowing the workers to learn anytime and anywhere (because of the connectivity) has had tremendously positive impacts on learning since not everybody learns the same way. This flexibility can prevent further an erosion of the underutilization of the talents. Not everybody wants to learn at the same time. And not everybody is faced with the same problem. Some may prefer more visual demonstration. Some could prefer more supervision. With current digital technology, offering different learning styles to the workers is possible. Learner(or worker)-centered approach should help motivate additional learning at his or her own pace.

In general, there are four classifications of learners in a workplace (Gazprom, n.d.). They are: (1) visual and verbal learner, (2) independent learner, and (3) conversational learner, and (4) hands-on learner. For the visual and verbal learner, he or she can succeed in a workplace an organized effort through notes, documents, graphs, and charts. Quality and timeliness of information represents a primary source of learning. Self-reflection (e.g., encouraging formal and informal presentations and personal notes) and follow-up questions help encourage learning for the visual and verbal learner.

For the independent learner, this term reflects the type of a learner who prefers to work in a quiet and isolated environment. An independent learner can be thought of as visual and non-verbal. He or she focuses on performing and improving the work at own pace due to fundamental understanding of given and available information (e.g., charts, graphs, and documents). Showing this classification of learner trust and ensuring that he or she is aware of the availability of resources to assist his or her work are sufficient to motivate learning. Investing in

digital infrastructure to support remote work can help the independent learners. Note that remote work refers to work that is performed outside traditional office environment and workspace. Remote work has gained more popularity for the past decade, especially during the current pandemic (i.e., COVID-19).

For the conversational learner, learning can be achieved by extensive discussion sessions and meetings. A facility to accommodate face-to-face interactions needs to be provided. This classification of learner prefers to have one-to-one or one-to-many sessions so that ideas, problems, issues, and potential solutions can be shared and worked out. Engaging this learner can be achieved by allowing working environment to be lively (and perhaps noisy). In addition, any team-learning activities should be planned when exchanging ideas is necessary. Supporting this team efforts by embracing feeling and open expression among team members can motivate learning further. The clarity of a deadline and expectation through constant communication is critical.

For the hands-on learner, the focus is on solving a problem actively through a systematic step-by-step process. This classification of learner needs to be allowed to learn and do hands-on work. Asking a hands-on learner to demonstrate is preferred. Asking him or her about a problem is to help strengthen learning without being disruptive. Finally, the four classifications of learner recognizes that anybody can learn and teach at the same time.

Understanding the differences among these four classifications can help facilitate and support a learning work to become human capital. The reason is that, when dealing with non-engaged or disengaged workers, the recognition into what motivates their learning and development is essential. Based on the description of a learner who is either passive or blocked, using conversations and feedback along with hands-on approach are expected to strengthen learning in a workplace. Many issues need to be considered when developing a plan to support and sustain workplace learning. These issues, based on these four classifications, include trust, visibility, communication, motivation, safe learning environment, positive feeling about how one can contribute to a workplace, etc.

The 70–20–10 Framework

To enable learning and development in a workplace more effectively, industrial engineers need to understand how learning takes place as

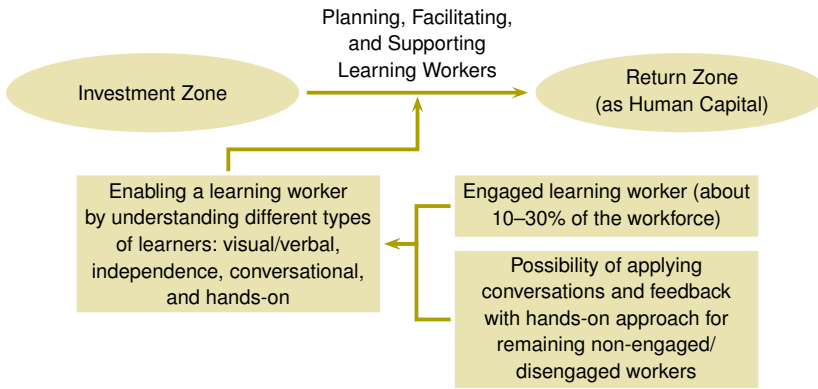

FIGURE 3.4 Impacts from Learner Understanding on Human Capital

well as how learning cannot occur. Both viewpoints are important for initiating and sustaining learning of non-engaged and disengaged workers. In general, a worker is engaged when he or she has an opportunity to perform and learn. In addition, a worker is engaged because of an awareness of how he or she can contribute to the performance and possible success of an organization. Others include empathy to the needs of the workers (by recognizing their diversity in learning capability), constant communication (e.g., conversations and feedback), and an establishment of safe and creative learning environment.

For a worker who is not engaged, he or she may not be immediately hostile or disruptive. However, when workplace disengagement happens, only minimum efforts and dedication at work can be expected. He or she is less attentive and often looks for a new employment opportunity because of a lack of perceived management support. This highlights that an organization needs to incorporate workplace engagement as part of the strategy on human capital and performance management. More importantly, workplace disengagement is not merely a problem with low-paid and front-line workers. This situation takes place at all levels within an organization.

Recently, engaging a worker is regarded as the essential foundation for a productive workplace. In addition, the need to recognize how a worker learns is strongly important. The 70–20–10 framework reflects an emerging viewpoint on a role of a worker and how he or she can improve work. This viewpoint highlights many important developments in the last two decades. Learning can take place anywhere and anytime

with anybody within and outside an organization. Moreover, learning involves both the context and contents (i.e., subject matters). Note that learning context includes learning environment, learner(s), technology, culture, and social interactions. Specifically, for learning context, social interactions are important because these interactions reflect learning culture and environment within a workplace. Since learning and working are integrated, it is critical that industrial engineers gain more insights into learning context, especially the potential impacts from social interactions on learning and motivation.

For the numerical reference of the 70–20–10 framework, 70% of learning comes from hands-on or actual experience, experimentation, and self-reflection. For the 70% component, it is known as learning by working. This description indicates an opportunity for a worker to solve a problem (as he or she is trusted and empowered), to undertake challenging tasks or work, to be given an opportunity to review his or her work. 20% of learning stems from working with others through constant communications and collaboration. For the 20% component, it is known as learning by working together. This description indicates an opportunity for a worker to constantly give and receive feedback during work, to observe and to coach others, and to be mentored. 10% of learning is based on career development planned by an organization. For the 10% component, it is known as learning by formal training and education which points to a series of courses, modules, seminars, and workshops. Also, a worker can learn in a classroom or register for e-Learning. Solutions are provided to a worker with follow-up assessment and test. For this 10% portion, learning is viewed as part of regulatory compliance and career development (e.g., to qualify for a position requires a certificate or a passing grade).

Recently, more attention is given to the 70% and 20% components is due to increasing complexity and interconnectivity of a problem or an issue facing a workplace (De Grip, 2015). Problem complexity at work, whether it is the present and the anticipated future, implies that the knowledge required to perform the tasks becomes more implicit. Implicit knowledge reflects the type of knowledge gained without formal learning objectives. It is difficult to document and formalize implicit knowledge as it deals with personal experiences, thoughts, exchanges, and tips. For instance, an industrial engineer shares a story about a success in persuading and engaging a passive worker from one factory with the colleagues. Thus, gaining implicit knowledge through a traditional

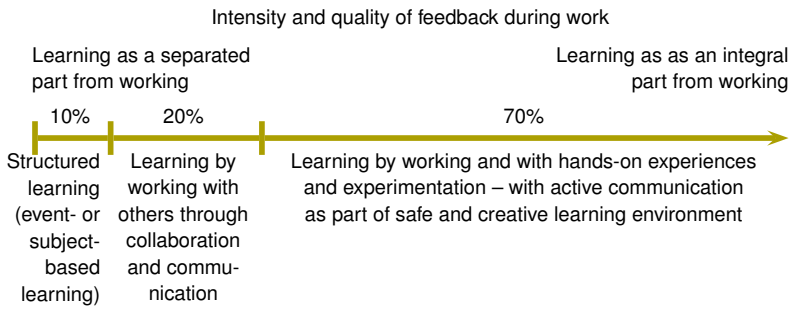

FIGURE 3.5 Formal and Informal Learning

way (e.g., classroom or e-Learning) is not as effective as an opportunity for the workers to learn by themselves and with their colleagues.

When a problem at work becomes more complex and interconnected, it is often referred to as a wicked problem—difficult or impossible to solve due to a lack of a clear understanding of the problem and also a lack of an obvious solution. There is no template or a procedure to follow when tacking this wicked problem. For instance, how to motivate the workers from various remote locations can be a wicked problem (since it is uncertain whether motivation is a problem and there are many possible ways to motivate them). Tackling this problem cannot be trained but should be shared through conversation and observation with some experimentations (to have hands-on experiences). In addition, conversations and feedback with actual experiences represents a strong possibility to strengthen learning within an organization.

Sharing and collaborating becomes a common practice in a workplace. This is due to a platform that an organization actively creates as part of a learning community—informal learning. This platform helps connect the workers together through regular communication, feedback, coaching, encouragement, and experiences. Often this type of a platform can stimulate more participation, discussion, and social activities among the workers which lead to higher productivity. In fact, this represents the 20% component as well as part of the 70% component of learning.

Conclusion

It is generally accepted that training is no longer effective in preparing the workers to confront and deal with complex problem and challenge. Blue-, white-, and knowledge work expect for a worker not only to per-

form the tasks but also to learn at the same time. A worker for a future workplace needs to view learning as part of work. In other words, it appears that learning represents a convergence of work (i.e., learning is expected regardless the type of work that a worker performs). A worker is expected to continuously learn and innovate because of the constant changes in a workplace such as technology, economy, expectation, and competition. A worker is considered as human capital when he or she can positively contribute to an organization's performance and success.

Despite the necessity of learning workers in an organization, only a handful of workers is engaged. Engaged workers show many observable characteristics. First, mutual trust between an organization and a worker is important. Notably, an engaged worker does not need to be directed closely in every step since he or she can perform the tasks. When trust is consistently shown, he or she is expected to be able to learn how to perform the tasks better. In addition, communication and feedback are visible as indicated by the 70–20–10 framework.

An engaged worker often expresses his or her high satisfaction in a workplace. More importantly, an engaged worker can show some leadership during work and can lead when faced with a crisis. An engaged worker is aware of how to complete the tasks in the best possible way and manner. In addition, an engaged worker is willing to take up a challenge at work now or in the future. The reason is that he or she is keen to learn and to be prepared for any unforeseeable situation at work. Obviously, an engaged worker is expected to outperform his or her colleagues. Lastly, an engaged worker illustrates a sense of belongingness towards his or her peers and an organization by committing to business success.

To engage a worker successfully, industrial engineers need to recognize that their traditional practices in the past may not be effective today. Training along with standardization and work instruction is not sufficient for an organization operating in Industry 4.0 in which products and services are customized. Understanding different classifications of the learner is essential so that learning by working and experiences, and by working with others can be effectively take place. Two-way feedback become crucial for continuous workplace learning. Feedback has led to more conversations and communication which is essential for a worker to learn. Learning anywhere and at any time for anybody is recognized as a future workplace.

References and Further Reading

Adkins, A. (2016, 13 January). *Employee engagement in U.S. stagnant in 2015.* Gallup. https://news.gallup.com/poll/188144/employee-engagement-stagnant-2015.aspx

Bersin, J. (2013, 29 August). *Employee retention now a big issue: Why the tide has turned.* Bobmorris.biz. https://bobmorris.biz/josh-bersin-on-employee-retention-is-now-a-big-issue-why-the-tide-has-turned

Boudreau, J. (N.d.). *Are high-skill occupations "safe" from automation?* Clarity. https://www.visier.com/clarity/are-high-skill-occupations-safe-from-automation/

De Grip, A. (2015). The importance of informal learning at work. *IZA World of Labor.* https://www.doi.org/10.15185/izawol.162

DeLayne Stroud, J. (N.d.). *The Kano analysis: Customer needs are ever changing.* iSixSigma. https://www.isixsigma.com/tools-templates/kano-analysis/kano-analysis-customer-needs-are-ever-changing

Gazprom. (N.d.). *Different learning styles in the workplace explained: Everything you need to know.* https://careers.gazprom-mt.com/blog/different-learning-styles-in-the-workplace-explained-everything-you-need-to-know/

Harris, A., & Jones, M. (2010). Professional learning communities and system development. *Improving Schools, 13*(2), 172–181.

Hiner, J. (2018, 23 May). *The No. 1 asset for job seekers of the future: The ability to learn.* TechRepublic. https://www.techrepublic.com/article/the-no-1-asset-for-job-seekers-of-the-future-the-ability-to-learn/

Jarche, H. (2012. 17 June). *Work is learning and learning is the work.* https://jarche.com/2012/06/work-is-learning-and-learning-is-the-work/

Morgan, J. (2014). *The future of work: Attract new talent, build better leaders, and create a competitive organization.* Wiley.

Phusavat, K., Delahunty, D., Kess, P., & Kropsu-Vehkapera, H. (2017). Professional/peer-learning community: Impacts on workplace training at Bangkok Metropolitan Administration (BMA) schools. *Journal of Workplace Learning, 29*(6), 406–427.

Phusavat, K., Ketsarapong, S., Ooi, K., & Shyu, S. (2012). Sustaining higher education reforms: Knowledge and policy implications learned from Thailand. *International Journal of Educational Management, 26*(3), 284–301.

Phusavat, K., Nilmaneenava, S., Kanchana, R., Wernz, C., & Helo, P. (2012). Identifying productivity indicators from business strategies' surveys. *International Journal of Productivity and Quality Management, 9*(2), 158–176.

Chapter Four

Workforce Diversity and Feedback

Highlights and Key Points

- There are three types of workers in an organization-engaged, not engaged, and disengaged (Management Study Guide, n.d.) Based on the Gallup poll in the early 2010s (Crabtree, 2013), approximately only 10-15% of a global workforce is considered as engaged while 60–65% of a workforce is not engaged and the remaining 25–30% of a workforce is disengaged.
- In the past decade, the proportion of engaged workers has increased to around 30–40% while the remaining 60–70% of the workforce is regarded as disengaged and disengaged (Hartbeat, 2020). This increase can be attributed to the efforts to better use the workplace talents. But the diversity of workforce and learning remains.
- An organization needs to achieve a 4-to-1 ratio of engaged to disengaged employees when attempting to overcome the negative effects of disengaged workers (Gallup, n.d.). Regrettably, for most leading organizations, the current ratio is 2 to 1.
- Similarly, there are three types of learners in a workplace—active, passive, and blocked (Chief Learning Officer, 2013). Only 10% of a workforce is active while 60% of a workforce is passive and the remaining 30% of a workforce is blocked.
- Within the context of learning and working, an engaged worker appears to be an active learner. A non-engaged worker is considered as a passive learner. A disengaged worker can be regarded as a blocked learner.
- Interestingly, more than 90% of workers agree that objective criticism when conveyed correctly is helpful to the improvement of performance and learning capability (Zenger & Folkman, 2014). 65% of workers prefers more feedback during work to help them perform and learn better.
- Improved sense of belongingness in a workplace has contributed to satisfaction of the workers which is translated to higher productivity by at least 12% (Warwick, n.d.)

Introduction and Importance of Workforce Engagement

To become a productive workplace, learning of the workers is essential in addition to continuous investment in new product and service development, and digital infrastructure. Effective learning help strengthen the value of human capital (i.e., return zone). A higher return to an organization financially and non-financially than the expenses relating to the human element is what is generally expected from a learning worker. Based on the following data, it is essential for industrial engineers to recognize the importance of the term engagement in a workplace for business competitiveness and success. For Industry 4.0, the talents in an organization imply everybody regardless of educational background and experiences.

Workforce engagement has long been recognized as the main contributor to continuous productivity and quality improvement in a workplace. Unfortunately, only a handful of the workers are presently considered as motivated due to a lack of engagement (about 10–15% of the global workforce is engaged). To counter the negative impacts from the disengaged workers, an organization typically needs to achieve a 4-to-1 ratio of engaged to disengaged employees. This ratio shows that while an organization focuses its efforts on strengthening customer engagement, workplace engagement can also have the same or even greater impacts on business success. Unfortunately, the number of workers who are disengaged outnumbers the engaged workers by 2 to 1 which points to a very serious problem in culture and leadership as well as an ability to learn and adapt in changing business environment and circumstances.

A disengaged worker is expected to show a decline in his or her productivity and is less likely to learn and improve his or her work. For instance, a disengaged worker is not expected to add any value to improve customer experiences. This lack of workplace learning has led to the following. 68% of customers who earlier switched to a competitor cited a lack of care and attention by an organization while only 14% expressed dissatisfaction. Moreover, 80% of the executives believed that their organizations had provided superior customer experience while only 8% of customers agreed with this notion (Desjardins, 2016). It appears the gap is very wide despite to the continuous efforts to interact with customers. Note that customer experience is how a customer views and feels about these interactions with an organization. Positive

customer experience indicates a high customer retention rate. These engaged customers also recommend the products or services to others. Often, customer engagement depends on how well an organization engages its workers who continuously interact with customers.

Not only he or she is less motivated and productive but being disengaged in a workplace also contributes to 60% more errors and defects during work. This is because 73% of disengaged workers often do not feel accountable for their decisions and actions, and constantly seek new job placements (The Conference Board, 2021). On the contrary, when having an engaged team, a workplace has experienced 17% higher productivity and 41% lower absenteeism. This positive impact translates to 10% increase in customer satisfaction rating and 21% more profitability for an organization. In this similar study, by increasing the financial support and commitment for workplace engagement by merely 10%, an organization can expect an annual increased profit yield of $2,400 per worker. Thus, 71% of the executives view that an ability to effectively engage with a workforce is vitally essential for high performance and business success.

Despite abundant clear evidence of positive impacts from workforce engagement, only about one-fifth of the senior executives and business leaders consider their organizations to be effective on workplace engagement. One-third of them also express their concern about having too many disengaged or non-engaged workers on performance. As previously mentioned, a non-engaged worker represents a person who performs the tasks with very minimal effort and commitment—going through the motions without any sense of urgency and enthusiasm. On the other hand, a disengaged worker is a person who does not enjoy being in a workplace. Thus, he or she is expected to deliberately performs the tasks poorly and can have negative influences on others. In other words, the disengaged workers can be disruptive to a workplace.

For industrial engineers, the recent development in human capital through the recognition of workplace engagement has pointed to a new paradigm and approach for achieving productive workplace. Engaging the workers apparently relies more on conversation, communication and feedback. Empathy and the recognition of learning diversity in a workplace are also crucial. Safe and creative learning environment needs to be established and sustained to encourage workplace learning. This environment paves the way for more share and communication.

Industrial engineers are aware that the successful approach and practices employed more than 100 years ago with motion and time study are no longer effective for a current workplace. As previously mentioned, with rapid changes in a workplace, an attempt to engage a worker is no longer about identifying this one best way, preparing a work instruction or a standard, and training a worker for compliance. Improving a worker's productivity is not about this worker being instructed what to do and how to do it. Paradigm shift that a worker can learn, improve, and adapt his or her work has already taken place and will continue to play an important role for the future of industrial engineering.

Dealing with Workforce Diversity

Dealing with non-engaged and disengaged workers require a different approach and mindset. Industrial engineers need to recognize the change from standardization into individualization (or at least group specialization) in all work processes. The term customization indicates the importance of customer engagement through an understanding of how individual customers use and require an organization's product and service. This same understanding needs to be applied for the workers. Recognizing that different approaches likely have different impacts on different worker is important when improving workplace productivity. For this recognition, it is also about an understanding that the workers can have unique motivating factors due to family, education, age, and others. Thus, workforce engagement needs to be carefully planned and designed.

A lack of workplace engagement indicates several poor symptoms relating to open communication, usefulness of feedback, clarity between current work and an organization's future, and meaningful and positive feeling at work. There are many visible signs that signify a lack of workplace engagement. These include a lack of two-way communication, a lack of interest in a workplace, and, and regular complaints. A worker has not been asked about how he or she can improve the work and working experiences. An engaged worker can become a non-engaged worker (and subsequently disengagement) in a short time.

Non-engaged workers can be easily observed and noticed. They conduct their work passively without energy and commitment. Some often refers to a non-engaged worker as a sleepwalker. Unable to engage reinforces a fixed mindset to a worker. A fixed-mindset person is not

aware how his or her work affects an organization's performance. A fixed-mindset person is afraid to learn since there is no urgent need to extend existing knowledge. A person with a fixed mindset does not view feedback as positive and helpful during work. Neglecting a non-engaged worker either for a short period or extended period can lead him or her to become disengaged.

A disengaged worker can be characterized as a person who is not happy at work and is willing to visibly show this unhappiness to others. Unlike a non-engaged worker who is not vocal and does not disclose displeasure feeling, a disengaged worker can purposely behave in such a way that can undermine his or her work as well as others. A disengaged worker can purposely embezzle or even damage an organization's resources and assets. More importantly, a disengaged worker can undo excellent work of an engaged worker.

Simply put, an engaged worker is consistently productive and constantly learns due to commitment and loyalty to a workplace. A non-engaged worker has the possibility to be productive but is not psychologically attached or committed to an organization. A disengaged worker is psychologically absent despite being at work. A disengaged worker often shows or expresses the feeling of unhappiness to others inside and outside an organization. The workforce diversity requires unique empathy and attention to tackle the differences in an organization's workforce. The presumption that all workers are the same is no longer applicable.

As most businesses have shifted from standardization and mass production (of products/services) to mass customization or personalization, so should how their workers are engaged. The aim to deliver customized products and services, that tailor to the specific needs and wants of individual customers, should help the customers feel more connected and hopefully stay loyal to an organization. Reciprocally, the challenge for industrial engineers is to deal with three different worker groups successfully. Specially, individualizing how to engage with the non-engaged or disengaged workers is the priority.

Feedback and Learning

Industrial engineers have embraced feedback as an integral part of development and improvement since the early 1900s. From the standard time to performance appraisal, feedback becomes a necessity for operation and process management. This very same idea has been sup-

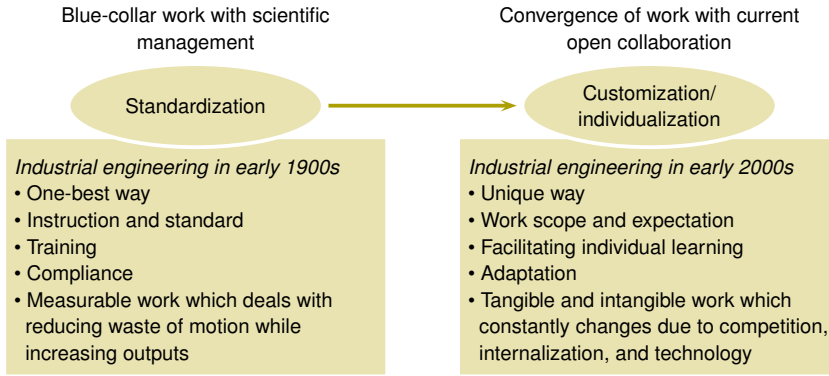

FIGURE 4.1 Shifting the Role of Industrial Engineers for Workforce Engagement and Learning

ported by many practitioners over the years on how to verify and provide quality feedback. Elon Musk once said, "I think it's very important to have a feedback loop, where you're constantly thinking about what you've done and how you could be doing it better." This is important as high-performance organizations often strive to improve the quality and channels of feedback. Industrial engineers have recognized the importance of feedback in maintaining a productive workplace. A standard time aimed to provide useful feedback on motion improvement. A fact(or feedback)-based decision represents the strength of scientific management which substitutes a rule of thumb (or approximation or trial-and-error). In other words, feedback has always been part of industrial engineering practices on productivity and performance improvement.

Later, when system thinking and total quality management began to dominate the practices in production and operation management in 1970s and 1980s respectively, feedback was again viewed to be crucial for the success of an organization. For system thinking, feedback reflects an important input for continuous improvement. Specifically, the effectiveness of an open system depends on the quality of feedback. For instance, when designing a product, feedback incorporates many human-related aspects such as sensory, anthropometry, and psychology. A driver of a car receives feedback through visual and audio means (e.g., need to fasten a safety belt, speed, and temperature, etc.) which symbolizes the sensory. The location for this driver to sense is determined by the anthropometry. The color (i.e., red, yellow, and green) re-

flects the application of psychology which is consistent with a driver's understanding.

Acquiring feedback from customers and stakeholders helps determine the success of a quality management system. In fact, customer's feedback is required as an objective evidence for all quality management practices and systems (e.g., ISO 9001, the Malcolm Baldrige National Quality Award, and the European Foundation for Quality Management Excellence Model). Customer feedback is essential since customers' preferences and expectation continue to change. This feedback has many benefits which include understanding of customer dissatisfaction and satisfaction, needs, preference priority, and opportunity. New product and service development and upgrade are often based on information from customer feedback. In addition, gathering and use of customer feedback demonstrates that a quality management system exists and remains functionally effective. When the operations begin to adapt more open collaboration (whether this collaboration is within an organization or with its stakeholders), feedback reflects the partnership's effectiveness, i.e., communication. Gathering and analyzing feedback based on customer behavior and pattern have contributed to the development of data analytics. This had led to many improvements in the development and improvement of products and services. On the contrary, based on the 70–20–10 framework, feedback appears to be crucial for learning and motivation of a worker. The effectiveness of learning by working with others depends on quality of feedback. For learning by working, its success also links with feedback along with actual experiences from work. In other words, when properly designed, feedback should be viewed as a cost-effective way to help develop a worker and to possibly reconnect with non-engaged and disengaged workforces.

In the 70–20–10 framework, feedback serves as a catalyst for learning and development. Feedback can be interpreted in various ways. Industrial engineers need to be creative in this interpretation. For instance, asking a question or providing a suggestion by a worker is good feedback to an organization's management as it indicates what this worker needs (and also shows he or she cares enough to ask). Providing feedback to a worker not only reflects an attempt to clarify this inquiry but also shows the mutual feeling of care and attention. When an organization assesses a worker's performance, it is a good opportunity to communicate with feedback. However, there is a tendency to mix between

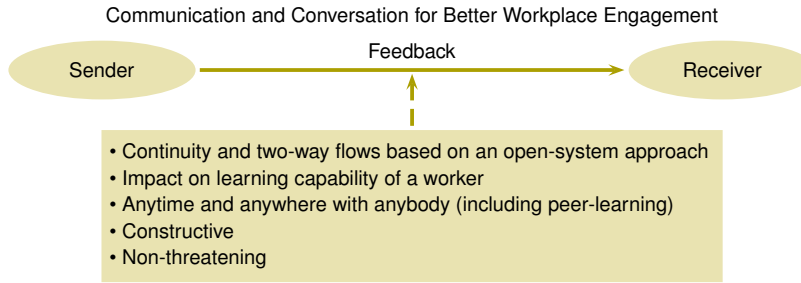

FIGURE 4.2 Feedback in the Context of Worker's Learning

assessment with evaluation and feedback. The reason is that feedback is often misunderstood with evaluation. Understanding of how to give feedback and to receive feedback requires strong leadership and empathy since feedback should be about the information on how a worker is performing when working towards a set of goals.

Feedback contributes to effective communication in a workplace. Communication is highlighted by having feedback exchanged and understood by two or more persons in an organization (e.g., worker and supervisor). It is important to recognize that successful communication largely depends on mutual sharing. Feedback is not only about sharing data and information but also includes how a person percieves appearance and actions. This is because feedback involves a sender and a receiver. More importantly, a clear purpose of feedback needs to be well-thought-out such as to change a behavior or to inspire confidence, etc.

To plan and design feedback, industrial engineers need to recognize the importance of both internal and external feedback. Both external (excluding complaints and rating from either customer or supplier) and internal (excluding performance evaluation and rating from supervisor) can help facilitate learning if this feedback is viewed as positive and constructive. Sensitivity to a feedback receiver is crucial. Feedback also sends a powerful message about inclusiveness and belongingness which are part of motivation.

Workplace requires openness to active and continuous collaboration, learning anywhere and anytime, and timely and constructive feedback (Senge, 1990). Workplace learning effectively uses feedback to engage its workers and to entice their learning and motivation. Feedback should be non-threatening, continuous, and constructive. A culture of

feedback needs to be embedded as part of workplace learning. For instance, customer feedback is constantly sought for the development and extension of product and service. As previously mentioned, Kaizen encourages the workers to provide feedback so that operational problems can be resolved.

For workplace learning, there is a need to recognize the importance of both external (e.g., suggestions from an external entity on improvement) and internal (e.g., idea sharing among colleagues and peers) feedback to help facilitate learning and development of the workers. External and internal feedback is essential since 65% of workers prefers more feedback during work to help them perform and learn better (Lipman, 2016). In other words, the workers need and strive for more feedback than previously thought or believed.

Adapting better use of feedback at the individual level presents an opportunity to help non-engaged and disengaged workers become more productive. The importance of feedback should be better recognized and integrated into productivity improvement in a workplace. This is because feedback has had positive effects on learning as indicated by the 70–20–10 framework. Due to the premise that learning is now part of work (as a reference to a learning worker), minimizing the waste of workers' talents (especially on learning capability) will be one of the most critical challenge for a workplace in Industry 4.0.

Feedback and Motivation

Feedback is an important part of a learning process. Despite this awareness, industrial engineers need to have better insights and knowledge on how to properly design and effectively deliver feedback to a worker. The reason is that how this feedback is provided and communicated affects how it is received. Potentially, feedback can affect a learning process of a worker because it helps strengthen his or her ability to evaluate, correct, and improve the work. In other words, feedback should be informative, instead of being threatening, to help encourage and motivate a worker's learning. It is important to point out that feedback should not be viewed as part of performance appraisal.

Feedback can be both positive and negative during work. Timely feedback is critical since it shows attentiveness from an organization towards its workforce. It is important for the worker to feel that his or her work and efforts are appreciated. If learning is part of work, timely feedback can stimulate more ideas for desirable business outcomes.

Feedback contributes to performance improvement by being a mechanism to communicate important business objectives and goals. For many organizations, feedback reflects continuous coaching and engagement which can help the workers perform and learn.

Negative feedback is part of a process of drawing the attention to when a worker performs poorly and working with him or her on how to improve from this undesirable circumstance (Chron, 2021). Negative feedback should be specific and cannot be mingled with evaluation. Being specific can lead to more concrete discussion and fruitful conversations with a worker. For instance, a worker should immediately receive negative feedback when there is a gap between an actual result and an agreed target of work. The term negative does not imply negativity about work (e.g., negative message or comment). But it needs to point to the potential negative impacts if there is no change in how a worker performs his or her tasks. In other words, negative feedback can be effective for correcting problems or altering poor behaviors and mindset.

Positive feedback becomes impactfull when a worker' strengths are known. Pointing out to the specific positive aspects is important since a worker tends to repeat and improve his or her behavior when being informed about the strengths. Positive feedback can contribute to continuous learning and motivation of a worker. Positive feedback often focuses on when he or she exceeds an expectation. Positive feedback can also motivate a worker who constantly needs to have confidence in his or her work. Positive feedback can motivate the workers to improve their work and learning by focusing on commitment and effort. Conversations with a worker should be part of feedback's development and delivery.

Simply out, effective feedback is expected to: (1) improve morale of a workforce, (2) increase work satisfaction, (3) create and sustain professional relationships, (4) generate meaningful conversations and discussions, (5) enable two-way communication, and (6) establish shared value and understanding of work expectation and its impacts on an organization. To some degree, effective feedback has reduced a sense of uncertainty and disconnection among the workers. This is essential for the feeling of belongingness and relevance within an organization. More importantly, how the feedback is delivered represents another challenge for industrial engineers. Instead of focusing either positive or negative feedback, industrial engineers can use the combina-

tion of both positive and negative feedback. For instance, the sandwich method of feedback reflects an attempt by an industrial engineer to insert negative feedback between positive feedback.

When feedback is explicitly embedded in an organization's communication (in terms of strategic use with consistency), it can reduce work stress, feeling of workplace isolation, and errors and mistakes during work. Thus, it is critical that a continuity in productivity improvement requires careful planning and delivery of effective feedback to an organization's employees. When executed properly, feedback can motivate, increase performance, and boost workplace satisfaction. Keep in mind that more than 60% of an organization's workforce prefer to learn at work and approximately about one-half expressed the preference to learn at the point of need (Linkedin, 2018).

In addition, more than 75% of the workers view engagement as open communication and conversations for sharing their inputs and opinions. From an organization's viewpoint, receiving feedback from the workers symbolizes commitment and reflect learning capability of its workforce. In addition, feedback needs to be timely and consistently delivered to a worker to enhance workplace learning. On average, an engaged worker receives any type of feedback at least once a week. More interestingly, a worker prefers negative feedback over general comment and praise due to its better impacts on learning and development. On-the-spot feedback along with peer-to-peer learning has become more important today.

Feedback has two primary functions in a workplace. The first one is to provide instructional information. This instructional function of feedback helps clarify the role, responsibility, and requirements of work (and its related tasks). It can be either positive or negative, given that a worker (as a feedback receiver) understands what is expected from his or her work. This feedback focuses on work completion and continuous learning. Clear understanding of the workplace's expectations is an outcome of the instructional feedback. For this function, one of its most common applications is when a set of goals/targets needs to be clearly communicated to the workers. Thus, constant feedback (during and after work) is essential for the workers. Note that instructional feedback often helps clarify any misunderstanding and mistakes during work.

The second function is to motivate the workers. The motivational function of feedback is to reinforce desirable behavior of the work-

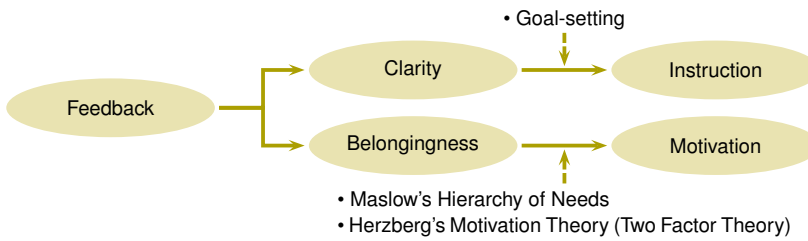

FIGURE 4.3 Roles of Feedback for Worker's Engagement

ers. This motivational feedback is expected to strengthen an engagement effort with the workers. For this function, motivational feedback attempts to improve the sense of belongingness among the workers. Based on Maslow's Hierarchy of Needs, feedback helps bring positive feeling from the workers. In other words, providing feedback to the workers in a two-way or conversational manner implies recognition and attention. Since the first two level of needs (i.e., physiological and safety) are legally mandated, many organizations have moved to better utilize the next level of needs which is belongingness. Furthermore, based on Herzberg's Motivation Theory (Two Factor Theory), feedback is part of the motivating factor which an organization should provide for its workforce. This motivating factor, unlike the hygiene factor (which an organization must provide to avoid dissatisfaction), can improve the level of satisfactory among the workers.

There are many ways to provide the feedback to the workers. Verbal feedback is based around the spoken words, so it needs to be clear and concise. Verbal feedback can be positive and negative. Verbal feedback should be immediate and direct. On-spot feedback represents one example of the verbal feedback which corrects a worker's mistake and misunderstanding as soon they emerge. Feedback provider should have confident voice while avoiding the use of jargons and terms whenever possible. On the contrary, a worker who receives verbal feedback needs to demonstrate his or her understanding and awareness of a circumstance surrounding the work.

Non-verbal feedback is critical for the workers because it represents most of a workplace's communication. Non-verbal feedback is broad and includes the use of body language such as head movements, gestures, and facial expression (e.g., a worker can see the level of his or her performance based on a smile or a head nod by a supervisor's face). Lis-

tening and paying attention to an input provided by a worker is viewed as very important non-verbal feedback. Keep in mind that non-verbal communication can be easily misinterpreted. Therefore, there is a need to constantly observe the workers' behavior and reaction in a workplace. For instance, walking with a pen and a notebook, to record what a worker says, can be misinterpreted as an attempt to gather mistakes during work. This notion can happen despite a purpose to show a willingness to listen to a worker. Nevertheless, non-verbal feedback, if consistently delivered, can be constructive which can boost the morale and esteem of a worker.

Another illustration of non-verbal feedback is the practice of management by walking around. This practice highlights the roles of a manager or an industrial engineer when spending some of his or her time listening to problems from and ideas of the workers, while walking around a workplace. This practice emphasizes the importance of two-way communication in a workplace (instead of having formal discussion sessions and meetings). To listen and to be visible can be a powerful feedback that help communicate with the workers.

External Feedback and Impacts on Learning

There are two sources of feedback—internal and external (in addition to the feedback type-positive/negative and the feedback function—instruction/motivation). Internal feedback is directly received by a worker during work (i.e., viewed as inside-out approach for feedback delivery). Internal feedback is primarily used within an organization for both instructional and motivational purposes. The use of internal feedback is sufficient if an organization's culture does not suppress constructive criticism which is essential for workplace learning. Internal feedback is traditionally derived from supervisors and peers.

Supervisors and industrial engineers can be an effective internal-feedback provider due to their experiences and familiarity with work. Peers or co-workers who have performed similar work can provide also useful viewpoints. This is part of informal and collaborative learning among the workers. This informal learning has been recently encouraged by many organizations through a common internally-designed digital platform. Despite a general acceptance that internal feedback is important to help the workers improve and develop, safe and creative learning environment needs to be assured and maintained.

External feedback is from relevant outsides sources (viewed as an

outside-in approach for feedback delivery). Many organizations have adapted the use of external feedback to primarily motivate the workers. External feedback has been essential for business improvement due to the acceptance of an open-system approach. The effectiveness of an open system depends on the quality of information from the stakeholders outside an organization. Feedback from external sources is sought after to help bring about an improvement or a change in a workplace. Common benefits from external feedback have included objectivity and originality. Objectivity includes objective criticism which is widely accepted by the workers for productivity improvement and learning. Originality reflects a different viewpoint from people outside an organization.

There have been several attempts to integrate external feedback to stimulate learning for a worker. Often key customers and stakeholders have been integrated. Customers is generally recognized as the most important source of external feedback for an organization as indicated by a quality management system. Typically, an organization uses a survey, a visit, a complaint, and a customer to help gather this external feedback. Customer feedback has traditionally strengthened an argument for a change in work processes. In addition, key stakeholders can contribute to the quality of external feedback by sharing their experiences and thoughts. Instead of sharing external feedback among the executives, involving the workers has become more common since it improves their learning and motivation.

External feedback should be gathered on the continuous basis. Often, many organizations attempt to collect feedback after work is performed or when a project is completed. This may hinder continuous learning by a worker. It is important for the workers that external feedback is part of an ongoing process for workplace learning such as supplier and customer feedback. This external feedback also implies the willingness to be flexible and open. External feedback is not for punishing or embarrassing a worker or judging his or her mistakes. When gathering feedback from a group of people who are not part of an organization, the workers can receive different types of information and perspectives. As a result, the use of external feedback needs to be carefully communicated and understood but has been proven to be useful and creative.

Finally, gathering external feedback is not straightforward and easy. Simply, sending an annual customer survey is not helpful since exter-

nal feedback needs to be continuous which is like internal feedback. To effectively use of external feedback, its scope and purpose should be clarified and planned. Its frequency (e.g., collection and delivery to the workers) needs to be clear. External feedback needs to be customized so that it is viewed positively by the workers along with routine internal feedback that they receive. External feedback needs to be viewed as something useful and beneficial by the workers. Thus, the consistency in delivery and purpose of use for external feedback are essential.

Conclusion

Improving workplace productivity requires fundamental understanding and insights into the diversity in a workplace. Past and current assumptions on a workforce (e.g., uniformity of the workers, needs for closed supervision, requirement of clear instruction, learning by training, and limited learning capability and motivation) are no longer useful when engaging with the workers. Due to learning diversity, three groups of the workforce are emerged and classified- engaged, non-engaged, and disengaged. For each group, the workers show different characteristics which impact on learning, creativity, and productivity. Given the emerging expectation on work and workers (i.e., simultaneously performing and learning), dealing with this diversity is crucial for long-term business success and competitiveness.

Feedback is viewed to be a potential catalyst that can bring more synergy and open collaboration. Feedback can strengthen communication within an organization. Feedback has two primary functions which are instructional and motivational. Industrial engineers are familiar with feedback and recognize its importance in many practices such as design and quality management. It has positively contributed to continuous performance improvement at the individual, functional, and organizational levels.

Specifically, many studies show that the workers prefer to receive negative feedback if they can use it to improve their work performance. Positive feedback is proven to be impactful. Interestingly, most managers and supervisors are hesitant to give both positive and negative feedback. They view feedback as part of performance appraisal which hinders the effectiveness of feedback. This circumstance points to the importance of how this feedback is developed and delivered. Essentially, actual data, honesty, and good intention should be highlighted so that the workers can better utilize feedback.

Based on several concepts such as the 70–20–10 framework, continuous feedback during work helps learning and motivation (to share and learn from each other). Not only internal feedback is needed, but also the positive effects from external feedback cannot also be overlooked. The potential benefits of feedback on learning and motivation will be essential for workplace engagement. Dealing with both non-engaged and disengaged workers in a workplace will be one of the future important tasks for industrial engineers.

References and Further Reading

Chief Learning Officer. (2013). *Engage passive learners.* https://www.chieflearningofficer.com/2013/01/10/engage-passive-learners/

Chron. (2021, 26 April). *The differences between negative feedback & positive feedback methods.* https://smallbusiness.chron.com/differences-between-negative-feedback-positive-feedback-methods-18127.html

Crabtree, S. (2013). *Worldwide, 13% of employees are engaged at work.* Gallup. https://news.gallup.com/poll/165269/worldwide-employees-engaged-work.aspx

Desjardins, J. (2016, 16 December). *Why your customers are leaving – and how to win them back.* Visual Capitalist. https://www.visualcapitalist.com/customers-leaving-can-win-back/

Gallup. (N.d.). *What is employee engagement and how do you improve it?* https://www.gallup.com/workplace/285674/improve-employee-engagement-workplace.aspx

Hartbeat. (2020). *Global employee engagement data 2020.* https://peakon.com/heartbeat/data/employee-engagement/

Johnson, S., Blackman D., & Buick, F. (2018). The 70:20:10 framework and the transfer of learning. *Human Resource Development Quarterly, 29*(4), 483–402.

Leitão, J., Pereira, D., & Gonçalves, A. (2019). Quality of work life and organizational performance: Workers' feelings of contributing, or not, to the organization's productivity. *International Journal of Environmental Research and Public Health, 16*(20), 3–18.

Linkedin. (2018). *2018 workplace learning report.* https://learning.linkedin.com/content/dam/me/learning/en-us/pdfs/linkedin-learning-workplace-learning-report-2018.pdf

Lipman, V. (2016, 8 August). *65% of employees want more feedback (so why don't they get it?).* Forbes. https://www.forbes.com/sites/victorlipman/2016/08/08/65-of-employees-want-more-feedback-so-why-dont-they-get-it/?sh=3f4c8d44914a

Management Study Guide. (N.d.). *Types of employees based on level of engagement.* https://www.managementstudyguide.com/types-of-employees.htm

Phusavat, K., Chindavijak, C., Meeampol, S., Kess, P., & Hidayanto, A. N. (2017). Key elements for achieving an enterprises performance in the areas of sustainability. *International Journal of Management and Enterprise Development, 16*(4), 275–290.

Phusavat, K., Delahunty, D., Kess, P., & Kropsu-Vehkapera, H. (2017). Professional/peer-learning community: Impacts on workplace training at Bangkok Metropolitan Administration (BMA) schools. *Journal of Workplace Learning, 29*(6), 406–427.

Phusavat, K., Radfar, A., & Rojanakit, R. (2015). Social network analysis: Potential quality tool for enterprise development. *International Journal of Management and Enterprise Development, 14*(3), 187–198.

Senge, P. (1990). *The fifth discipline: the art & practice of the learning organization.* Doubleday/Currency.

Sutton, R., Hornsey, M., & Douglas, K. (2012). *Feedback: The communication of praise, criticism and advice.* Peter Lang.

The Conference Board. (2021). *DNA of engagement: How organizations create and sustain highly engaged teams.*

Warwick. (N.d.). *New study shows we work harder when we are happy.* https://warwick.ac.uk/newsandevents/pressreleases/new_study_shows

Zenger, J., & Folkman, J. (2014, 15 January). *Your employees want the negative feedback you hate to give.* Harward Business Review. https://hbr.org/2014/01/your-employees-want-the-negative-feedback-you-hate-to-give

Chapter Five

Research Design and Case Study

Highlights and Key Points

- School and workplace have shared many similar characteristics and challenges which relate to learning and motivation. Today, a learning worker in a workplace can be compatible with a learner at school in terms of the need to perform the assigned or required tasks, and to learn and improve continuously. Both groups of learners constantly involve with evaluation and appraisal. Motivation has been a challenge for continuous learning.
- Gaining the insights into the effectiveness of feedback on a disengaged worker or learner requires a longitudinal study. The reason is that the research needs to examine many factors affecting the attitude, behavior, and motivation of a learner. These factors include safety and sense of belongingness. As a result, the impacts from feedback need to be repeatedly observed. The Hawthorne Effects are recognized during the design of the research.
- More workers prefer constructive feedback (57%) over praise (43%) (Zenger & Folkman, 2014). This implies that the workers like to know what they need to do for performance improvement. Constructive feedback needs to be specific and solution-focused and is based on observations and facts. Constructive feedback can be both positive and negative. It is important to note that, instead of separating focusing on either positive or negative feedback, the research primarily examines the term constructive feedback.
- A manager or supervisor or engineer, who has focused on the strengths of a worker, is 30 times more likely to manage an engaged worker when comparing with those who fail to regularly provide constructive feedback (Ryba, 2021).
- The Hawthorne Effects need to be recognized for the design of a research dealing with human behavior.

Dealing with Learning and Motivation at Workplace/School

Workplace and school share many similar goals and characteristics. Performing the tasks while learning how to improve these tasks typically take place at both workplace and school. The term learner is

used to describe a student. On the other hand, in a workplace, the term learning worker has been used to describe a worker. Students are often evaluated and receive performance information which is like in a typical workplace. Both workplace and school also experience many comparable changes over the years. For instance, one-way lecture (or learning by listening, reading, and observing) is no longer encouraged. Likewise, learning by training or by e-Learning has been less promoted in a workplace due to the belief that a worker has the talent to learn. Learning by sharing and doing with open collaboration has been boosted for school while the 70–20–10 framework indicates a similar trend in a workplace. Moreover, social ladder in a school and social climbing in a workplace show a strong similarity.

Use of feedback more effectively (through careful development and delivery) has been constantly urged. In fact, the study conducted by Education Endowment Foundation singles out the importance of effective feedback in learning and motivation of the students (Education Endowment Foundation, n.d.). It highlights the need to engage with the students who are diverse and require different interventions and attention. At the same time, an improvement of feedback's contents and delivery has been pushed as part of enhanced communication.

As previously mentioned, feedback should be continuous; therefore, it should be clearly separated from annual or semi-annual performance evaluation and appraisal. Feedback, unlike evaluation, reflects information which can be instructional and motivational. Unfortunately, both workplace and school share comparable symptoms which contribute to a lack of positive feeling and engagement. These symptoms are absenteeism, dropout or turnover, retention, bullying, and harassment. In many countries, the disengagement is particularly widespread in a large school located in poor urban and rural communities. This large school has usually applied stringent control to administer its affairs. Often a large workplace exhibits a similar problem. Rigid control with rules and procedures is regularly expected in the large entities. Similar efforts have also included the need to tackle a lack of physical and psychological safety to enhance learning.

Physical safety indicates there is an effective mechanism in place to protect the workers and the students alike from physical harm. Some of the physical harm at school or in a workplace include hitting, smacking, slapping, punching, kicking, hair pulling, and suffocating. On the other hand, psychological safety indicates a situation where a person

(i.e., a learner at school or a learning worker at workplace) feels or believes that he or she will not be punished or reprimanded when speaking up, voicing an opinion, asking a question, and making a mistake (Stieg, 2020). When he or she can bring up an idea or a suggestion without being fearful or feeling embarrassed, then this workplace or school is safe psychologically. Lack of safe learning and working environment has been cited as a major contributor to disengagement. A lack of both physical and psychological safety impacts on the level of creativity.

When dealing with harassment and bullying, many similar issues facing a school and a workplace have emerged. Peer abuse has been commonly described at school and in a workplace as a primary source of a roadblock for effective learning. When this issue is not seriously addressed, the feeling of indifference and subsequently disengagement will transpire. Despite strong legal ramification, the physical and verbal abuse continues to occur and has extended to cyber bullying. Harassment and bullying have had detrimental effects on health, wellbeing, learning, and motivation of a person whether he or she is at school or at work.

Loneliness and unhappiness are the consequence of the disengagement. This circumstance contributes to a school's dropout or a workplace's turnover, and afterward lower productivity. In addition to ensuring safe learning environment, the primary goals from both school and workplace are to instill confidence, willingness to share and learn, and appreciation of life-long or continuous learning. These goals encourage positive perception of learning which is essential for becoming a learning worker (Washor et al., 2014). Successful engagement is recognized as a key contributor to desirable behavior at school and workplace.

Finally, as previously discussed, for learning diversity, learners can be classified as: active with engaged, passive with non-engaged, and blocked with disengaged. In addition, what transpires at school will likely follow in a workplace since a student will eventually become a worker. For instance, the students who are frustrated at school tend to become non-engaged and to learn passively. It is not surprising that this passivity and indifferent attitude would extend to a workplace. Thus, using a school as a substitute for a workplace is possible for the examination into the impacts of feedback on learning and motivation. Furthermore, using a school can help reduce the effects from employment turnovers and transfers while ensuring the continuity of an experiment for a long period of time.

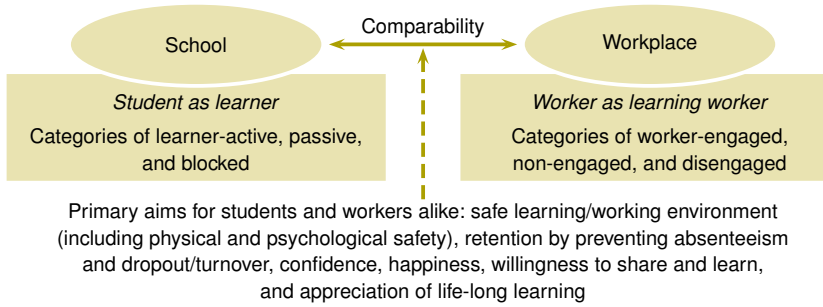

FIGURE 5.1 Comparison between School and Workplace on Learning and Development

General Description on Learning Gap from Case Study

For the challenge of human learning, the research aims to gain more insights and understanding into the use of external feedback to sustain and support learning and motivation. The research has adapted a school which largely resembles a workplace. Moreover, not only what is learned from school during this research is applicable to a workplace, strengthening learning and motivation of the students at school will benefit a workplace and an organization. Human learning and performance have been one of the emerging research areas in industrial engineering during the past decade due to: (1) the need to better the talents in a workplace, (2) the diversity in a workplace and (3) the necessity to achieve high-performance for business success. Becoming a productive workplace with learning workers is now an objective of industrial-engineering interventions and improvement.

Specifically for Thailand, despite numerous efforts to improve the quality of learning, the country's education gap has inadvertently widened. This is based on the national assessment that shows the widening gap when comparing Ministry of Interior' schools with those from Ministry of Education as well as from the higher educational institutes with Faculty of Education (OECD, 2016). This challenge stems from many reasons. Some of the most cited reasons are a lack of systematic engagement with the students, a lack of motivation and interests in learning, and lack of the compatibility with learning contents and students' needs and interests. Unfortunately, the curriculum design (particularly science education) is based many assumptions which contribute to the one-size-fits-all decisions. The one-size-fit-all or standard decisions point to a failure to recognize the diversity of the learners has

resulted in school disengagement. This circumstance is like in a workplace where the diversity of learning is not the focal point in continuous productivity and performance improvement.

To motivate the learners at school, the use of challenging homework assignments and examinations have been widely practiced. Special or extra tutoring sessions are required to supplement with school's lessons. Academic performance based on strict evaluations (e.g., use of Grade Point Average) is believed to be a motivating factor to learn. The students who perform well often receive special attention by a teacher and distinct recognition by a school (e.g., a large poster or billboard with a learner name). In addition, standardized assessment and evaluation are expected to help motivate the learners due to all learners are required to undergo the same process. Then, an evaluation on a learner's academic performance into a rating scale (i.e., A to F or 4.0 to 0.0) is made. This practice is also similar to a workplace where rigid control through assessment and evaluation is applied for productivity and performance improvement.

The grade, based on a rating scale, is viewed as feedback which should reflect and contribute to knowledge and learning capability of a learner. This rating result is shared with a learner under the presumption that this information is a source of a learner's motivation. Unfortunately, the feedback, initially thought to be helpful, has unfortunately caused unforeseeable negative effects such as memorization, learning by listening (and complying with a teacher's instruction), individualization of work (instead of collaborative learning), etc. This situation shows that poorly-designed feedback has contributed to negative experiences and feeling, poor engagement, poor learning, and poor utilization of a person's talents. Like in a workplace, performance appraisal often leads to more compliance (i.e., performing and following an instruction).

Furthermore, a use of competition among the learners has been a key to achieve academic excellence. However, this has led to the perceived unfairness among the learners. Those who cannot afford to pay for a special tutoring lesson are at a disadvantage. In Thailand, this unfairness has had two important implications. The first implication is that it has contributed to a lack of interactions and communication by the teachers who are traditionally trained to prepare the learners for higher education. Students who perform well tend to receive special attention and recognition while students who underperform are ne-

TABLE 5.1 Learning Gap Based on the 2011 Score from Trends in International Mathematics and Science Study

School Category	Science	Mathematics
University Teacher Training School (Demonstration or Laboratory)	552	554
Ministry of Education (only Public School)	472	460
BMA Schools (part of Ministry of Interior)	447	425
Ministry of Interior Schools	440	424

NOTES Based on data from Department of Education and BMA.

glected. Thus, the underperformed students become disengaged from school and can disrupt teaching and learning. In other words, a failure to recognize learning diversity of the learners has been magnified. The second implication is to reinforce the belief among the learners who are from the disadvantageous background that they would likely continue to be poor in their foreseeable future. Their performance and future are determined regardless of their talents. The understanding of this mindset is critical for learning and motivation.

Note that, in Thailand, there are two primary ministries responsible for education: Ministry of Education and Ministry of Interior. Local municipalities under Ministry of Interior are responsible for health and human services to local population which also includes education. Currently, about 15% of the student's population or 800,000 students in basic education are attending these schools under the supervision of Ministry of Interior. The largest group in this category belongs to Bangkok Metropolitan Administration (BMA) which is administering 437 schools and is handling over 350,000 students. Unfortunately, for these learners, they are considered as underprivileged. Poverty, broken family, frequent school transfers, and lack of career and economic opportunity are often associated with these learners. This has contributed to school disengagement and contribute to widening learning gap with other learner groups.

It is important to note that a school transfer happens to the learners whose parents need to migrate to a city for work. Due to this poverty, many learners often work after the completion of their basic education instead of pursuing higher or vocational education. The challenges facing these schools under Ministry of Interior are not mainly about the budget for procurement and the arrangement for more the vigorous tests and examinations. Lack of hope for their future opportunity

together with the need for essential skills at work have been cited as the roadblock learning and development of the learners. Due to a lack of academic success, a student becomes non-engaged at school. Many eventually become disengaged from a schooland exhibit many characteristics that can hinder their study and learning. School disengagement like workplace disengagement contributes to a lack of human learning, unsatisfactory development, negative attitude, and poor performance.

Consideration of the Hawthorne Effects

The Hawthorne Effects have been part of industrial engineering's research and practices since 1930s. The term refers to an experiment conducted at the Hawthorne Works Electric Company in Illinois during the late 1920s until the early 1930s. This experiment was on the interrelationships between illumination and work performance by the individual workers. Working hours and workload management were later added to this experiment. This experiment represented an attempt to gain more insights into how working environment (mainly lighting and other related aspects in working environment) could positively influence the workers' productivity.

The findings indicated there was a significant increase in productivity when the lighting was improved. However, this improvement was not just limited to the lighting was improved. When there were some changes during this experiment, despite the lighting level was decreased to an initial level, the productivity level continued to increase. In other words, maintaining the identical working environment and condition while continuing the observation had resulted in productivity improvement. However, when an experiment was completed, the productivity level went back to its original level. Thus, it was concluded that the workers' productivity was not entirely affected by the changes in working conditions. The Hawthorne Effects revealed another interesting finding about productivity improvement. This experiment brought out the importance of social needs which incorporated emotion and sense of belongingness. In other words, it is essential to recognize that a possible improvement can be expected with how the individual workers behave and react due to the special attention. The special attention was closed observations (but can be in many shapes and forms such as frequent conversations, active listening, etc.)

When conducting an experiment relating to or dealing with behav-

ioral observation, the Hawthorne Effects should be recognized as an unavoidable consequence. This scenario occurs when people behave or react differently because they are aware that they are being watched and observed. The Hawthorne Effects indicate that the workers could temporarily change their appearance and behavior at work in response to the attention they receive from their supervisor and others within and outside an organization. The workers feel the pressure to change until the attention is over. Then, their appearance and behavior will return to what has been before an observation. This affects the credibility and reliability of a research. As a result, the Hawthorne Effects point to the need for a longitudinal study when observing how the individuals learn and react to learning. This longitudinal study indicates the need to repeatedly examine and observe the same category of the individuals over a specific period to detect any intended changes. Even though no specific amount of time is given, one critical factor for the observation is to allow the participants to behave continuously and repeatedly.

The duration of an experiment when observing behavior changes can vary from a few months to a few years. The challenge is the consistency so that behavior changes can be confidently detected or noticed. Typical research and reports with a longitudinal study include employee engagement, workforce engagement and motivation, customer behavior, brand awareness, market trend, and service preference. Therefore, a research on the non-engagement and disengagement issues of the students cannot be conducted over a short period. Repeated observations based on a set of interventions are needed. This helps ensure an accurate impact from these interventions.

Finally, the Hawthorne Effects signify the importance of social and emotional issues on performing the tasks at work. This circumstance indicates that meeting the social and emotional needs and creating a sense of belongingness among the workers are as important as financial incentives and safe working condition. Moreover, for the research, building trust is essential in gaining accurate and reliable impacts from many planned interventions on learning and motivation of the disengaged learners.

Feedback from External Source and Foreign Business Community

Overcoming the major crisis facing a workplace today (i.e., dealing with non-engaged and disengaged learning workers), an intervention needs to integrate empathy and clearly identify the pain points experienced

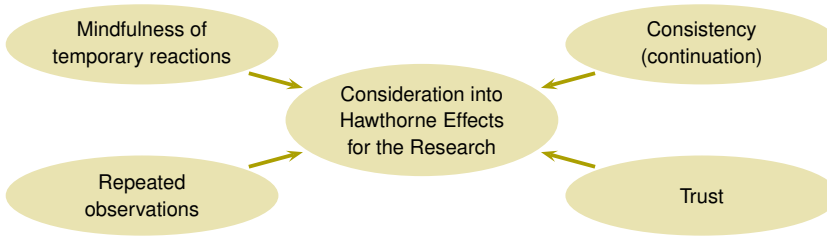

FIGURE 5.2 Key Consideration for the Research

by these learners. One of the reasons for examining the use of external feedback is a challenge to bring about concrete changes internally. These changes relate to the mindset, attitude, and personal outlook in life. This is because the perception that an attempt to engage the learners can be treated as a project or a discrete event. Bad experiences from these disengaged learners view an intervention as an event-based activity without continuity. Thus, an outside-in perspective is preferred which has led to an integration of external feedback.

This integration of external feedback is based on the following reasons. Firstly, feedback can be considered one of the main components for workplace engagement. Feedback is part of two-way communication which is needed for workplace learning. Feedback represents the information to help the workers understand what have gone well and what needs to be improved. As previously discussed, effective feedback from an external entity allows the workers to become more open and more receptive to the ideas generated within and outside a workplace. This learning is essential for becoming a productive workplace.

Focusing on external feedback provides many advantages. Note that, in the research, a school represents a workplace due to the previous discussion on their similarities. In addition, it is possible to establish a context of a student as a learning worker or a learner. This context includes a teacher as a manager or a supervisor. This setting is not picture-perfect but can be applicable in a workplace. External feedback helps reduce the internal pressure to change at school. Secondly, external feedback can bring out some innovative ideas and exciting knowledge which is drastically different from routine or day-to-day information for classroom activities. Lastly, it is likely that both students/learners and teachers will become more receptive to a stakeholder outside a school.

External feedback often incites meaningful discussions on what to do next in a workplace. Allowing new and creative ideas into an organization is a symbol of an open system. Industrial engineers have advocated this open-system concept for many decades as a mechanism for continuous improvement. Soliciting customer feedback to help improve an organization's product and service is a good case in point. Another recent illustration is when an organization needs to continuously improve its products and service through the emerging concept of minimum viable product (also known as MVP). This concept emphasizes the use of external information and feedback on new product development. It allows an organization to design and develop its product and service at the minimum requirement of the users. Gradually, an organization can learn from a customer after a purchase. The information from an external source or entity (i.e., users and organizations) helps further improve existing product or service.

There are several benefits when attempting to gather external feedback. External feedback can accelerate a learning curve of learners during their study. Ideas and suggestions from an external source can stimulate learning more effectively due to higher feeling of enthusiasm. Within the context of a workplace, when learning effectively takes place, it is expected that, after an initial period in which the amount invested in a worker is greater than his or her financial and non-financial returns, these returns should eventually be greater than the investment. The learning curve provides a premise that the more a worker performs the tasks, the better he or she will perform. If the performance does not improve, it indicates a lack of learning and reflects a scenario in which the talents are not fully utilized. Having a visit by a customer or a supplier often bring some degree of excitement which can encourage more learning among the workers.

Receiving external feedback from those who are neither part of nor embedded in an organization can bring different objective information to help inspire fruitful conversations and meaningful ideas. During the preparation of the following comprehensive research on the roles of external feedback on sustaining learning and motivation among the disengaged learners, it is important to clearly outline the primary assumptions and basic characteristics of the learners and learning environment. They can be descried as follows. Research assumption:

- Despite being underprivileged in a society, family poverty, lack

of affordability for further education, perceived lack of economic opportunity and career, lack of positive experiences during study, and feeling disengaged with school activities; the students understand the value (e.g., usefulness) and are eager to receive feedback. Moreover, the students intend to learn so that they can improve their future career after basic education. It is important to mention that this notion greatly differ from a general perception of underperformed students. When a student does not perform well, the perception is that he or she is lazy and has no desire to work hard. Bad behavior and poor attitude are part of poor academic performance.

- When discussing the terms non-engaged and disengaged learners, the difference in behaviors and attitude is presumed to be negligible. As previously discussed, non-engaged learners focus on receiving information and perform accordingly with some inconsistent efforts and determination. Disengaged learners often refuse to listen so information is not received. Thus, disengaged learners are often compelled to perform unwillingly. The learners in these two categories tend to perform poorly without closed supervision. As a result, the term disengaged learners includes the learners viewed as non-engaged throughout the research.
- Like the workers in an organization who are expected to perform and learn about the tasks, the students also need to study the subjects (e.g., listening, conducting an experiment, presenting a work, collaborating with other students in an assignment, completing homework assignments, etc.) and to learn how to study more productively. Studying is part of working while the tasks on learning deal with improvement. For instance, learning how to study more productively means better time management, better observation, and sharing ideas and thoughts during and after a lesson.
- Directly interfering with regular classroom teaching and learning is not allowed. The teachers are required to continue their lessons in accordance with the national curriculum. Respect the jurisdiction and responsibility of the teachers is important since learning and motivation of the disengaged learners need to have the support from the teachers.

General description and scope of the research:

- The research focuses on science education with the emphasis on science experiment. In addition, some flexibility into lesson plan development for these science experiments can be arranged.
- Most students from Ministry of Interior schools cannot afford to further or advance their education beyond the basic education. This affordability contradicts with the presumption when designing the national curriculum on science education. Typically, the students, who learn science education, plan to become a scientist, an engineer, and/or a medical doctor. Thus, science knowledge, contents, and subjects are the priority.
- Most students who attend the school under the jurisdiction of Ministry of Interior plan to work after the completion of their basic education. Therefore, their priority and focus are on employability which primarily includes soft and life skills.
- Assessment and evaluation through vigorous examinations and challenging assignments are expected to be the major source of students' motivation. However, for the learners who cannot afford to attend higher education institutes, the use of more difficult examinations and assignments as well as longer classroom time contribute to the acceleration of school disengagement. Lack of connected feeling with their daily learning is prevalent.
- When the learners feel disengaged from school, poor behavior such as tardiness, absenteeism, and bullying and harassment is expected. This behavior is further driven by a lack of hope and belongingness (as many studying subjects are not perceived to be helpful for their career after school).
- Unsafe learning environment is another serious issue. This includes physical, verbal, and cyber bullying. Often, workplace (or school) disengagement and unsafe learning environment are interrelated.
- Persistently high turnovers among the teachers in the Ministry-of-Interior schools have deepened school disengagement among the students. Any meaningful observation on students' progress is disrupted. This also contributes a lack of significant feedback between a teacher and a student.

To design a research that examine the impacts from constructive

feedback on sustaining learning and motivation of the learners, the importance of Foreign Business Community (FBC) is recognized, FBC has been instrumental in the country's economic and social development. FBC is a valuable stakeholder of the country because of continuous business investment and expansion. One of the most important concerns for the international firms in Thailand is a lack of human capital which affect their business performance. Preparing the disengaged learners to become human capital is viewed as a challenge but represents an opportunity among FBC firms to share business experiences and practices. It is important to point out that productive workforce is a critical success factor for all businesses, domestic and international firms.

FBC previously conducted a comprehensive survey from its members. There were two important skills (expertise) identified for future employability. The first one was about having fundamental soft skills. These skills would enable the learners to work productively in a team environment through shared responsibility and cultural difference. Critical thinking and communication were singled out by FBC members. Social and emotional skills were repeatedly mentioned. The second one dealt with having work integrity and ethics. From the business standpoint, work integrity and ethics reflected the expected and desirable professional behavior which would be influenced by personal attitudes and values. Lack of work ethics could negatively damage the country's long-term labor market. Understanding financial literacy (reflecting responsible spending was part of the second skill set.

Involving FBC as an entity to provide external feedback is crucial for the research. FBC is interested in future qualified workforce. Therefore, the commitment and continuity of its involvement with the research on workplace/school engagement is not an issue. The continuity is important to help overcome the previously-mentioned Hawthorne Effects and also the learners' poor experiences. Finally, an ongoing policy by the Ministry-of-Interior schools encourages more receptive to the participation from the parents, the communities, and other external stakeholders. Given this circumstance, meaningful and beneficial partnership between FBC and the schools is achievable.

Open-Loop Learning Concept

Empathy and the need to identify the pain points among the disengaged learners at school are essential. A series of interviews and obser-

vations with these learners were made. Their pain points represent a specific problem and adversity that the disengaged learners had been facing. This specific problem or adversity negatively affected learning and motivation. For this research, being a disengaged learner means that he or she neither recognizes nor appreciates the benefits from attending and participating in the lesson discussion. He or she is faced with strict control and can be reprimanded for non-compliance. Grade or performance rating are used for communication.

Specific pain points, based on the interviews and observation at the beginning of the research, can be summarized as follow. Note that many pain points are compatible to what the workers have experienced in their workplace.

- Standardized curriculum with strict guideline and instruction on studying, including experimentation. The subjects, which would prepare the learners for university study and education, are not positively viewed due to their lack of relevance and usefulness. Thus, the learners feel disengaged and are not committed to learn and study science subjects.
- Focus on academic performance (e.g., Grade Point Average), homework, examination, and long classroom hours to help motivate the learners. Since the learners need to go to work after school, many extra or after-school activities are negatively received.
- Lack of laboratory readiness. Actual experimental lessons are not often conducted due to a lack of readiness in a science laboratory. Therefore, the learners have no hands-on experience and eventually become disengaged due to the primary focus on listening to and following the instructions from a teacher.
- Unsafe (and lack of creative) learning environment. School disengagement has contributed to this pain point. Poor behavior (e.g., bullying and harassment) is expected due to lack of academic interests and motivation (stemming from uncertainty in learners' future career).
- Lack of two-way communication. Academic performance report is not sufficient to identify how a learner can improve. Most learners prefer to receive more descriptive feedback instead of an evaluation report with a numerical score and grade which would reveal anything useful for their future.

It is important to note that the circumstance relating to school disengagement is like an ongoing difficulty in a workplace. Rigid control, standardization of work, expectation of compliance when performing the tasks, unsafe (and lack of creative) working environment, and lack of communication are some of the most common pain points that have consistently contributed to workplace disengagement, and eventually to a lack of learning and development of the workers.

To design and incorporate external feedback into the research, the concept of open-loop learning by Argyris (1991). is applied. In this concept, there are two important loops that are essential for a learner. These two loops are referred to as a single and a double loop. Within the context of a workplace and school, in single and double loop learning, a learner is given feedback through many methods. They include performance evaluation reports, memos, and notices with a possibly face-to-face meeting. Unfortunately, providing feedback in a workplace and school tends to be one-way communication. This is based on a failure to recognize the learners' talents. Consequently, this often leads to negative feeling, cynicism, and de-motivation which results in reduced emotional attachment and sense of belongingness in a workplace and school.

Not only the open-loop learning is helpful in the design of feedback (e.g., the purpose and content of feedback) but the concept also indicates the importance of understanding (through empathy) a person who receives this feedback. A learner (i.e., a student and a worker) alike is often cautious to change. Feedback should encourage a recognition to change. The first or single-loop learning underlines the importance of information which points to the work performed by a learner. The feedback for the single-loop learning should describe a gap between expected and reached outcomes. This feedback can include current work situation, expectation, etc.

This single-loop learning allows a learner to observe himself or herself with respect to work. This observation should focus on a problem, work habit and behavior, result and expectation, etc. The single-loop learning helps a learner adapt and adjust his or her decision/actions according to the feedback. Simply put, a single-loop learning contributes to gradual improvement by providing the feedback that helps a learner answer whether he or she is doing things right.

The double- loop learning requires an understanding of the causes of decisions/actions made by a learner. Gaining more insights into a dis-

FIGURE 5.3 Single-Loop Learning (in response to doing things right)

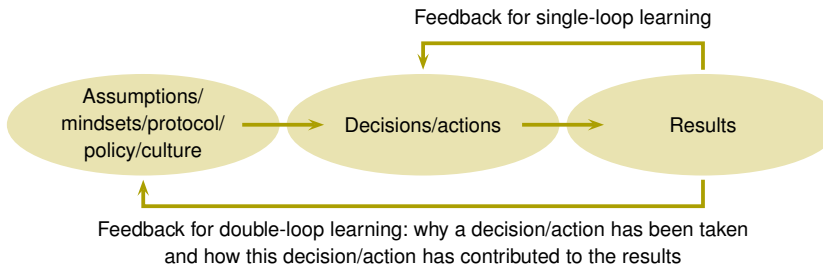

FIGURE 5.4 Double-Loop Learning (in response to doing the right things)

engaged learner's mindset is essential. The underlying causes could be attributed to personal belief and mindset, personal paradigm, personal motives, and experiences, organizational policies and culture, etc. The feedback needs to reflect past decisions/actions (unlike the single-loop learning in which feedback can focus on the more recent or immediate results from a decision/action). The reflection needs to include learners' background, work protocols, and the reasons on what has gone well and what should have been improved. The double-loop learning helps deepen the premise behind a learner's discretion and decisions/actions. A double-loop learning contributes to drastic improvement as individual learners are aware whether he or she is doing the right things.

It is important to bring up about the disengaged learners' pain points based on the interviews and observations. For the students with underprivileged background, their mindset has been mostly negative about learning, school, and future career. They believed that, regardless of how hard they try at school, their efforts would not lead better livelihood at some point. In other words, due to their family background and opportunity, any achievement at school would not translate into a better career. They deemed that their lives would not have been different based on their performance at school. This circumstance weighted into

their mindset—why I needed to work hard or why I needed to learn. Often, they mention that since I was born as a poor person, I would not have any opportunity to succeed.

For FBC, its roles as an external-feedback provider needs to become aware of the type and content of feedback that should be delivered. From the emotional perspective of a learner, constructive feedback should be a priority. Bringing a change in both a learner's mindset and the way his or her decisions/actions are made needs to be cautious and deliberate. Many learners from an underprivileged background have less faith and trust in any improvement interventions at school (like many workers feel about their workplaces). Constructive feedback is both instructional and motivational. It provides the informative suggestions and ideas that should potentially lead a positive outcome, visible improvement, better attitude and mindset, and more desirable behavior. Constructive feedback offers encouragement, emotional support, corrective measures, and direction to a receiver. Constructive feedback can be positive (e.g., conveying positive information to a learner on fulfilling expectation), negative (e.g., informing a learner on existing gap when performing a task and possible future improvements), or neutral (e.g., visit and observation). As a successful business executive, FBC members have valuable skills and experiences to provide constructive feedback. They recognize that feedback is not criticism and is not about evaluation. They are aware that feedback should not be viewed as a list of errors, mistakes, or mishaps made by a learner. Even though constructive feedback can be negative and neutral, its delivery needs to be viewed by a receiver (or a learner) as constructive.

It is important to ensure that constructive feedback is specific and needs to be delivered in a timely manner. Constructive feedback cannot be vague and judgmental. Constructive feedback needs to have observable (and objective) information. It should indicate a specific course of action for improvement. The second issue is how this constructive feedback is delivered. In other words, it is how a receiver perceives constructive feedback. Timely delivery helps reinforce the positive perception of constructive feedback. Constructive feedback should not incite upset and defensive feelings. Effective constructive feedback should inspire a sense of confidence and belongingness (instead of a sense of failure).

Conclusion

To tackle workplace disengagement, an extensive and long-term research needs to be conducted. The importance of feedback and communication is recognized as an essential component for an engaged worker. To learn and understand an effective transformation from a disengaged to an engaged worker requires a study that likely spans more than a few years. Typically, there are strong similarities between workplace and school. These similarities include performance evaluation and appraisal (through performance rating), need to learn simultaneously while performing the tasks (or studying the subjects), learner characteristics (from passive learner and engaged worker to blocked learner and disengaged worker), impacts from safe and creative learning environment, and need for constant two-way communication. The negative impacts from the disengagement are also comparable such as dropout and turnover, absenteeism and tardiness, and harassment and bullying.

For the research, the focus is on how to sustain and support learning for the disengaged leaners. More insights into the effects from feedback on learning and motivation of a learner represent one of the research's aims. Note that the term learner is used to indicate both a student and a worker. For the schools in Thailand, there is a widening learning gap which has contributed to the feeling of disengagement among the schools under the supervision of Ministry of Interior. A growing number of disengaged learners will become problematic to the country's economic and social development. This is due to the importance of human capital for being an attractive destination for investment and long-term business competitiveness. To conduct a quality research on human behavior, the Hawthorne Effects are considered. The reason is that that a person is expected to modify his or her behavior in accordance with an experiment's expectation. The reason is that he or she receives attention and is closely observed.

One important entity, FBC, participates in the research as an external-feedback provider. The research applies constructive feedback as a mechanism to evaluate the sustainability of learning and motivation at school. In this context, constructive feedback represents a source of encouragement and motivation for the disengaged learners. The design of constructive feedback incorporates the open-loop learning which consists of a single and a double-loop. A single-loop learning focuses on the relationship between a decision/action and a result (i.e., is a learner do-

ing the things right?). A second-loop learning thoroughly examine embedded assumption, mindset, and experience which have contributed the way this decision/action is made by a learner (i.e., is a learner doing the right things?).

References and Further Reading

Argyris, C. (1991). Teaching smart people how to learn. *Harvard Business Review, 69*(3), 99–109.

Education Endowment Foundation. (N.d.). *Feedback.* https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/feedback/

OECD. (2016). *Education in Thailand: An OECD-UNESCO perspective, reviews of national policies for education.*

Phusavat, K., Delahunty, D., Kess, P., & Kropsu-Vehkapera, H. (2017). Professional/peer-learning community: Impacts on workplace training at Bangkok Metropolitan Administration (BMA) schools. *Journal of Workplace Learning, 29*(6), 406–427.

Phusavat, K., Setiono, K., Skurzynska-Sikora, U., Hidayanto, A., & Delahunty, D. (2016). Adapting social enterprise to improve education quality: Key findings at one Bangkok Metropolitan Administration school. *International Journal of Management in Education, 10*(1), 96–110.

Ryba, K. (2021). *What is employee engagement? What, why, and how to improve it.* Quantum Workplace. https://www.quantumworkplace.com/future-of-work/what-is-employee-engagement-definition

Stieg, C. (2020). *"Psychological safety" at work improves productivity–here are 4 ways to get it, according to a Harvard expert.* Make It. https://www.cnbc.com/2020/10/05/why-psychological-safety-is-important-at-work-and-how-to-create-it.html

Violato, C., Lockyer, J., & Fidler, H. (2008). Changes in performance: A 5-year longitudinal study of participants in a multi-source feedback programme. *Medical Education, 42*(10), 1007–1013.

Vollmeyer, R., & Rheinberg, F. (2005). A surprising effect of feedback on learning. *Learning and Instruction, 15*(6), 589–602.

Washor, E., Mojkowski, C., & Phi Delta Kappan. (2014). *Student disengagement: It's deeper than you think.* EducationWeek. *https://www.edweek.org/teaching-learning/opinion-student-disengagement-its-deeper-than-you-think/2014/04*

Chapter Six

Disengaged Learners and Peer-Learning Community

Highlights and Key Points

- The first phase of the study took place during the academic year 2015–2016. It aimed to evaluate a possibility to apply constructive feedback to sustain and support improvement interventions made into classroom and laboratory's work.
- Constructive feedback was chosen because of its focus on behavior with strong empathy towards the learners. Initial constructive feedback included school visits and in-kind donations.
- Like a workplace, based on the survey conducted on 500,000 students in grades five through 12 from more than 1,700 public schools in 37 states within the US, the results shows that 24% of fifth graders were disengaged. The disengagement feeing grew to 39% for middle school students. Eventually, it jumped to 56% for students in high school. Note that the 56% level excludes all those who had already dropped out (Busteed, 2013).
- The key approach to improve classroom and laboratory work was the use of Peer- learning Community. This approach would strengthen communication and interaction while addressing unsafe learning environment (i.e., physical and psychological safety). It reflects collaborative learning which is highlighted by the 70–20–10 framework.
- Fundamentally, key improvement interventions to studying activities included: (1) emphasis on outdoor experiments, (2) focus on a science problem that the disengaged learners can relate to, and (3) use of product instead of report to reflect an acceptable level of understanding.
- Initial objective was to assess the willingness to try and implement these improvement interventions. This willingness and the ability to come up with new ideas (e.g., more products from science experiments) would send a good signal for learning. The preliminary reactions to constructive feedback was another objective.

Learner Engagement and Importance of Attention

For the research, FBC began to work with two BMA schools in 2015 (for the academic year 2015–2016). It represented an initial study to evaluate the possibility of using constructive feedback to support improvement interventions made into the academic work in classroom and laboratory. This feedback aimed to tackle school disengagement. Typically, the schools under Ministry of Interior (unlike those from Ministry of Education) have been part of the opportunity-extension policy for the past 40 years. These schools were created and expanded in the1980s during the country's economic boom period. Many urban areas such as Bangkok experienced large migrants of the workers from a countryside who were looking for employment. Their jobs were neither stable nor secure, so they did not have a permanent home. Children accompanied their parents had to frequently move. This negatively affected quality of learning.

Typically, the opportunity-extension schools are attended by the students who mostly are from the underprivileged background. The students are from different provinces throughout the country and often have not had the stability in their families (e.g., single-parented families). These students are faced with poverty and lack of economic opportunity and hope. This is the reason that the Minister-of-Interior schools provide two free meals per day during a school year (i.e., breakfast and lunch) along with free school uniforms and other accessories for studying such as textbooks, notepads, etc.

Initial focus from FBC was to gauge the reactions of the disengaged learners to constructive feedback. Improvement interventions to classroom and laboratory work were made while constructive feedback aimed to sustain and support these interventions. The positive reaction to constructive feedback would point to more effective learning and higher motivation. Specifically, during the initial collaboration with these two schools, there were many challenges. These include teen pregnancy, dropouts, physical and verbal bullying, and fighting across schools. Specific pain points shared by the learners can be summarized as follows.

- *Poor sense of autonomy and ownership* (having experienced rigidly-controlled environment throughout their academic years) as they need to be told what to do and are expected to follow the instructions strictly all the time.

- *Lack of meaningful friendship at school* as they need to work after school for extra money which contribute to a lack of interactions with school peers/colleagues.
- *Anxious feeling and lack of belongingness* due to little positive experiences when interacting with the teachers: being fearful to make a mistake and receiving negative comments since the focus is on what we did wrong.
- *Perceived unreasonable schoolwork:* long classroom hours, difficult and irrelevant assignments, and examinations which would add nothing to their employability.
- *Lack of self-belief and confidence:* low expectation among themselves due to their negative outlook after school.
- *Lack of relevance:* as the subjects and contents that will not benefit their future career.
- *Lack of continuous communication* as the grade and academic performance have been the focal point of feedback.
- *Lack of skills* (e.g., problem-solving and analytical skills) to understand more advanced subjects and learning materials, due to the curriculum contents are designed for the students who plan to continue their study at a university.
- *Perceived unsafe learning environment,* including bullying and harassment as well as perceived lack of psychological safety which has prevented active classroom participation.

Positive reaction the disengaged learners would represent the initial hopeful sign for the research. The disengaged learners often refuse to learn so enticing their attention would be critical. In general, a disengaged learner's attention could potentially be lured with surprise. The surprise came from real-world examples (and not from textbooks). This is the FBC strength as successful business operators. It is important for the disengaged learners to recognize that what they studied has practical benefits and would help them in real life. Also, what they could learn in parallel with when they studied would improve their future employability. Informing these disengaged learners of the practicality based on real-life stories and experience was expected to grab their attention and could contribute to the possible desire to study and learn more.

Initiating an attempt to attract the attention of the disengaged learners began with an integration of a peer-learning community (PLC). The primary reason for using PLC stems from the 70–20–10 framework and

FIGURE 6.1 Need for Outdoor Experimental Learning (due to Facility Readiness)

the need to change how the disengaged learners would study and learn about the subject matters. PLC corresponded to the 70 and 20 elements of learning. Feedback exchanged among the peers was deemed to be as important as external feedback from FBC. The idea was to first inject joy of learning and to allow the disengaged learners to have common activities after school. At the same time, these activities aimed to address a lack of safe learning environment. PLC was to be applied to help strengthen communication among the disengaged learners. After consulting with the teachers and school administrators, the scope and working guidelines for the research were agreed as follows.

- FBC would try to create positive impacts on the disengaged learners at the classroom level. The primary roles were to be complimentary and supportive to teachers' improvement-intervention efforts. FBC would play a role of a feedback provider to help sustain and support these interventions.
- FBC would work with the teachers on science education. It was later decided that science skills would be the priority (instead of the contents and the subjects which were designed as a preparation of higher education). Problem analysis, parameter identification, impacts and discussion, teamwork, and observation are part of science skills.
- BC together with the teachers would focus on the hands-on practical approach ("something" students could relate to). Outdoor experiments learning that dealt with soil and water was to be a starting point. The emphasis was on studying and learning by doing and by working together. For BMA schools, an actual science experiment is not often conducted due to a lack of laboratory readiness.

FIGURE 6.2 Outdoor Science Experiments: Water Pollution

- Due to business knowledge, instead of conducting a science experiment and writing a report, FBC would encourage product development that would be used to provide a proof of understanding of science knowledge.
- Product development based on solving environmental problems facing both schools would further strengthen the sense of belongingness to school and community. Product development and science experiment were to be blended.
- Product development would allow PLC to take place. This is due to a possibility to work together after school for planning and production.

The initial work on polluted water brought a lot of attention from the disengaged learners in many ways. Firstly, the water topic relates to Physics, Chemistry, and Biology. Instead of separately studying about these three subjects, the disengaged learners could easily relate to science as water pollution was their everyday problem. Furthermore, the teachers were able to blend other subjects into the lessons such as conservation, geography and map, and public responsibility. To verify water quality (after treatment), FBC together with the teachers urged the disengaged learners to learn from their study and became more creative which resulted in its usage to grow marigold flowers. Due to the local demands for flowers, PLC was initiated to help exchange different ways for water treatment. Income from the sale of marigold flowers was a motivating factor for PLC and was also a catalyst in obtaining the attention from the disengaged learners.

Peer-Learning Community

The Peer-Learning Community or PLC concept is a model that emphasizes the need to connect the learners through the willingness and mo-

FIGURE 6.3 Outdoor Experiment on Polluted Water: Growing Marigold Flowers

FIGURE 6.4 Use of the 70–20–10 Framework for Studying and Learning of the Experiments

tivation to study the contents, to learn about how to better understand these contents, share information (e.g., what has been learned), and collaborate during work. The PLC concept was used as an initial stage in evaluating the possibility of applying constructive feedback. The attempt to apply PLC was based on the 70–20–10 framework. Constructive feedback was then applied to help sustain and support the PLC. Since there was no trust in the continuation of the research (as anything that they had previously experienced was short and temporary such as one visit, one meeting, and one project), the study needed to be conducted in a deliberate manner. FBC would observe how PLC was carried out and what type of products to be derived from science experiments.

Listening skill became critical due to the hesitation from the disengaged learners who were skeptical about the involvement by FBC. It is important to point out that both PLC and constructive feedback could be repeatedly applied (to help avoid the Hawthorne Effects). PLC was also expected to help these disengaged learners overcome the feeling of unsafe learning environment. Having worked on a common objective

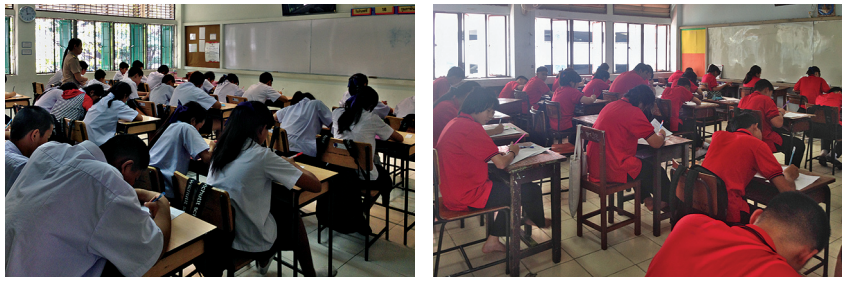

FIGURE 6.5 Current Learning Environment (Psychological Barrier for PLC)

FIGURE 6.6 PLC for Outdoor Science Experiment

with the opportunity to interact and share ideas, bullying and harassment would be expected to decline. At the same time, being fearful to speak up or to participate in a lesson would become less. Communication and conversations with the disengaged learners by FBC were critical.

In this research, FBC perceived its role as a facilitator to help bring meaningful conversations and communication from the outside. In addition, FBC planned to prepare constructive feedback which would maintain and support the commitment from the disengaged learners to improvement interventions initiated by the teachers. Note that PLC has no specific format and structure. Nevertheless, the success of PLC depends on the willingness to share ideas, problems, and solutions; and to work and learn together from its community members.

For PLC to become acceptable and effective, FBC was aware of the results from science experiments had to be visible, tangible, and beneficial. These results needed to show a progress towards an improvement of science study (including science skills) and learning (how to improve science experiments, including products). One of the most critical success factors during the research's initial stage was the importance of

FIGURE 6.7 Demonstration of Learning by Practicing and Teaching with PLC for Mapping on Polluted Waterway (Clarity of Expected Results with Practical Use of Mobile Phone)

working with the teachers. This teacher partnership was crucial since the teachers also needed to provide an opportunity for the disengaged learners to experience with the PLC.

Design of Constructive Feedback

To sustain the use of PLC, FBC performed many tasks to ensure that constructive feedback was visible and viable to the disengaged learners. This constructive feedback was designed in a way that it could be delivered to these learners directly and indirectly (including the use of symbolic and gesture means). FBC aimed to reinforce positive behaviors while gently pointing to negative behavior which could later be modified. Initially, constructive feedback focused more on positive behavior and activities during science experiments. Visibility was the essential part of FBC's initial constructive feedback. This feedback can be described as follows.

- *Frequent visits to school for repeated observations of PLC activities.* These visits were arranged so that different FBC members had an opportunity to witness the learners' progress and to interact with them through constructive dialogues and conversations. Informal interactions were emphasized; therefore, these school visits would take place after the studying hours. Based on observations and informal discussions, FBC was able to identify possible areas of improvements which would be shared with both the teachers and the disengaged learners. This would later result in future planning of the workshops.
- *In-kind donation to support outdoor science experiments.* These donated instruments and equipment were to show implicit

FIGURE 6.8 Constructive Feedback through In-Kind Donation

feedback which indicated that the disengaged learners were doing the things right (when performing the tasks). There were two donations: oxygen measuring and soil testing instruments. Instead of using the knowledge from Physics, and Chemistry, and Biology for polluted water treatment and testing water with the flowers, having the instruments helped reinforce many positive activities undertaken by the disengaged learners such as addressing a pollution problem facing their community and school, applying the knowledge in real-world setting, and working together as a team.

It is also important to point out, during the design and delivery of constructive feedback, working collaboratively with the teachers was essential since they were directly interacting with the disengaged learners. Like a workplace, successful collaborating with the workers requires meaningful support from their supervisor or managers. Important information from direct interactions (by the teachers) and observations (by FBC delegates) such as reactions, behavior and attitude, conversations, and attention were shared.

Delivery of Constructive Feedback and Impacts on the Disengaged Learners

Constructive feedback can be valuable for learning and motivation when it is received, understood, and acted on by a receiver. How the disengaged learners perceived, analyzed, and reacted would reflect the effectiveness of constructive feedback. Constructive feedback indicated the support and appreciation of the efforts and results shown by the disengaged learners. These efforts included discussing what they had studies, sharing what they had learned from how to improve their experimental work, and working together for producing the products

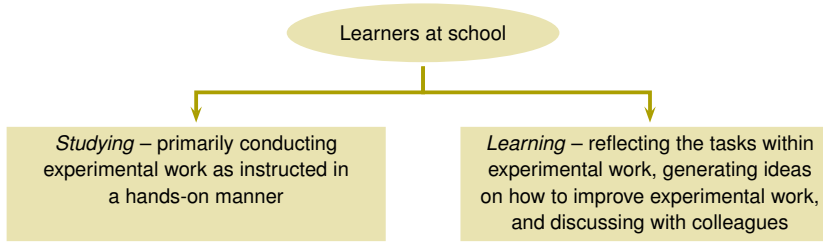

FIGURE 6.9 Roles of Learners at School (Compatible to Learning Workers at a Workplace)

from their science experiments. In this research, through the interactions, conversations and observations) that the disengaged learners would show at least some interest and would provide positive reaction and attention to constructive feedback. It was important for the disengaged learners to maintain their commitment and positive attitude towards the ongoing improvement efforts initiated the teachers.

For the research setting, the disengaged learners had two primary tasks, i.e., studying and learning. Studying implied reading, reviewing, and conducting experimental work in a hands-on manner as instructed. Learning indicated the reflection from studying, the idea generation on how to improve experimental work, how to improve and extend products from this experimental work, and the discussion of the challenges faced during experimental work. This setting demonstrates the similarities between the learners at school and the learning workers in a workplace.

The interview was conducted after one semester (in late 2016) to gather the feeling, reaction, and effects from 30 disengaged learners. Some of their specific expressions can be shown as follows.

- They realized that studying did not have to take place in a classroom and a laboratory. Dealing with a real problem (e.g., polluted waterway) provided an opportunity to reflect from experimental work. Working on this real problem, which they had to face daily with their families and communities, compelled them to inevitably pay more attention.
- Doing away with an experiment from a laboratory which was not ready was helpful. It was something that signaled a concrete change in regard to how they would study and how they would learn about experimental work.

- PLC helped strengthen friendship based several outdoor tasks, especially survey and mapping activities. An opportunity to share the findings with the peers was enjoyable.
- Meaningful and regular visits by FBC were new but brought some positive feeling to what they had conducted with their experiments. Being observed and having an opportunity to realize that someone really cared enough to come to their schools and experimental locations were unexpected. They noticed the consistency of the FBC visits.
- Receiving attention and engaging with FBC delegates were the highlights of their school years. Interacting with the outsiders who enjoyed business successes was rare.
- Realizing that there were many alternatives to show the knowledge and understanding of science (especially through products) was very helpful and beneficial. An opportunity to think outside a box was rare in a rigidly-controlled environment. This change allowed PLC to be sustained continuously. PLC provided a chance to reflect the lessons and an opportunity to generate new ideas to improve or extend these products.

More products were developed from the experiments relating to water and soil such as fertilizer, soap, and detergent. These products had commercial potential. Selling these products for income helped stimulate more sharing of new ideas on product improvement or extension. The commercial benefit from the products would allow FBC to play a more active role as a facilitator for learning and a provider of constructive feedback later. This is due to limited business knowledge and experiences by the teachers. Note that the environmental issues relating to water and soil was part of life science which was embedded in the national curriculum.

Lessons from Initial Work with the Disengaged Learners

Based on the first year of working with the two BMA schools, the initial finding was not to prematurely give up on the disengaged learners. Past experiences indicated the following disengaged learners' routines: attending a lesson, listening to a teacher, working after school, completing homework, feeling uncertain about the future, and dealing with unfriendly learning environment. Then, a teacher evaluated and determined academic performance through a numerical score. This cycle

FIGURE 6.10 Examples of Products from Science Experiments in 2016

FIGURE 6.11 School Routine and Feeling of Isolation and Later Disengagement

has been difficult to unlock and utilize the talents. Furthermore, due to the underprivileged status, the students were automatically presumed to have poor attitude and behavior during the lessons.

Like in a workplace, a poor performer can be too easily dismissed without any concrete attempt to engage. Instead of improving the quality of feedback and the effectiveness of its delivery, more evaluation and control are implemented. This circumstance has led to the underutilization of the talents, skills, and knowledge. It undermines motivation and hinders learning capability of a worker. This old paradigm that a worker mainly works while more skills and knowledge can be planed, trained, and transferred needs to be revised to ensure future productive workplace.

Often, a failure to recognize that part of work today is also learning has further fueled the feeling of disengagement. For the disengaged learners, studying and learning are part of their work at school. In this study, constructive feedback was initially utilized to help sustain improvement interventions made during science study and experiments. The initial reaction appears to be positive, and the disengaged learners were excited about the visits and interactions with FBC delegates. Con-

structive feedback seems to entice and attract the attention from the disengaged learners when it was delivered. It was believed that, without the attention, the interest in and willingness to learn are expected to be diminished. This finding is supported by past research and findings which clearly demonstrate that, regardless of the type of a learner (i.e., active/engaged, passive/non-engaged, and blocked/disengaged), he or she usually seeks and appreciates helpful and honest feedback.

Addressing school disengagement requires patient and understanding that a change in the mindset and behavior of one person cannot be made with merely one visit, one project, or one activity. As earlier described, the Hawthorne Effects point to the expected shift in the attitude in a gradual way. For this study, enticing the learners' attention to activities and constructive feedback was viewed as an initial positive outcome. Instead of conducting a pre- and post-test to the disengaged learners, observing their decisions/actions was preferred. The repeated observations were part of building trust with the disengaged learners as it was recognized that asking these learners to take a pre- and post-test would have been a major mistake.

After the first year, it was certain to conclude that initial constructive feedback had enticed some attention from the disengaged students. For studying, the disengaged students appeared enjoy outdoor science experiments and enthusiastically followed the instructions. For learning, the disengaged learners actively suggested and tested many ideas to improve the quality of water and to use it along with fertilizer to grow fresh produces. These ideas reflected different ways to help improve how to conduct and plan for an experiment. The disengaged learners agreed to collaborate on product improvement so that their income could increase. For instance, they worked on how to improve the production of fertilizer.

It is important to mention that the willingness to learn about the ecological subjects included the thoughts on expanding the scope of an experiment to incorporate plastic bottles. Although it was not part of experimental plan (as the two schools mainly dealt with organic wastes), the suggestion on plastic waste showed an increased level of motivation. With the consistent visits and interactions with FBC delegates, the disengaged learners' confidence and outlook were higher and more positive respectfully.

Safe learning environment was deemed to be an important foundation for an attempt to reengage with the learners. Feeling both physical

FIGURE 6.12 Results When the Disengaged Students Enticed Constructive Feedback

and psychological safe at school was part of the planning and preparation of improvement interventions for classroom and laboratory work. PLC and outdoor experiment allowed the disengaged learners to interact with each other while their groups' product provided an opportunity to spend more time together after school. Sharing ideas and implementing some of these ideas for product improvement and extension helped dismantle personal barrier and feeling of animosity. By reinforcing both studying and learning from the disengaged students through constructive feedback (i.e., FBC's in-kind donations and visits, conversations and interactions), it appeared that the level of exactment and commitment for the above improvement interventions were maintained. Enticing the disengaged learners' attention through their positive reactions showed the usefulness of constructive feedback.

Conclusion

Dealing with the diversity of the learners is a challenge for industrial engineers. The presumption that, in a workplace, all workers are expected to behave (i.e., work and learn) in a similar way is neither practical nor realistic. Learning diversity is part of the engagement (or lack of engagement) in workplace which has contributed to the underuti-

lization of the talents. Whether it is a workplace or school, the disengagement remains a serious problem. Based on the early collaboration with the two BMA schools during the academic year 2015–2016, several improvements were initiated with the focus on science education, especially science experiment.

The improvements aimed to tackle the cause of school disengagement which had been illustrated by poor academic performance, dropout, and bullying and harassment. These initial improvements focused on the use of PLC which supports outdoor experiments. The outdoor experiments helped encourage sharing and collaboration among the disengaged learners. In addition, concentration on environmental problems. use of product development (instead of report), and emphasis on science skills were part of these improvement interventions. Constructive feedback was then applied to help sustain and maintain the commitment of the disengaged learners on these improvement efforts. Constructive feedback from an external source brought some immediate attention and excitement. Constructive feedback was able to entice strong attention and led to positive reactions from the disengaged learners.

The initial findings after applying constructive feedback for one year represented an important milestone to prepare for further activities to evaluate the effectiveness of constructive feedback on learning and motivation of the disengaged learners. Empathy and understanding of past negative experiences were important in the design and delivery of constructive feedback. These learners often perceived themselves to be an experimental subject for an event or a project introduced by others. They were used to with one visit, one project, or one event. Finally, industrial engineers need to recognize the importance of constructive feedback. From the initial work with the two BMA schools, providing constructive feedback supported improvement interventions and helped sustain how the disengaged learners perform their tasks on science lessons, both studying and learning.

Finally, feedback apparently improved two-way communication (as both FBC delegates and the disengaged learners had many opportunities to interact). New ideas to tackle environmental problems (i.e., water and soil pollution) near their schools and homes as well as some creativity in product development and extension highlighted the talents of the disengaged learners. These talents have bee overlooked due to the paradigm on an underperformer.

References and Further Reading

Busteed, B. (2013, 7 January). *The school cliff: Student engagement drops with each school year.* Gallup. https://news.gallup.com/opinion/gallup/170525/school-cliff-student-engagement-drops-school-year.aspx

Delahunty, D., Phusavat, K., Kess, P., Kropsu-Vehkapera, H., & Hidayanto, A. N. (2018). Globalization and education: Case demonstration and lessons learned from Finland's education export. *International Journal of Management in Education, 12*(1), 24–42.

Kongtong, T., Phusavat, K., Pastuszak, Z., Hidayanto, A., & Majava, J. (2020), Human capital development: A construct for underprivileged students. *Human Systems Management, 39*(2), 357–366.

Lieberman, A., & Miller, L. (2008). *Teachers in professional communities: Improving teaching and learning.* Teachers College Press.

Nederveld, A., & Berge, Z. (2015). Flipped learning in the workplace. *Journal of workplace learning, 27*(2), 162–172.

Phusavat, K., Delahunty, D., Kess, P., & Kropsu-Vehkapera, H. (2017). Professional/peer-learning community: Impacts on workplace training at Bangkok Metropolitan Administration (BMA) schools. *Journal of Workplace Learning, 29*(6), 406–427.

Phusavat, K., Hidayanto, A., Kess, P., & Kantola, J. (2019). Integrating design thinking into peer-learning community: Impacts on professional development and learning. *Journal of Workplace Learning, 31*(1), 59–74.

Phusavat, K., & Intha, A. (2021), Demonstration of STEM education for underprivileged students: Impacts from environment and motivation. *Southeast Asian Journal of STEM Education, 2*(1), 112–126.

Chapter Seven

Impacts of Feedback on Disengaged Leaners' Studying and Learning

Highlights and Key Points

- Improving performance of the individuals cannot be achieved and sustained without properly-designed feedback.
- The research has been conducted at the two BMA schools considered to be way behind the national achievement since the 2015–2016 academic year. Students are referred to as the disengaged learners.
- The prevailing belief on the disengaged learners is that they are lazy and irresponsible with poor behavior. They are not capable of studying and learning.
- The framework of constructive feedback from an external source (i.e., FBC) is developed together with the collaboration with the teachers on science education. Constructive feedback aims to maintain and sustain improvement interventions initiated by the teachers on studying and learning.
- The survey involved two categories, constructive and indirect. In the survey, the first term constructive dealt with the contacts between the disengaged learners and their teachers during studying while the second term indirect highlighted the conversations and interactions between the disengaged learners and FBC delegates outside classroom and laboratory for learning.
- Altogether there were 337 participants (i.e., former, and current students) from both schools participated in the survey which took place in early 2020.
- The survey's findings show that the disengaged learners who had attended the revised pedagogy noticed and paid the considerable attention to constructive feedback (more with the teachers and to a certain with FBC delegates).
- Constructive feedback appears to sustain improvement interventions made into classroom and laboratory work, but also seems to encourage more creative ideas from the disengaged learners. These new ideas demonstrated the talents from the disengaged learners

that had been overlooked for years. If properly engaged, they are capable of studying and learning.

Continuation of Constructive Feedback

During the first phase (2015–2016) of working with the teachers, it was revealed that the disengaged learners apparently enticed their attention to constructive feedback. The feedback appeared to help maintain the commitment and motivation of the disengaged learners on in how they studied and learned. Despite past negative experiences at school and mistrust of any attempt by an outsider to join an activity with the teachers (as previous attempts were performed in a temporary manner: one meeting, one visit, and/or one project), the positive responses were visible. This visibility encouraged FBC to plan for a longer collaboration with the two BMA schools.

During the period of 2016–2020, FBC was working closely with the teachers in supporting improvement interventions for studying and learning (for product improvement and extension). All activities, that reflected constructive feedback from the earlier academic 2015–2016, continued while additional initiatives were to be further developed and included. Science experiments relating to water and soil have remained the focal point. These experiments have allowed the disengaged learners to stay with PLC—outdoor experiment with actual implications to their livelihood as well as product development for their extra income.

Together with the teachers, FBC has highlighted the use of products (e.g., new product development) to reflect the understanding of science topics. Product development from science experiments also stress the importance of developing science skills (e.g., problem analysis, parameter identification, impacts and discussion, and observation). Using the products as one of many results from the experiments strengthens studying (through hands-on exercises in accordance with lesson plans) and learning (through the conversations among the peers and with FBC to help improve products from the experiments and to suggest new tasks of the experiments).

FBC has further enhanced constructive feedback (in addition to regular school visits and in-kind donations) by conducting workshops, invitation to display and see products in international and business events, and study visits outside school. For the school visits, FBC attempted to bring several groups which FBC had closely collaborated.

FIGURE 7.1 School Visits with FBC and Its Partners

FIGURE 7.2 Workshop on Product Extension and Improvement

With a combination of new and old faces, these visits aimed to reinforce all the things that had been performed rightly (e.g., working together as a team, showing products to the public, and tacking environmental problems) by the disengaged learners. Because they have been doing things right, many people would like to come and witness their activities and products. Some of these groups include the delegates from international schools and the senior diplomats from foreign embassies, etc.

The workshops were conducted to facilitate product improvement and extension. These workshops became necessary due to limited business experiences by the teachers. Working with the disengaged learners helped identify additional workshop subjects (such as packaging and labelling). Furthermore, FBC workshops included the subjects like cost estimation, pricing, customer relation, marketing, barcode and QR code, and use of online for sale and promotion. It is important to mention that each workshop received active participation from the disengaged learners. In addition, FBC tried to ensure that all materials and instrument were available in any shop such as a supermarket so the disengaged learners could repeat a workshop by themselves.

FIGURE 7.3 Fertilizer Product to Tackle Air Pollution

The following description is to show the impacts from these workshops on product improvement and extension. One of the simple products from science experiments was fertilizer. Air pollution had been an environmental problem facing the disengaged learners and their communities and homes for years. The cause of this air pollution was the need to burn large piles of dry leaves from nearby a school's man-made lake (used as a storage for runoff water). Since science experiments typically involve all four subjects (i.e., Physics, Chemistry, Biology, and Mathematics), the teachers needed to work as a team to ensure that these subjects would be integrated into lesson plans.

Conducting a science experiment when using dry leaves with food waste from school to produce fertilizer was both common-sense and useful. During the workshops, an extension from fertilizer was made to grow contamination-free vegetables (as value-added from the fertilizer) while packaging and labelling were improved to become more attractive and readable by potential customers. Additional suggestions on the experiments, based on the workshops, dealt with the duration of sunshine, a growth rate of a plant based on different types of fertilizer, etc.

Invitation to display and sell the products from science experiment by FBC represented an important step for the disengaged learners. It

FIGURE 7.4 Improvement and Extension of Fertilizer Product

marked the first recognition and vote of confidence of their work by an international entity. FBC along with its partners, associates, and respective embassies routinely extended an invitation for product promotion, display, and sales. Outside recognition was very powerful and meaningful constructive feedback. It helped inject the sense of responsibility and purpose. Ample opportunities were given to show their work which bolstered their confidence. The above demonstrations reflect the first loop in the Open-loop Learning. Constructive feedback, as it is an important lesson for development and delivery, needs to provide information whether the disengaged learners have been doing the things right.

For this first loop, FBC worked closely with the teachers so that the purposes of constructive feedback would be clearly understood by the disengaged learners. To develop constructive feedback, FBC investigated through repeated observations and frequent exchanges with the disengaged learners. It was critical to find out their challenges and difficulties to fulfill the requirements by science experiments. For instance, the issues such as their concerns on current and future financial well-being were incorporated into the development of constructive feedback. As a result, school visits often lead to product purchases. The visits and invitations helped validate the efforts and hard work made by the disengaged learners. The primary outcomes from the visits and invitations were the sales of experiment's products, the motivation for further improvement and extension of these products, and the sense of pride and belongingness.

Providing constructive feedback, which corresponded to the second loop of the Open-loop Learning, involved FBC's sponsors of study visits outside school. This decision was made to further strengthen the commitment and motivation of the disengaged learners on ongoing

FIGURE 7.5 Invitation to Display and Sell Products from Science Experiments

improvement interventions for classroom and laboratory work. For the first trip, it was a visit to a successful social enterprise which had produced fertilizer from water hyacinth and vermicompost. This trip aimed to challenge the prevailing mindset of the disengaged learners about their future. Their mindset had been driven by limited career opportunity and poverty.

The disengaged learners believed that, due to their family background, they would not have a good employment. Due to their education background (i.e., graduating from a less-known school), they would not have a bright future. Given this mindset, these learners had often been doubtful about the future and questioned the need to work hard, behave well, collaborate with their peers, and continue learning. Simply, the attitude was that no matter how hard one worked, he or she would not succeed in life. This is a gloomy perspective that has resonated with the disengaged learners since they started to attend a school. From FBC's viewpoint, highlighting the example of a from-waste-to-product was to be the theme of the planned first visit. Fertilizer was based on unwanted materials but became a product that experienced strong demand throughout a year. To tackle this mindset, the disengaged learners discovered that the social enterprise had earned excellent income from its fertilizer products with the market outreach into many provinces. This scenario illustrated to the disengaged learners that, despite family background and school reputation, they could be successful through hard work on studying and learning and would enjoy a good career and future. They could use the fertilizer as an example that, although it was made from unwanted materials, it could become great value in the end.

By sponsoring many similar study visits, it was hopeful that the constructive feedback would deepen the belief among the disengaged

FIGURE 7.6 Study Visit and the Challenge for the Second Loop in the Open-Loop Learning

learners that they were doing the right things: having hands-on experiences, sharing ideas and experiences, enhancing science skills, and learning how to improve and extend products, and to be content with oneself. It is important to point out that, to incorporate constructive feedback in response to the second loop, more empathy on their pain points is needed. From this lesson, to tackle workplace disengagement, industrial engineers need to identify predominant viewpoints and beliefs of the disengaged workers. For instance, it could be a premise that no matter how hard I try, nobody would appreciate my efforts and work. Feedback should be designed in a way to help a disengaged worker overcome this feeling.

Teacher Collaboration

Collaborating with the teachers was deemed to be critical for gaining insights the effects of constructive feedback on sustaining and support learning by the disengaged learners. FBC roles were primarily to support improvement interventions initiated by the teachers. For instance, to make science experiments more attractive and interesting to the disengaged learners, the visits by FBC were arranged to help share extensive business experiences on product development. Workshops and invitations to display were the results of this collaboration.

It is important to point out external constructive feedback played a very important role not only for the disengaged learners but also for the teachers. School engagement requires the partnership and collaboration with both the teachers and learners. Like a school, workplace engagement also needs to include the workers and the supervisors or managers. Despite the scope of the research which focuses on the disengaged learners, it is important to mention the collaboration between

FIGURE 7.7 Demonstration of Sharing Online Business with Teachers and Their Adaptation of the Activities from the Workshop for Own Teaching

FBC and the teachers. This lesson is critical for industrial engineers who need to recognize the importance of including a supervisor or a manager.

FBC worked closely with the teachers to help strengthen the knowledge of the learners' psychology. FBC shared many practices on customer and employee engagement with the teachers. Positive emotion was important for learning and motivation. For instance, when tackling employees' negative feeling, FBC delegates suggested the use of "yes-and" instead of "yes-but." Furthermore, many ideas and suggestions were suggested by the teachers for workshop preparation. They included an introduction of the disengaged learners to the potential of online sales of their products in many platforms and social medias.

FBC has often recognized the importance of teacher collaboration when delivering constructive feedback to the disengaged learners. Special recognitions to express the appreciation to the participating teachers had been organized such as a visit to the ambassador's residence, and a certificate of appreciation. The success of improvement interventions and the effectiveness of constructive feedback can be attributed to the teachers. Like a school, a plan to use constructive feedback cannot overlook the importance of a supervisor or a manager. They need to understand their roles in working and learning of a worker.

Survey Findings on the Perception

After having collaborated with both BMA schools and the teachers during 2015–2016 as the first phase and 2016–2020 as the second phase, a comprehensive survey was conducted at the end of the academic year 2019–2020. The survey was needed to help determine the impacts from constructive feedback on sustaining and supporting learning and moti-

vation of the disengaged learners. Previously, after the first phase, constructive feedback appeared to show some promising impacts on the disengaged learners. These learners enticed and reacted positively to the initial constructive feedback.

To overcome a problem the Hawthorne Effects (on the reliability of an intervention on human behavior and performance), the second phase was implemented from 2016–2020. The 5-year duration should provide sufficient confidence on and credible evidence to support the impacts of constructive feedback in supporting human learning and performance. The confirmation of the positive effects from constructive feedback is critical when addressing the issues of learning and workplace engagement.

The survey participants included past (already graduated) and current learners. This survey is based on the following premise: whether constructive feedback would noticeably entice and attract the attention of the disengaged learners while trying to study and to learn at the same time. Not only the disengaged learners have had years (based on school's culture) of poor experiences about feedback (which is mainly about academic performance and numerical scores), they are also faced with the negative stereotype from the teachers and other stakeholders such as lack of motivation on learning, lack of learning's ability, being lazy, and having poor behavior during a lesson (e.g., aggressiveness and violence).

Within the framework and context of constructive feedback, the survey has two categories: constructive and indirect. The term constructive in the survey dealt with the positive contact and communication (e.g., listening, attention, etc.) between the disengaged learners and their teachers. The term indirect highlighted the constructive relations (e.g., conversations, interactions, etc.) between the disengaged learners and FBC members through school visits, workshops, donation ceremonies, and invitations to display and sell the products.

For the first category, the survey items reflect supportive comments and tips that would contribute to a desirable outcome (e.g., behavior towards studying and learning). In this category, the focus was on how the teachers communicated with the disengaged learners after these teachers had been familiarized with empathy and psychology (by FBC delegates). There were four items to be surveyed in this feedback category. For the second category, the survey items focused on the indirect interactions between the disengaged learners and FBC delegates. The

reason for referring the interaction as indirect is based on the clarity that FBC did not interfere with the lesson plans. There is a total of nine items in the survey for the indirect category.

Altogether there were 337 participants (i.e., former, and current students) from both schools in the survey which took place in early 2020. Out of 337 participants, 163 persons had participated in the revised practice/pedagogy (with constructive feedback led by FBC) while the remaining 174 persons attended the traditional practice/pedagogy (i.e., regular science education without outdoor experiment activities, product development, and FBC involvement). Since almost of these students did not continue their education further after the completion, it was not suitable to use the national examination score for comparing the impacts from constructive feedback.

The preliminary results from the surveys on both categories of feedback show the apparent gap between the two groups. The gap from all items in constructive feedback and the last four items in indirect feedback appear to be detectable. In other words, the disengaged learners from the revised pedagogy paid their attention and reacted positively towards constructive (and indirect) feedback to help sustain their efforts on studying and learning. The results are shown as follows. Note that the Likert scale was used in the survey—the term "never" is denoted 1, the term "seldom is denoted 2, the term "sometimes" is denoted 3, the term "often" is denoted 4, the term "always" is denoted 5, and the term "N/A" is denoted 0.

A further analysis was made to statistically compare the average values of constructive and indirect feedback from the two groups. The use of *t*-test was applied since it would help determine if there was a significant difference between the means of these two groups.

For the preliminary analysis, there was significantly different between the average score for each of the items on constructive feedback from the two groups (between the disengaged learners and the teachers). On the other hand, for indirect feedback, highlighting the contacts and interactions, the overall averages from the two groups were not significantly different. However, specifically, four items (Items 6 to 9) from the survey for indirect feedback were noteworthy. The survey's findings appeared to show that the disengaged learners who had attended the revised pedagogy noticed to a certain degree and reacted positively to indirect feedback from the teachers and FBC delegates, respectively. The survey's results are important due to poor paradigm on studying

TABLE 7.1 Survey Findings on Feedback and Its Impacts

Type	Item	(1)	(2)	(3)	(3)
Constructive Feedback	C1	3.13	3.52	12	−3.919*
	C2	3.11	3.45	11	−3.185*
	C3	3.41	3.67	7	−2.334*
	C4	3.34	3.63	9	−2.472*
	Average	3.25	3.56	10	−3.717*
Indirect Feedback	I1	2.58	2.66	3	−0.640
	I2	2.59	2.77	7	−1.418
	I3	2.40	2.43	1	−0.272
	I4	2.32	2.31	–	−0.025
	I5	2.57	2.75	7	−1.530
	I6	2.30	2.55	11	−2.088*
	I7	2.16	2.39	11	−1.893*
	I8	2.25	2.65	18	−3.189*
	I9	2.22	2.56	15	−2.798*
	Average	2.38	2.56	8	−1.929

NOTES Column headings are as follows: (1) traditional pedagogy (average value), (2) revised pedagogy (average value), (3) percentage increase, (4) *t*-test. * p-value < 0.05. Items: C1—The teachers have allowed me to evaluate myself, my actions, and my performance; C2—The teachers have enthusiastically given sufficient explanations on the tasks that I have completed without mixing their personal feeling; C3—The teachers have proactively provided sufficient examples and useful guidance to help improve myself; C4—The teachers have more actively listened to my opinion and thought; I1—Information about my behavior and perspective are discussed; I2—I have received an award or a certificate from a school; I3—I have received an award or am recognized by external entities and individuals such as JFCCT; I4—I have had an opportunity to represent a school in academic contests; I5—I have had an opportunity to demonstrate my academic project inside a school due to the visits by external entities and individuals; I6—I have had an opportunity to demonstrate my academic project outside a school through JFCCT and its partners; I7—I am recognized by external entities and individuals through a praise on my ideas and a purchase of my (our) products or invention; I8—I have had an opportunity to interact with external entities and individuals during a workshop and other encounters (e.g., a school visit) to help improve my ideas, and products or inventions; I9—I have had an opportunity to receive financial support or in-kind donation which support my ideas, and products or inventions.

and learning from the disengaged learners. Despite an underlying belief (that they are blocked and do not want to study and learn), the disengaged learners were responsiveness (i.e., enticed and reacted positively to both types of constructive feedback) to communications, contacts, conservations, and interactions with the teachers and FBC delegates.

Implications

From school to workplace, there are constant changes in work processes driven by technology, customer, competition, regulation, etc. The applications of digital technology have affected working and learning in a workplace which is like studying and learning in a school. Often, the outcomes of these applications are less than satisfactory. The reason stems from a failure to recognize learning diversity—not everyone learns in the same way and not everyone is motivated to learn equally. This dilemma is shared by a school which needs to empathize learning diversity.

Learning diversity stems from many factors. Workplace disengagement is believed to be very critical which has led to a lack of utilizing the talents from the workers. Thus, the commitment to any improvement intervention can be halfhearted without motivation from the workers. Adding more evaluation and control can swiftly turn more negative and lead to more disengagement. Disengagement is a root cause to poor performance and inability to learn and adapt, especially with the need to transform into a learning worker.

For the two BMA schools, applying constructive feedback has shown an encouraging result. The disengaged learners noticed and reacted positively to constructive feedback which was delivered by the teachers and FBC delegates. This progress reflected the optimistic sign of both studying and learning. The findings contradicted to a prevalent paradigm that a disengaged learner could not study and learn due to his or her personal characteristics—family background, behavior, and motivation. Despite the period of 5 years, the positive impacts from constructive feedback on the disengaged learners have remain visible. Studying and learning, based on improvement interventions, continue to take place. Product improvement and extension have been supported and sustained by constructive feedback. Reaching out to a community and steady flows of ideas to tackle water and air pollution reflects good progress for academic work. Improving and extending products from science experiment which are based on environment are also a clear sign of feeling of engagement at school.

To demonstrate the impacts on studying and learning from constructive feedback, it is important to adapt the surrogate concept. Instead of asking a question directly to the disengaged learners, repeated observations were made. Furthermore, it was agreed with the teachers that suggesting new ideas and showing more concerns and attention

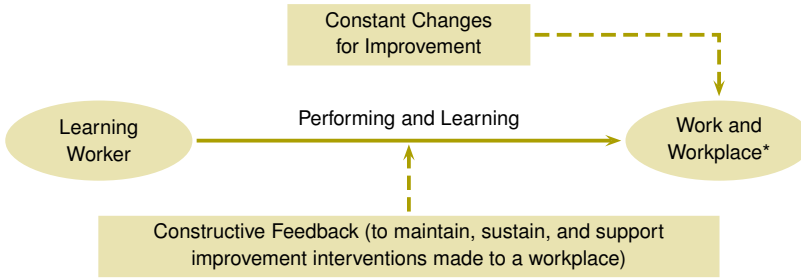

FIGURE 7.8 Constructive Feedback and Learning Worker (* need to transform from disengagement to engagement)

to school' surroundings would be an important reflection of more commitment by the disengaged learners. From the perspective of FBC, with the attention, it would be possible to have to the openness among the learners which can potentially lead to better school engagement.

Specifically for the context of learning, successive groups of the disengaged learners proposed and undertook many ideas which would tackle water pollution (by removing water hyacinth and mixing it with dry leaves and food wastes) through better production of fertilizer. Different fertilizer formulas were proposed with a combination of vermicompost. Then, they used this fertilizer to grow fresh produces such as chili and mushroom to give them to a surrounding community. This activity was part of science experiments in which the disengaged learners were trying to test the effectiveness of fertilizer on certain crops. As a result, the commitment to assist poor communities highlighted the positive effects from learning on improving science experiments by the disengaged learners. Finally, it is important to point out that these two schools are in a densely-populated area, faced with ecological and as well as poverty problems.

To further examine how the disengaged learners learn, continuous observations based on school visits spotted several new ideas for product development and extension. These observations were part of regular visits to the schools by FBC delegates and FBC's partners from the embassies and international agencies. One of the noticeable changes in the behavior of disengaged students was their motivation, willingness to work together, and sense of confidence. Not only constructive feedback appears to sustain improvement interventions made into classroom and laboratory work, but also seems to encourage more creativity

FIGURE 7.9 Tackling Water Pollution and Reaching out to the Surrounding Community

from the disengaged learners. Consistency in delivering this constructive feedback was likewise essential due to their past misgiving with the visitors. These new ideas demonstrated the talents from the disengaged learners that had been overlooked for years at school.

In summary, the disengaged learners were previously reluctant to study and learn. They were not interested in studying and learning because of the way a teacher took them through irrelevant lessons and did not provide regular constructive feedback (as the concentration was primarily on academic performance). Integrating constructive feedback from an external entity appears to attract their attention and entice positive reaction. This development was significant to support and sustain improvement interventions made for classroom and

FIGURE 7.10 New Experimental Ideas on Natural Products and Mask for PM 2.5 Dust Particles

laboratory work. Having the disengaged learners' attention was the foundation for the change in their behavior and mindset.

Despite a prevailing viewpoint on the disengaged learners that they do not particularly care about studying (i.e., conducting an experiment according to a lesson plan) and learning (i.e., improving how an experiment should be conducted and improving a product from a science experiment), the findings show that this perspective may not be entirely accurate. In fact, improving a science experiment's product reflected the willingness of the disengaged learners to share and learn. Despite being disengaged, these learners have the talents that could be utilized. Based on the 5-year study, product development represents the important cornerstone because it has allowed FBC to participate and interact with the disengaged learners on the regular basis.

The survey's findings reiterate the belief that, when dealing with studying and learning as well as performance of the disengaged learners; communication, contacts, conversations, and interactions are crucial. The interactions in a classroom are essential since they are part of providing feedback to the learners. Together with an external entity such as FBC, sustaining and supporting improvement interventions appear to be effective. This effectiveness can be attributed to overcom-

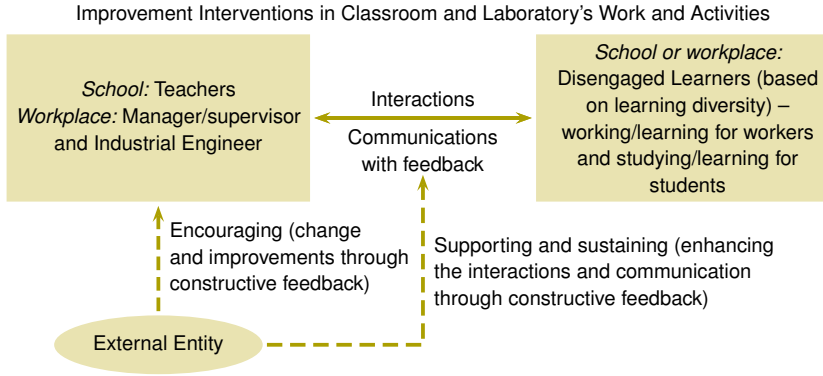

FIGURE 7.11 Implications on the Roles of External Entity in Learning and Development

ing the feeling of mistrust and lack of purposes at school. Empathy also plays an important role in feedback development and delivery. Within the context of a workplace, the presumption about the underperformers should be carefully reevaluated. The roles of a supervisor or a manager should include the development and delivery of feedback to the workers. Dealing with the disengaged workers may need to incorporate someone or some entities outside an organization. This is due to mistrust and misgiving that have taken place in a workplace. To overcome this feeling, the use of an external entity seems to be promising.

Instead of focusing on more control in a workplace, the examination into the effective use of feedback should be made. Issues relating to the development and delivery of feedback, and the roles of an external entity represent a strong possibility for industrial engineers to explore further. The research underlines the premise that any improvement interventions need to be supported and sustained by properly-designed feedback. Blending the Double-loop Learning, empathy, and understanding on the feeling of disengagement and past mistrust are important for feedback development and delivery. This feedback should reflect the efforts to improve the communication between a disengaged worker and a manager. An external entity can facilitate workplace learning along with the supervisors and managers.

Supporting Information

Table 7.2 and Table 7.3 partially illustrate the survey and the surveys' data.

TABLE 7.2 Partial Demonstration of the Survey

Statement	(1)	(2)	(3)	(4)	(5)	(6)
C1 The teachers have allowed me to evaluate myself, my actions, and my performance.						
C2 The teachers have given sufficient explanations on the tasks that I have completed without mixing their personal feeling.						
C3 The teachers have provided sufficient examples and useful guidance to help improve myself.						
C4 The teachers have listened to my opinion and thought.						
I1 Information about my behavior and perspective are discussed.						
I2 I have received an award or a certificate from a school.						
I3 I have received an award or am recognized by external entities and individuals.						
I4 I have had an opportunity to represent a school in academic contests.						
I5 I have had an opportunity to demonstrate my academic project inside a school.						
I6 I have had an opportunity to demonstrate my academic project outside a school.						
I7 I am recognized by external entities and individuals through a praise on my ideas and a purchase of my (our) products or invention.						
I8 I have had an opportunity to interact with external entities and individuals during a workshop and other encounters (e.g., a school visit) to help improve my ideas, and products or inventions.						

NOTES Column headings are as follows: (1) never, (2) seldom, (3) sometimes, (4) often, (5) always, (6) N/A. C1–C4—constructive feedback, I1–I8—indirect feedback.

Conclusion

Based on the collaboration with the two schools since 2015, the survey findings highlight many important courses of action when dealing with the disengagement problem. Despite a prevalent paradigm on the underperformers at school which is about being lazy and irresponsible, having poor attitude, and not having sufficient learning capability; constructive feedback is important for supporting and sustaining improvement interventions relating to studying and learning. Improve-

TABLE 7.3 Partial Demonstration of the Data

Item (Indirect Feedback)			Tradit. ped.		Revised ped.	
			Total	%	Total	%
16	I have had an opportunity to demonstrate my academic project outside a school.	(1)	48	27.6	35	21.5
		(2)	45	25.9	49	30.1
		(3)	61	35.1	45	27.6
		(4)	16	9.2	22	13.5
		(5)	3	1.7	12	7.4
		(6)	1	0.6	0	0.0
17	I am recognized by external entities and individuals through a praise on my ideas and a purchase of my (our) products or invention.	(1)	55	31.6	42	25.8
		(2)	45	25.9	46	28.2
		(3)	56	32.2	46	28.2
		(4)	12	6.9	17	10.4
		(5)	3	1.7	10	6.1
		(6)	3	1.7	2	1.2
18	I have had an opportunity to interact with external entities and individuals during a workshop and other encounters (e.g., a school visit) to help improve my ideas, and products or inventions.	(1)	53	30.5	32	19.6
		(2)	42	24.1	39	23.9
		(3)	56	32.2	56	34.4
		(4)	18	10.3	21	12.9
		(5)	3	1.7	14	8.6
		(6)	2	1.1	1	0.6
19	I have had an opportunity to receive financial support or in-kind donation which support my ideas, and products or inventions.	(1)	56	32.2	36	22.1
		(2)	41	23.6	38	23.3
		(3)	59	33.9	58	35.6
		(4)	14	8.0	19	11.7
		(5)	3	1.7	11	6.7
		(6)	1	0.6	1	0.6

NOTES Row headings are as follows: (1) never, (2) seldom, (3) sometimes, (4) often, (5) always, (6) N/A.

ment interventions were made for classroom and laboratory work. So, sustaining and supporting these interventions at school is very critical for continuous improvement. Overcoming the feeling of mistrust from the disengaged learners was viewed to be critical; therefore, a decision to integrate FBC as an external entity needed to be made.

Constructive feedback was then designed to first entice the attention of the disengaged learners. Their attention could reflect the willingness of learn (in addition to studying). Feeling disengaged does not mean that an opportunity to learn is lost. Given properly-designed construc-

TABLE 7.4 Initial Demonstrations on the Academic Impacts during 2015–2017

Year	Description	Sponsoring Organization
2015	"Winner" on Water for Life-long Learning Award	Teachers' Council of Thailand
2016	"National Runner Up" on My Little Farm: My Community, My-School, My-Backyard	Department of Agriculture under Ministry of Agriculture and Cooperatives and Kantana Group Public Company Limited
2016	"National Runner Up" on Environment and Living Community: School's Roles	Crown Property Bureau Foundation
2016–2017	"Winner" on Love Water with Brothers and Sisters: Pollution Prevention and Water Treatment in Waterways surrounding School and Community	Utokapat Foundation under Royal Patronage of H. M. The King
2017	Participating teachers were selected to be the trainers for 200 participating schools in environ. and ecology	Department of Environmental Quality Promotion under Ministry of Natural Resources and Environment

tive feedback and its delivery, reversing school disengagement and better utilization of the talents from the disengaged learners looks promising. Properly-designed term indicates empathy and psychology, recognition of the 70–20–0 framework, and integration of the Double-loop Learning concept. The feeling of encouragement and confidence for their work are the outcomes from constructive feedback. This narrative can be potentially applied in a workplace.

Note that the positive reactions brought surprising awards and recognition which can be briefly shown in Table 7.4.

References and Further Reading

Johnson, S., Blackman D., & Buick, F. (2018). The 70:20:10 framework and the transfer of learning. *Human Resource Development Quarterly, 29*(4), 483–402.

Kongtong, T., Phusavat, K., Pastuszak, Z., Hidayanto, A., & Majava, J. (2020), Human capital development: A construct for underprivileged students. *Human Systems Management, 39*(2), 357–366.

Newman, D. (1995). The school as a workplace. In C. Zucchermaglio, S. Bagnara, & S. U. Stucky (Eds.), *Organizational Learning and Technological Change* (NATO ASI Series, Series F: Computer and Systems Sciences, pp. 212–224). Germany.

Sutton, R., Hornsey, M., & Douglas, K. (2012). *Feedback: The communication of praise, criticism and advice.* Peter Lang Publishing.

Vollmeyer, R., & Rheinberg, F. (2005). A surprising effect of feedback on learning. *Learning and Instruction, 15*(6), 589–602.

Chapter Eight

Feedback and Its Impacts on Learning

Highlights and Key Points

- From 2015–2020, constructive feedback has had positive impacts on learning. Based on the 2016 observations and initial analysis from the 2020 survey, the disengaged learners appeared to be willing to study in accordance with new improvement interventions, and to learn, especially for product development.
- The belief that the disengaged learners cannot perform the tasks and are not capable for learning should be seriously questioned. These findings point to opportunity loss for better utilize the talents of the disengaged learners.
- Constructive feedback has helped support and sustain improvement interventions made for classroom and laboratory work.
- The research shows the positive impacts from constructive feedback on learning and motivation. Despite being marginalized by past experiences at school, the disengaged learners from the revised pedagogy are more receptive and to react more positively to constructive feedback.
- There are two implications from the survey's results relating to individual and workplace learning. Constructive feedback should include an external entity due to the need to incorporate different viewpoint and experience-importance for the disengaged learners. For the second implication, when attempting to engage a learner, other factors should be examined such as safe and creative learning environment as well as sense of belongingness and confidence.
- The findings support the premise that a disengaged learner can learn and is motivated when given a suitable setting and working environment. Using constructive feedback to transform the feeling of disengagement is critical for a success of a future workplace.

Overview and Background of the Research

Reversing and transforming workplace disengagement has been part of industrial engineering's interests in human learning. From training to learning, industrial engineers have recognized the shift in a workplace.

In other words, one-best-way to work is no longer effective when dealing with a lack of talent utilization in a workplace. Working and learning have replaced working with learning capability. Despite this shift, the aim for achieving productive workplace remains the same since an organization needs to be competitive in the ever-changing business environment. The new waste (in addition to the existing seven waste) points to the need for better utilization of a workforce's talents. Together with work convergence in which learning becomes part of work regardless of whether it is for blue-, white-, and knowledge work has become more common. In other words, not only a worker needs to complete the required tasks in a productive manner, he or she is expected to learn during work for continuous improvement. This is the reason the individuals in a workplace are referred to as a learning worker.

One of the major roadblocks that prevents learning and development in a workplace is a failure to recognize learning diversity within an organization's workforce. This diversity includes the characteristics of a learner who can be engaged, non-engaged, or disengaged. To further simplify the research, the term disengaged learner is used to reflect both non-engaged and disengaged workforce. Workplace disengagement has contributed to low productivity, poor quality, and lack of creativity and innovation. Without effective workplace engagement, an organization is faced with a challenge to overcome rapid changes in technology, customer expectation, intense competition, and regulatory requirements. Furthermore, in this research, a school is used to epitomize a workplace. The reason is that both places share common characteristics earlier discussed. Moreover, working with a school allows the research to address the Hawthorne Effects due to its continuity over a long period of time.

Initially, the research examined the impacts from constructive feedback on sustaining and supporting improvement interventions made in science education—classroom and laboratory work. This first phase of the research was conducted during 2015–2016 which had included three important groups: disengaged learners (or students), teachers, and FBC. Two BMA schools participated in this research. Note that the status of these two schools is referred to as an extended-opportunity school. This extended-opportunity school has been established to accommodate the students whose parents need to move to the urban areas for employment opportunity. Their family background is poor and are often expected to work when completing their upper secondary

schools. Based on poor academic achievement, the students are viewed as disengaged and are referred to as an underachiever or an underperformer.

Behavior problems (e.g., being lazy, showing aggressive behavior, and low attention span) and fear of studying (due to lack of safe and creative learning environment) are used to characterize these disengaged learners. Past efforts to help them study and learn had failed despite more time spent at school, more assignments, more challenging examinations, etc. Lack of empathy and a failure to recognize the needs of the disengaged students not only contributed to school disengagement but also added to the feeling of mistrust. In the initial phase, many improvement interventions were made in classroom and laboratory work. These changes included a use of product development as part of science experiment, outdoor activities with PLC (in accordance with the 70–20–10 framework), and working on a environmental problem that the disengaged learners are faced daily. Product development had two benefits, allowing FBC to participate and the disengaged learners to be able to work together and earn extra money.

This circumstance has contributed to more interactions between the disengaged learners and the teachers since the focus was on product development. Furthermore, FBC's role was to provide constructive feedback which would support these improvement interventions. FBC also helped facilitate learning of and motivation for the disengaged learners through business experiences and positive encouragement. Focus on product improvement and extension had allowed FBC extensive contacts and conversations with the disengaged learners. Despite a poor image of a disengaged learner (e.g., lack of responsibility, discipline, and capability to learn), it seems that the disengaged learners were willing to try and explore a new way during their study. They were proven to be creative which unfortunately illustrate that their talents had been overlooked.

Based on the promising results, the second phase continued from 2016–2020. The roles of FBC were expanded not only to continue providing constructive feedback to the disengaged learners but also collaborate more actively with the teachers such as haring business experiences on how to deal with the workforce in their respective businesses. FBC delegates were able to explain the importance of empathy and emotional intelligence to the teachers. Using the Open-loop Learning, FBC showed the support of these teachers (since they had done the

things right for the disengaged learners during their interactions) by organizing the events with its partners to recognize the contributions to learning and development of the underprivileged students. This has been viewed as essential to help maintain and support the improvement interventions for the disengaged learners.

From the perspective of a workplace, a use of an external entity to provide constructive feedback to the disengaged workers while an organization implement interventions represents an encouraging approach for workplace engagement. Despite this hopeful premise, it is important to recognize the importance of and to work with supervisors and managers so that constructive feedback will continue. The use of an external entity for feedback development and delivery is appropriate when there is a mistrust but a gradual shift to supervisors and managers is inevitable. Therefore, the research focuses on the overall perception and reactions to learning and motivation of the disengaged learners without separating the teachers and the FBC delegates.

In early 2020, a survey to assess the students' attention and perception on constructive feedback was conducted. A total of 337 former and current disengaged learners from both schools participated in the survey. 163 persons had participated in the revised practice/pedagogy with FBCs participation while the remaining 174 persons attended the traditional practice/pedagogy. It is important to point out that, within the context of constructive feedback, there were two feedback categories used in the survey—constructive feedback (between the teachers and the disengaged learners) and indirect feedback (between the disengaged learners and FBC).

Research Objective and Method

Once he willingness to study in accordance with new improvement interventions was confirmed and demonstrated, the next focus was on learning and motivation. The research attempted to tackle school disengagement by examining whether constructive feedback could affect learning and motivation. In this context, learning was about improving and extending science experiments and product development. For the study, it was important to illustrate that the disengaged learners made an effort to improve science experiments and product development for future learners.

In addition, learning involved how a learner received, shared, and evaluated the information (on what could be improved from past ex-

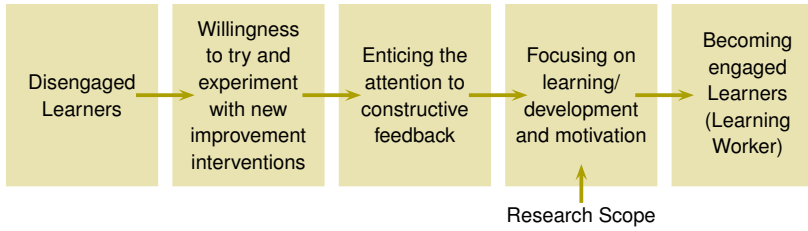

FIGURE 8.1 Roles of Constructive Feedback in Transforming the Disengaged Learners

perimental activities) against his/her study (i.e., following an instruction from a lesson plan during an experiment). Motivation implied internal feeling that would compel desirable behavior to reach a goal (that can be personal and/or formal). Motivation was important to sustain studying and learning. FBC delegates tried to highlight the importance of motivation through emotional intelligence with the teachers. It was deemed that motivation was critical for transforming the disengaged learners.

To continue the research, a survey study was to be conducted to assess their perceived impacts and implications from constructive feedback. A total of 337 students participated in the survey which took place in 2020. 163 persons had participated in the revised practice/pedagogy while the remaining 174 persons attended the traditional practice/pedagogy. The interactions between the teachers and the disengaged learners took place during classroom and laboratory work. The interactions were symbolized by how constructive feedback had been communicated (reflecting corrective information and optimistic tone to the disengaged learners). Contacts and conversations with FBC delegates were exchanged along with the presence of the teachers. It is important to repeat that FBC delegates had actively shared with the participating teachers on the importance of empathy and psychology. The teachers had participated in and involved with constructive feedback together with FBC since the 2015–2016 academic year. Gradually shifting the roles of the teachers as a provider of constructive feedback was important to the continuity of improvement interventions.

In this research, the term learning dealt with an overall increase in: (1) personal focus on lessons and academic work, (2) an ability to recall and reapply a relevant formula and theory during a science experiment, (3) a level of energy to learn or explore something new which

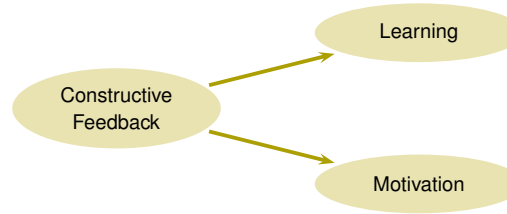

FIGURE 8.2
Framework for Data Analysis on Impacts of Constructive Feedback

could improve lesson plan development, and (4) a sense of innovativeness and creativity on extending a new idea and further developing a new product or invention from a lesson plan. On the other hand, the term motivation included the more willingness: (1) to study hard due to perceived usefulness of science-related subject, (2) to work together within a group, (3) to demonstrate a group's products from science experiments to others, and (4) to further improve these products.

Findings

The average values based on the perception, reaction, and feeling from the disengaged students are described as follows. Apparently, constructive feedback was felt more by the disengaged learners who had attended the revised approach/pedagogy. Moreover, their perceived levels of learning and motivation were greater. The gap seemed to be higher for more time on self-reflection and more objective interactions. In addition, a more moderate gap on perceived learning and feeling of motivation from the revised practice is shown.

In addition to the comparison of the average values between the two groups, the analysis would include the possible two interrelationships: (1) constructive feedback and learning and (2) constructive feedback and motivation. The multiple regression approach was applied to assess these two possible interrelationships. Furthermore, the analysis would evaluate the reasons or the cause-and-effect from the roles and activities undertaken by FBC. For the disengaged learners from the traditional approach, their learning and motivation were positively influenced by only one of the four items in constructive feedback which routinely took place during the lessons. For learning, this leading item was "The teachers have comprehensively evaluated and have sufficiently explained the tasks that I have completed without mixing their personal feeling." Further, one item in constructive feedback ("The teachers have always shown the willingness to listen to my concern, ideas,

TABLE 8.1 Descriptive Statistics on the Findings from the Two Disengaged Learners' Groups

Group	Item	(1)	(2)	(3)	(4)	(5)
Disengaged students who have attended a traditional approach for teaching and learning	C1	174	1.00	5.00	3.13	0.87
	C2	174	0.00	5.00	3.11	0.98
	C3	174	0.00	5.00	3.41	1.01
	C4	174	0.00	5.00	3.34	1.03
	L	174	1.00	5.00	3.41	0.60
	M	174	1.00	5.00	3.52	0.70
Disengaged students who have attended the revised approach with a reengagement from JFCCT	C1	163	1.00	5.00	3.51	0.92
	C2	163	0.00	5.00	3.45	0.94
	C3	163	0.00	5.00	3.67	0.99
	C4	163	0.00	5.00	3.63	1.10
	L	163	1.00	5.00	3.50	0.67
	M	163	1.00	5.00	3.72	0.66

NOTES Column headings are as follows: (1) number, (2) minimum, (3) maximum, (4) mean, (5) standard deviation. L—learning, M—motivation.

and thought.") appeared to influence the level of motivation of the disengaged learners from the traditional approach.

The findings further showed that, for the disengaged learners from the traditional approach, the impacts from constructive feedback on learning and motivation were marginal, based on the low values of R^2 (i.e., 0.079 and 0.084 respectively). Specifically, only C2 ("The teachers have comprehensively evaluated and have sufficiently explained the tasks that I have completed without mixing their personal feeling.") contributed to their learning. This was probably because of the comprehensive and vigorous use of assignments, reports, and examinations to assess their academic understanding. Similarly, only C4 ("The teachers have always shown the willingness to listen to my concern, ideas, and thought.") impacted their motivation. This was due to the need to routinely hold some discussions from presentations and in-class experiments.

For the disengaged learners from the revised approach, their learning was affected by three out of four items in constructive feedback. All these three items were based on the collaboration and exchanges of ideas and experiences between the teachers and FBC delegates (on the importance of conveying more positive message in both explicit and implicit ways-through direct comment to actively listening to the dis-

TABLE 8.2 Multiple Regression from the Disengaged Learners from the Traditional Pedagogy

Factors	Learning				Motivation			
	B	SE	β	t	B	SE	β	t
C1	Excluded from being a variable				Excluded from being a variable			
C2	0.169	0.044	0.281	3.833**	Excluded from being a variable			
C3	Excluded from being a variable				Excluded from being a variable			
C4	Excluded from being a variable				0.196	0.049	0.290	3.968**
Constant	2.882	0.144		19.983**	2.872	0.173		16.65**
	R^2 = 0.079, SEE = 0.569, F = 14.691				R^2 = 0.084, SEE = 0.668, F = 15.742			

NOTES L = 2.882 + 0.169(C2). M = 2.872 + 0.196(C4). Sig. of F = 0.000, * $p < 0.05$, ** $p < 0.01$.

TABLE 8.3 Multiple Regression from the Disengaged Learners from the Revised Pedagogy

Factors	Learning				Motivation			
	B	SE	β	t	B	SE	β	t
C1	0.143	0.055	0.196	2.599**	Excluded from being a variable			
C2	Excluded from being a variable				Excluded from being a variable			
C3	0.211	0.053	0.309	3.985**	0.299	0.047	0.445	6.300**
C4	0.095	0.047	0.155	2.026*	Excluded from being a variable			
Constant	1.876	0.222		8.431**	2.622	0.180		15.540**
	R^2 = 0.264, SEE = 0.583, F = 18.996				R^2 = 0.198, SEE = 0.597, F = 39.695			

NOTES L = 1.876 + 0.143(C1) + 0.211(C3) + 0.095(C4). M = 2.622 + 0.299(C3). Sig. of F = 0.000, * $p < 0.05$, ** $p < 0.01$.

engaged learners respectively). On the other hand, one item within constructive feedback ("The teachers have provided innovative examples and encouragement, and useful new guidance and suggestions from outside a school to help improve myself.") significantly influenced the level of motivation of the disengaged learners. Based on the findings within the context of the two groups, constructive feedback seemed to play more impactful and critical roles for improving learning and motivation of the disengaged learners from the revised approach.

Given the marginal to moderate effects from constructive feedback, the next step would involve the prioritization of the impacts on learning and motivation from each of the four items within constructive feedback. For the disengaged learners from the revised pedagogy, their learning appeared to be orderly affected or influenced by C3, C1, and C4, respectively. These three items from constructive feedback were

TABLE 8.4 Effects from the Constructive Feedback on Learning and Motivation

Factors	Traditional Approach		Revised Approach	
	Learning	Motivation	Learning	Motivation
C1	—	—	0.196	—
C2	0.281	—	—	—
C3	—	—	0.309	0.445
C4	—	0.290	0.155	—

primarily based on the knowledge and skills of the teachers who had learned from FBC delegates' business experiences. The need to sort out the priority for the disengaged learners who have attended the traditional pedagogy was not necessary as only one item had shown a noticeable impact.

The survey's findings indicated that constructive feedback from the teachers and FBC delegates had enticed the attention and galvanized the positive reactions from the disengaged learners more significantly. The FBC roles as an indirect or supporting entity outside school were positive to help change the attitude and behavior on learning while contributing to more motivation. This finding is important since effective feedback is an important mechanism when performing the tasks and learning from these tasks for future improvements. Feedback can originate internally and externally but needs to be communicated and delivered effectively. More importantly, the disengaged learners showed the willingness to try a new way for routine classroom and laboratory work and to participate in product improvement and extension. This notion is important since it contradicts to a prevailing perception that the disengaged learners are not interested in studying and learning. Thus, it is hopeful that a transformation of a disengaged worker is achievable which is critical to tackle the underutilization of the talents in an organization.

Implications

The results recognize the positive impacts from constructive feedback on learning and motivation. The potential benefits from applying constructive feedback in learning and motivation cannot be underestimated. Despite being marginalized by past poor experiences at their schools, the disengaged learners from the revised pedagogy are more receptive to constructive feedback. Furthermore, these learners reacted positively to this constructive feedback. The negative conse-

quences from the Hawthorne Effects should be minimal due to the long period of FBC's involvement with the two schools and the teachers. Although some initial feeling mistrust in improvement interventions made in science education exists, the disengaged students have shown a higher level of learning and motivation when constructive feedback is actively adapted by the teachers.

For the disengaged learners, current school culture which emphasizes control and academic excellence based on examination, assignment, and long classroom hours has contributed to the disinterests of learning and low motivation. In addition, a future economic challenge has added to the uncertain feeling which has not been tackled at school. More importantly, the concern on a lack of safe learning environment (including physical and psychological safety) has negatively affected the level of learning and motivation. Thus, overcoming the fear of learning through use of constructive feedback (as well as PLC and others) has been essential.

Based on the survey's findings, a shift for the disengaged learners on their inability of learning and a lack of motivation should be noticed. To simply assume that poor performers or underachievers at school or in a workplace are not capable of learning or are not motivated to complete the tasks is not accurate. Based on the repeated observations, the willingness to try new ways of performing academic activities (i.e., classroom and laboratory work), the creativity in constantly developing new products from science experiments, and the eagerness to reach out to a surrounding community are some of the tangible proofs of the disengaged learners' ability to learn with motivation. Further, it is believed that the disengaged learners can learn, unlearn, and relearn like any students when they are given an opportunity to succeed (those with better family background or attend a better school).

From school to workplace, there are two significant implications from the study. The first one points to the importance of constructive feedback to help sustain learning and development. Constructive feedback can help strengthen communication within a workplace. It can also help support an effort to improve the productivity and performance in a workplace. To overcome workplace disengagement, a collaboration with an external entity should seriously be contemplated. For the research, the collaboration between the teachers and FBC delegates has proven to be an critical step to help transform the disengaged learners. Although this external entity does not have direct responsi-

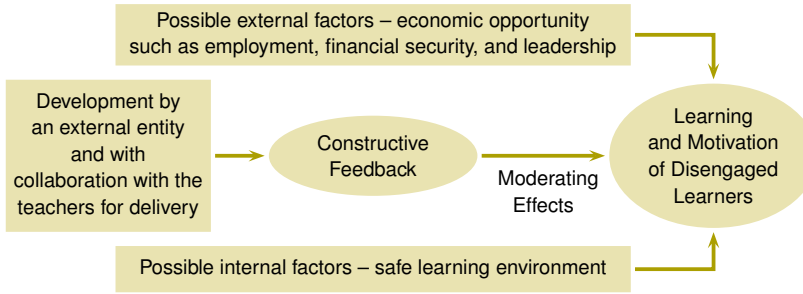

FIGURE 8.3 Implications from the Surveys on Impact Factors for Learning and Motivation

bility and authority on the disengaged learner, it provides reassurance that a right action (i.e., doing things right and doing the right things) is taken in their academic work. Furthermore, despite the positive influence by an external entity, it is important to recognize the need for this entity to include supervisors or managers who have to interact with the disengaged learners.

The second implication is based on the two moderate interrelationships: (1) constructive feedback and learning, and (2) constructive feedback and motivation. According to many previous studies, constructive feedback is probably one of many factors directly and indirectly affecting learning and motivation. These factors include secured employment, long-term financial security, autonomy, leadership, and organizational culture. In this research, it appears that the development of constructive feedback is satisfactory. However, it is possible that less influence can stem from the delivery of constructive feedback which can be impacted by the above direct and indirect factors. Further examinations into the effective delivery of constructive feedback are needed to help assure the importance of constructive feedback. The understanding can potentially increase the level of learning and motivation. This increase is essential for individual learning workers and a productive workplace.

From the survey's findings, instead of relying on internal feedback such as performance appraisal (e.g., it should be avoidable as feedback should not mix with assessment and evaluation), the use of constructive feedback could improve the level of performance of the disengaged workforce. Constructive feedback also contributes to learning in a workplace. Thus, improving the development and delivery of feed-

TABLE 8.5 Demonstration of the Data on Constructive Feedback

Item (Constructive Feedback)			Tradit. ped.		Revised ped.	
			Total	%	Total	%
C1	The teachers have consistently allowed me enough time to be able to evaluate myself, my actions, and my performance.	(1)	8	4.6	5	3.1
		(2)	29	16.7	8	4.6
		(3)	72	41.4	76	46.6
		(4)	62	35.6	78	47.9
		(5)	3	1.7	7	4.3
		(6)	0	0.0	0	0.0
C2	The teachers have comprehensively evaluated and have sufficiently explained the tasks that I have completed without mixing their personal feeling.	(1)	9	5.2	2	1.2
		(2)	33	19.0	15	9.2
		(3)	65	37.4	74	45.4
		(4)	58	33.3	47	28.8
		(5)	8	4.6	24	14.7
		(6)	1	0.6	1	0.6
C3	The teachers have provided innovative examples and encouragement, and useful new guidance and suggestions from outside a school to help improve myself.	(1)	5	2.9	1	0.6
		(2)	26	14.9	15	9.2
		(3)	52	29.9	54	33.1
		(4)	69	39.7	55	33.7
		(5)	21	12.1	37	22.7
		(6)	1	0.6	1	0.6
C4	The teachers have always shown the willingness to listen to my concern, ideas, and thought.	(1)	6	3.4	5	3.1
		(2)	25	14.4	15	9.2
		(3)	66	37.9	51	31.3
		(4)	53	30.5	51	31.3
		(5)	23	13.2	40	24.5
		(6)	1	0.6	1	0.6

NOTES Row headings are as follows: (1) never, (2) seldom, (3) sometimes, (4) often, (5) always, (6) N/A.

back has become one of the most challenging tasks of industrial engineers today. In this research, the delivery of constructive feedback from the initial stage until the present has received strong collaboration from the teachers. This circumstance is important as the purpose of constructive feedback was clearly communicated and understood. Note that, for many workplaces, it may not be the case so more examinations into the delivery-related issues of constructive feedback can be potential research areas in the future.

Future research could also include the examination into the interre-

TABLE 8.6 Partial Demonstration of the Multiple Regression

Item		C1	C2	C3	C4	Learning
C1	Pearson Correlation	1	0.433**	0.373**	0.345**	0.365**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000
	N	163	163	163	163	163
C2	Pearson Correlation	0.433**	1	0.488**	0.409**	0.342**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000
	N	163	163	163	163	163
C3	Pearson Correlation	0.373**	0.488**	1	0.413**	0.446**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000
	N	163	163	163	163	163
C4	Pearson Correlation	0.345**	0.409**	0.413**	1	0.351**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000
	N	163	163	163	163	163
Learning	Pearson Correlation	0.365**	0.342**	0.446**	0.351**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	
	N	163	163	163	163	163

NOTES ** Correlation is significant at the 0.01 level (2-tailed).

TABLE 8.7 Model Summary

Model	*R*	R^2	Adjusted R^2	Std. Error*
1	0.446[a]	0.199	0.194	0.60408
2	0.495[b]	0.245	0.235	0.58847
3	0.514[c]	0.264	0.250	0.58285

NOTES * Of the Estimate. [a] Predictors: (Constant), and C3. [b] Predictors: (Constant), C3, and C1. [c] Predictors: (Constant), C3, C1, and C4.

lationships between learning and motivation. Instead of the presumption that the levels of learning and motivation are impacted by constructive feedback, it is conceivable that they can also be interrelated. In this research's context, both terms are viewed independently. Possibly, an ability to learn needs to be attained before a disengaged learner can be motivated. Or a disengaged learner needs to be initially motivated before his/her learning can take place during work. In addition, a focus group on how a disengaged learner can unlearn what he/she has earlier been exposed or experienced in a workplace can be examined. And, how this disengaged learn become more effective in relearning through constructive feedback is another important subject that should be encouraged. For a disengaged learner, unlearning may be an

TABLE 8.8 Illustration of ANOVA

Model		(1)	(2)	(3)	(4)	(5)
1	Regression	14.623	1	14.623	40.074	0.000[a]
	Residual	58.750	161	0.365		
	Total	73.373	162			
2	Regression	17.965	2	8.983	25.939	0.000[b]
	Residual	55.408	160	0.346		
	Total	73.373	162			
3	Regression	19.359	3	6.453	18.996	0.000[c]
	Residual	54.014	159	0.340		
	Total	73.373	162			

NOTES Column headings are as follows: (1) Sum of Squares, (2) Degrees of Freedom, (3) Mean Square, (4) *F*, (5) Significance. [a] Predictors: (Constant), and C3. [b] Predictors: (Constant), C3, and C1. [c] Predictors: (Constant), C3, C1, and C4. Dependent Variable: Learning.

TABLE 8.9 Illustration of Coefficients

Model		(1)	(2)	(3)	(4)	(5)
1	(Constant)	2.381	0.182		13.049	0.000
	C3	0.304	0.048	0.446	6.330	0.000
2	(Constant)	2.003	0.215		9.299	0.000
	C3	0.246	0.050	0.361	4.871	0.000
	C1	0.169	0.054	0.230	3.107	0.002
3	(Constant)	1.876	0.222		8.431	0.000
	C3	0.211	0.053	0.309	3.985	0.000
	C1	0.143	0.055	0.196	2.599	0.010
	C4	0.095	0.047	0.155	2.026	0.044

NOTES Column headings are as follows: (1) *B*, (2) Standard Error (Unstandardized Coefficients), (3) β (Standardized Coefficient), (4) *t*, (5) Significance. Dependent Variable: Learning.

important step for strengthening higher cognition and his/her ability to learn future tasks.

Supporting Information

Some of the details of the survey's data is demonstrated in Tables 8.5–8.10.

Conclusion

The research examines the impacts from constructive feedback on learning and motivation of a disengaged learner. The survey was used

TABLE 8.10 Excluded Variables

Model		(1)	(2)	(3)	(4)	(5)
1	C1	0.230[a]	3.107	0.002	0.239	0.861
	C2	0.163[a]	2.042	0.043	0.159	0.762
	C4	0.200[a]	2.634	0.009	0.204	0.829
2	C2	0.097[b]	1.172	0.243	0.093	0.689
	C4	0.155[b]	2.026	0.044	0.159	0.787
3	C2	0.065[c]	0.780	0.436	0.062	0.660

NOTES Column headings are as follows: (1) β ln, (2) t, (3) Significance, (4) Partial Correlation, (5) Tolerance (Collinearity Statistics). [a] Predictors: (Constant), and C3. [b] Predictors: (Constant), C3, and C1. [c] Predictors: (Constant), C3, C1, and C4. Dependent Variable: Learning.

to evaluate these impacts. This evaluation based on the FBC's collaboration with the teachers on constructive feedback since 2016. A total of 337 students participated in the survey in early 2020. 163 persons had participated in the revised practice/pedagogy (with FBC's involvement) while the remaining 174 persons attended the traditional practice/pedagogy. The perceived levels of learning and motivation from those who had attended the revised pedagogy were significantly higher. A further examination illustrated two important issues which would potentially contribute to better workplace learning.

The first one pointed to the development and delivery of constructive feedback. Involving an external entity could bring different (but stimulating) viewpoints to a workplace. For the second issue, when attempting to engage a learner, other factors (in addition to constructive feedback) needed be examined such as safe and creative learning environment, culture, and autonomy. The findings also strongly supported the premise that a disengaged learner could learn (and study at the same time) and could be motivated. Findings a way to transform a disengaged learner is critical for a success of a future workplace. Future research areas are also discussed.

References and Further Reading

Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly, 44*(2), 350–383.

Hislop, D., Bosley, S., Coombs, C., & Holland, J. (2014). The process of individual unlearning: A neglected topic in an under-researched field. *Management Learning, 45*(5), 540–560.

Keller, J. (2010). *Motivational design for learning and performance: The ARCS model approach.* Springer.

Kluger, A., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119*(2), 254–284.

Omer, A., & Abdularhim, M. (2017). The criteria of constructive feedback: The feedback that counts. *Journal of Health Specialties, 5*(1), 45–48.

Sutton, R., Hornsey, M., & Douglas, K. (2012). *Feedback: The communication of praise, criticism and advice.* Peter Lang.

Violato, C., Lockyer, J., & Fidler, H. (2008). Changes in performance: A 5-year longitudinal study of participants in a multi-source feedback programme. *Medical Education, 42*(10), 1007–1013.

Vollmeyer, R., & Rheinberg, F. (2005). A surprising effect of feedback on learning. *Learning and Instruction, 15*(6), 589–602.

Chapter Nine

Impacts from Feedback on Safe Learning Environment

Highlights and Key Points

- Feedback can help strengthen and improve safe (and creative) learning environment by creating two-way communication and sense of belongingness.
- Studying and learning by the disengaged learners are possible when they can overcome fear of learning and feel safe enough to participate in and interact with each other and an external entity during academic, social, and extracurricular activities.
- The involvement from an external entity with business experience and success has fundamentally contributed to the feeling of hope and the willingness to engage. This is essential for PLC to be effective and for creating safe learning environment.
- Studying and learning by a disengaged learner (i.e., he/she is not interested in solving a problem, completing a task, acquiring new knowledge, and making a career progress.) is possible when safe learning environment is ensured.
- Likewise for a workplace, the findings show that workplace disengagement can be transformed with safer learning environment which should result in better utilization of the workforce's talents.
- Improvement interventions (which have been derived from many concepts such as the 70–20–10 framework, PLC, outdoor experiments, empathy with the use of product development for science experiments) have been successfully sustained by constructive feedback.
- It is important that improvement interventions and constructive feedback should not only aim to improve how the learners perform and learn about their tasks but also to consider and ensure safe (and creative) learning environment.

Overview and Background of the Research

The current business environment is influenced by competition, technology advancement and human capital development. Given an in-

creasing level of business complexity, learning is viewed as an enable to maintain an organization's productivity and long-term competitiveness. Effective workplace learning depends on how learning is facilitated which primarily deals with the individuals' work-related ability and willingness to learn. Because of negative feeling about a workplace, learning and motivation become diminished while work-related capability is stagnant.

Traditional improvements and support on workplace learning have integrated many technical and behavioral techniques such as digital technology and quality of work life. Despite these efforts, many organizations have been struggling to overcome workplace disengagement. This matter becomes more serious when considering the underutilization of the talents in a workplace. For workplace disengagement, one of the key contributors is fear of learning which relates to a lack of safe (and creative) learning environment. Safe feeling on learning environment is essential since it can discourage sharing and discussion among the workers (as advocated by PLC and the 70–20–10 framework).

Overcoming workplace disengagement has been a challenge for many decades due to its impacts on productivity and performance. This matter becomes more urgent because of many uncertainties in business operations such as supply-chain disruptions. These uncertainties require active and rapid responses to unknown circumstances. This is supported by an ongoing trend which relies more on learning workers instead of outside experts and managers. Workers need to become more prepared and motivated to not only perform the tasks well but also to learn how to improve these tasks. Thus, the term learning worker has gained the popularity.

To examine the roles of constructive feedback on safe (and creative) working environment, the research has again used the same two BMA schools that have worked with FBC since the 2015–2016 academic year. This constructive feedback has been applied together with PLC along with many improvement interventions during science experiments. As previously mentioned, constructive feedback has included school visit, workshops, and in-kind donations which correspond to the first loop within the Open-loop Learning. In addition, for the second loop within the Open-loop Learning, constructive feedback has included financial support for study visits (outside school) and invitations to display and sell products from science experiments.

For this research, constructive feedback reflects supportive and cor-

rective comments that would contribute to a desirable outcome. It has two components during the implementation at the two schools. The first component or term, constructive, represents what had taken place in a classroom or a laboratory between the teachers and the disengaged learners. The second component or term, indirect, represents what had taken place outside a classroom and a laboratory between FBC delegates and the disengaged learners. This indirect feedback represented an external source of inputs which focused on emotional support to the disengaged learners. Contacts and conversations were part of the interactions.

To further recognize the importance of learning (in addition to studying) for the disengaged learners, the concept of informal learning was applied. Informal learning is part of self-paced activity initiated by the workers in a work setting or a workplace. It injects new skills and knowledge while assisting these workers to improve how the tasks are performed. Effective informal learning results in better utilization of the talents in an organization and contributes to a productive workplace. In this research, use of PLC was part of informal learning which stems from the 70–20–10 framework.

PLC aimed to address the concerns of school bullying (which had contributed to unsafe learning environment) while encouraging more sharing and interactions among the disengaged learners. PLC was adapted as part of improvement interventions for classroom and laboratory work. PLC was applied to support outdoor experiments and product development for science experiments. To sustain and support these improvement interventions, constructive feedback from an external entity was utilized. From the previous discussions, constructive feedback contributed to an increase in learning and a level of motivation. Constructive feedback demonstrated the appreciation those learners who were trying to study and learn.

The advantages of using a school to reflect a workplace were the similar characteristics such as social ladder in a school and social climbing in a workplace, school bullying and workplace harassment, and fear from being excluded by friends at school or fear of being reprimanded or ridiculed at work. Focusing on a school allowed the ability to continuously and repeatedly observe the behavior of the disengaged learners. In a workplace or a classroom alike, lack of learning among the disengaged learners often results in underperformance or underachievement, loss of productivity and creativity, and dropout or turnover. Being

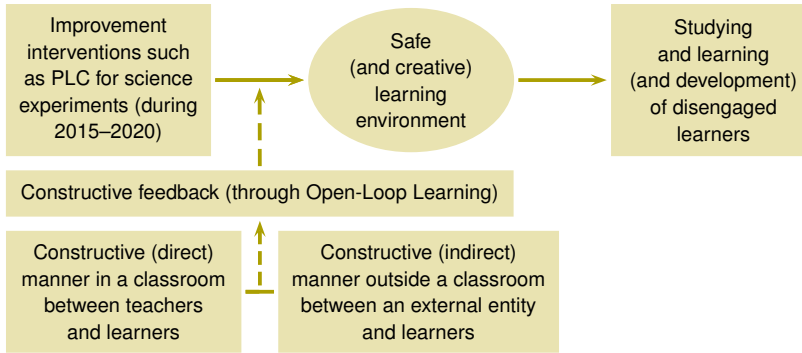

FIGURE 9.1 Research Scope on Safe (and Creative) Learning Environment

perceived as an underperformer often indicates that the talents would not be fully utilized due to a negative notion on disengagement.

Research Objectives and Method

The research aimed to test and evaluate the influences of constructive feedback on safe learning environment—perceived feeling and quality of learning for the disengaged learners. There were two groups of the disengaged learners who attended two pedagogical practices, i.e., traditional and revised with FBC's involvement. The survey applied the questionnaire developed by Thailand's Office of Basic Education Commission. Statistical analyses would be used to help interpret the perception of the disengaged learners who included former and current students of the two BMA schools. The survey took place after the 5-year period of collaboration between FBC and the two schools.

The total participants from the first and second schools were 286 and 400 persons, respectively which exceeded the minimum requirement of 267 and 318 persons. Out of the total 686 survey participants, 204 persons had attended the traditional pedagogy. Thus, 482 persons had taken part in the revised pedagogy (with FBC's involvement). The results would be separated between these two groups. To determine the sample size for the survey, the study applied the approach suggested by Yamane (1973). The reason stemmed from the prior knowledge of a specific size of the students from both schools. Before the survey, the first school had 798 students while the second school had 1,541 students who attended the secondary level. Therefore, for the first school, the minimum participants were 267 students, 798/(1+798(0.052)). For the

second school, the minimum participants were 318 students. Note that the actual participants from the first and second schools were 286 and 400 students, respectively which were greater than the minimum requirement.

Findings

The survey's results showed that the revised pedagogy had significantly contributed to more positive feeling of safe learning environment. A combination of Improvement interventions and constructive feedback appeared had increased the feeling of safer learning environment for the disengaged learners. Outdoor experiments with product development allowed the disengaged learners time to know each other. Working on a common goal through PLC not only helped address the disengaged learners' difficult and challenging background but also overcame unsafe learning environment. The highlights of key activities during PLC included the following: (1) developing products from a science experiment and selling them for needed income, (2) exchanging ideas, (3) sharing experiences, and (4) removing a communication barrier. Note that the decision to apply PLC was based on the 70–20–10 framework.

The opportunities to interact with FBC delegates allowed the disengaged to showcase their products for potential sales, and to be invited for product displays and sales. These opportunities strengthened internal communication among group members for each product. Once internal communication effectively took place took place, fear of studying and learning could be removed. Consistent constructive feedback provided by an external source like FBC played a role in helping the disengaged learners feel more reassured and focused on product development and extension. Being more focused was important to overcome the feeling of uncertainty and to provide an opportunity to openly express the ideas and opinions.

The findings also showed that the revised pedagogy had significantly decreased the perceived frequency on physical, verbal, and psychological bullying. Instead of writing a report based on an experiment, a shift to product development highlighted the importance of working together and exploring each other's ideas. Given constant constructive feedback through school visits and others, hopeful feeling with more confidence was viewed as critical for tackling unsafe learning environment. Also, as a constructive feedback provider, the FBC's sponsored

TABLE 9.1 Feeling of Safety and Happiness during a Lesson/Experiment and at School

	Circumstance	Regular ped.[a]		Revised ped.[b]		*t*-test
		(1)	(2)	(1)	(2)	
1	I am happy with my work and activities so that I forget about time.	2.35	0.801	2.37	0.834	−0.309
2	I can concentrate with assignments and tasks.	2.11	0.689	2.31	0.736	−3.342*
3	If I intend to complete my assignment and task, I can complete it.	2.65	0.889	2.77	0.886	−1.478
4	I feel that I reach my personal goals.	2.56	0.942	2.86	0.992	−3.701*
5	I am energized and enthusiastic to begin a day.	2.29	0.836	2.59	0.899	−4.170*
6	I often feel that I can tell good things that have happened to me to friends.	2.62	1.041	2.90	1.151	−2.928*
7	Faced with a problem, I know I have friends with me.	2.52	1.010	2.77	1.064	−2.880*
8	I feel that friends are genuinely concerned about my well-being.	2.61	1.070	2.85	1.097	−2.570*
9	I feel cheerful and often laugh easily.	2.85	1.079	3.15	1.110	−3.322*
10	I have positive outlook with my life.	2.55	1.028	2.82	1.094	−3.004*
	Overall Results	2.51	0.607	2.74	0.663	−4.340*

NOTES Column headings are as follows: (1) Average Value, (2) Standard Deviation. [a] $n = 204$. [b] $n = 482$. * Significance at the 0.05 level.

trips helped challenge the disengaged learners' mindset about a lack of hope and opportunity due to their family background and school. An opportunity to understand that the poverty would neither define nor predict their future was very critical. Having more positive hope about the future had affected the behavior since it would not be beneficial to continue to harass and be aggressive to others.

There was no significant impact on the perceived frequency of bullying through mobile phones, computers, and other digital devices. Although the average value of the overall results from the revised pedagogy was less, it was not statistically significant. It is important to note that only a few of the disengaged learners owned their personal notebook or computers. In addition, they typically used a prepaid card for

TABLE 9.2 Frequency of Physical, Verbal, and Psychological Bullying

Circumstance		Regular ped.[a]		Revised ped.[b]		*t*-test
		(1)	(2)	(1)	(2)	
1	I am verbally abused, ridiculed, and harassed which contribute to my despair during a lesson.	2.38	1.187	2.06	1.006	2.294*
2	I am ignored and prevented from class discussion, group participation, and play.	1.48	0.803	1.40	0.709	1.184
3	I am physically attacked or am isolated in a room.	1.45	0.855	1.34	0.724	1.579
4	Somebody makes up a story or a rumor about me and tries to spread it to others.	1.44	0.723	1.44	0.722	0.010
5	I have money or personal belongings taken or stolen from me.	1.46	0.704	1.42	0.754	0.687
6	I am harassed or am forced to perform a task against my will.	1.37	0.780	1.33	0.733	0.639
7	I am verbally abused or ridiculed due to my appearance, sexual preference, academic ability which contribute to my reluctance to go to school.	1.90	1.184	1.54	0.818	2.901*
Overall Results		1.61	0.566	1.50	0.560	2.282*

NOTES Column headings are as follows: (1) Average Value, (2) Standard Deviation. [a] $n = 204$. [b] $n = 482$. * Significance at the 0.05 level.

their mobile device due to a lack of affordability to pay a monthly subscription. Given the accessibility's restriction, it is understandable that cyber bullying probably would not be looked at or viewed as a serious matter by the disengaged learners.

Implications

The key findings can be summarized as follows. From the previous findings, both studying and learning by the disengaged learners were achievable. Certainly, the disengaged learners were able to study due to improvement interventions which were based on a great deal of empathy (identified by FBC delegates and the teachers). Nevertheless, learning was another challenge until the disengaged learners felt safe enough to participate in social and extracurricular activities. In addition to improvement interventions made for classroom and laboratory

TABLE 9.3 Frequency of Bullying through Mobile Phones, Computers, and Other Digital Devices

	Circumstance	Regular ped.[a]		Revised ped.[b]		*t*-test
		(1)	(2)	(1)	(2)	
1	I have experienced cyber bullying.	1.29	0.667	1.30	0.672	−0.393
2	Somebody makes fun of me and my name and spread this through online.	1.34	0.620	1.29	0.637	0.998
3	Somebody uses a photo and creates a rumor about me, and spread this through online.	1.13	0.418	1.14	0.506	−0.887
4	I have been intimidated or threatened through online.	1.20	0.615	1.14	0.424	1.270
5	I have been removed from a social or online group without my consent and have been prevented from joining.	1.26	0.609	1.20	0.571	1.119
6	Somebody has fabricated my identity which causes defamation and degradation.	1.15	0.580	1.13	0.451	0.566
7	Somebody has stolen my password and share confidential information which results in personal embarrassment and humiliation.	1.24	0.609	1.15	0.474	1.858*
	Overall Results	1.23	0.466	1.19	0.396	

NOTES Column headings are as follows: (1) Average Value, (2) Standard Deviation. [a] $n = 204$. [b] $n = 482$. * Significance at the 0.05 level.

work, constructive feedback significantly contributed this feeling. The findings also allude to the importance of informal learning (e.g., sharing and discussing the ideas on adjusting science experiments and for product improvement and extension) and a common goal shared by the disengaged learners when overcoming unsafe learning environment.

The findings point to the need to first address unsafe learning environment as part of a transformation of a workplace from disengagement to engagement. The presumption on a disengaged learner (i.e., he/she is not interested in solving a problem, completing a task, acquiring new knowledge, and making a career progress.) has often overlooked unsafe feeling which could contribute to a lack of active participation and collaboration with the peers. In this research, improvement

interventions and development and delivery of constructive feedback took into consideration unsafe learning environment experienced by the disengaged learners. Fear of learning is usually based on a lack of physical or psychological safety.

The divide between the engaged and disengaged learners is not about the intelligence and personal characteristics. The research demonstrates a viable approach to first examine learning environment which often affect the learners in a workplace. The research has adapted the premise from the 70–20–10 framework which relies on informal learning through sharing and interactions as well as hands-on experiences. PLC is part of informal learning. In addition, constructive feedback contributes to more interactions and conversations among group members for individual products. School visits and invitations to display and sell their products by FBC delegates often mean that the disengaged learners need to discuss and work together for product demonstration. More communications means higher positive feeling on the issues relating to physical or psychological safety

Supporting Information

The survey focused on three main issues with the use of the 5-point Likert Scale. The first one, with 10 items, dealt with feeling of safety as well as happiness during classroom and laboratory work. The "almost always" category corresponded to the score 5. The "never" category was assigned the score of 0. The second issue, with seven items, was about the perceived frequency of physical and psychological bullying at school. The "3–4 times a week on average" category corresponded to the score of 5. The "never" category was denoted the score of 0. The third issue, with seven items, coped with the frequency of bullying through mobile phones, computers, and other digital devices which could take place inside and outside school. The "more than 10 times a month on average" category corresponded to the score of 5. The "never" category was denoted the score of 0. To test and confirm the reliability of the survey, the use of Internal Consistency Method and the alpha coefficient (Cronbach's alpha) were applied. A survey participant was asked to select the most applicable description that he or she had faced during his or her last academic year.

To evaluate the findings, the frequency, based on the interval of 0.8, was used. This interval was calculated from (5–1)/5 which is equivalent to 0.8. The frequency description is as follows. The average value

TABLE 9.4 Illustration of Issue 1 (Feeling of Safety and Happiness during a Lesson/Experiment and at School)

Circumstances		(1)	(2)	(3)	(4)	(5)
1.1	I am happy with my work and activities so that I forget about time.	1	2	3	4	5
1.2	I can concentrate with assignments and tasks.	1	2	3	4	5
1.3	If I intend to complete my assignment and task, I can complete it.	1	2	3	4	5
1.4	I feel that I reach my personal goals.	1	2	3	4	5
1.5	I am energized and enthusiastic to begin a day.	1	2	3	4	5
1.6	I often feel that I can tell good things that have happened to me to friends.	1	2	3	4	5
1.7	Faced with a problem, I know I have friends with me.	1	2	3	4	5
1.8	I feel that friends are genuinely concerned about my well-being.	1	2	3	4	5
1.9	I feel cheerful and often laugh easily.	1	2	3	4	5
1.10	I have positive outlook with my life.	1	2	3	4	5

NOTES Column headings are as follows: (1) never, (2) sometimes, (3) often, (4) very often, (5) almost always.

between 4.21–5.00 would reflect the feeling of the least safe or happiness due to the highest frequency level of being bullied. The next level would be the average value between 3.41–4.20 reflecting the feeling of less safe and happiness due to the high frequency of being bullied. The next three levels would be between 2.61–3.40, 1.81 to 2.60, and 1.00–1.80. The average value of 1.00–1.80 would signify the feeling of safe and happiness because a learner did not experience any forms of bullying.

Conclusion

One of many key challenges of workplace learning is how to deal with the disengaged workforce. The research provides a possible roadmap on overcoming workplace disengagement which is based on a combination of several considerations. Several issues, that are believed to contribute to this disengagement, have been recognized such as unsafe learning environment (e.g., physical and psychological safety, and fear of learning), lack of motivation (e.g., sense of belongingness, hope, and outlook), and ineffective studying and learning process (e.g., vigorous assignments and examination with longer studying hours). Improvement interventions were initiated based on many ideas and concepts such as empathy, PLC, the 70–20–10 framework, the Open-loop Learning, and feedback. Improvement interventions since 2015 with con-

TABLE 9.5 Illustration of Issue 2 (Frequency of Physical, Verbal, and Psychological Bullying)

Circumstances		(1)	(2)	(3)	(4)	(5)
2.1	I am verbally abused, ridiculed, and harassed which contribute to my despair during a lesson.	1	2	3	4	5
2.2	I am ignored and prevented from class discussion, group participation, and play.	1	2	3	4	5
2.3	I am physically attacked or am isolated in a room.	1	2	3	4	5
2.4	Somebody makes up a story or a rumor about me and tries to spread it to others.	1	2	3	4	5
2.5	I have money or personal belongings taken or stolen from me.	1	2	3	4	5
2.6	I am harassed or am forced to perform a task against my will.	1	2	3	4	5
2.7	I am verbally abused or ridiculed due to my appearance, sexual preference, academic ability which contribute to my reluctance to go to school.	1	2	3	4	5

NOTES Column headings are as follows: (1) Never, (2) Happened 1–2 times, (3) Happened 2–3 times a month, (4) Once a week, (5) Happened 3–4 times a week.

TABLE 9.6 Illustration of Issue 3 (Frequency of Bullying through Mobile Phones, Computers, and Other Digital Devices)

Circumstances		(1)	(2)	(3)	(4)	(5)
3.1	I have experienced cyber bullying.	1	2	3	4	5
3.2	Somebody makes fun of me and my name and spread this through online.	1	2	3	4	5
3.3	Somebody uses a photo and creates a rumor about me, and spread this through online.	1	2	3	4	5
3.4	I have been intimidated or threatened through online.	1	2	3	4	5
3.5	I have been removed from a social or online group without my consent and have been prevented from joining.	1	2	3	4	5
3.6	Somebody has fabricated my identity which causes defamation and degradation.	1	2	3	4	5
3.7	Somebody has stolen my password and share confidential information which results in personal embarrassment and humiliation.	1	2	3	4	5

NOTES Column headings are as follows: (1) Never, (2) Happened 1–2 times, (3) Happened 2–3 times a month, (4) Once a week, (5) Happened 3–4 times a week.

structive feedback to support their implementations have been made and have resulted in many outcomes and insights.

First, from the previous findings, the disengaged learners noticed

and paid the attention to constructive feedback during their study. Initially, they had some reservation due to past experiences which had been mostly negative. During their time at school, the disengaged learners showed learning and motivation because they were able to improve or extend existing products developed from science experiments. They also showed the willingness to work as a team, consider with surrounding communities for experimental plan, and engage with FBC delegates.

Secondly, to support both studying and learning, it is essential to recognize the importance of safe and creative learning environment. Like a workplace, fear of learning has negative impacted not only on working but also learning. An inability to work and learn or study and learn helps accelerate the feeling of isolation and disengagement. In other words, school safety (for both physical and psychological aspects) is one of the major issues that needs to be considered. Constructive feedback has supported and sustained the implementation of improvement interventions since 2015. Feeling of safer learning environment due to informal learning and constructive feedback is perceptible based on the survey's findings. In addition, more positive attitude and mindset towards studying and learning are some of the outcomes from improvement interventions and constructive feedback.

References and Further Reading

Clardy, A. (2018). 70–20–10 and the dominance of informal learning: A fact in search of evidence. *Human Resource Development Review, 17*(2), 153–176.

Gomes, C., Kruguanska, S., Gouvea, I., Madruga, L., & Schuch, V. (2015). Conditioning factors for learning-oriented organizations. *International Journal of Innovation and Learning, 17*(4), 453–469.

Hislop, D., Bosley, S., Coombs, C., & Holland, J. (2014). The process of individual unlearning: A neglected topic in an under-researched field. *Management Learning, 45*(5), 540–560.

Johnson, S., Blackman D., & Buick, F. (2018). The 70:20:10 framework and the transfer of learning. *Human Resource Development Quarterly, 29*(4). 483–402.

Keller, J. (2010). *Motivational design for learning and performance: The ARCS model approach.* Springer.

Yamane, T. (1973). *Statistics: An introductory analysis* (3rd ed.). Harper and Row.

Chapter Ten

Future Research on Human Learning and Workplace

Highlights and Key Points

- Industrial engineers are expected to be a key contributor and promotor of human learning in a workplace. Learning has replaced training for sustaining labor productivity. This notion is highlighted by the 70–20–10 framework (with informal learning). Facilitating the improvement of workplace's productivity under learning diversity has been one of the main responsibilities of industrial engineers.
- Industrial engineers need to recognize that, in today business environment, learning is driven by a learner. Thus, the roles of industrial engineers need to shift from a knowledge provider to a learning facilitator (allowing and supporting learning to take place).
- Human learning is part of the transdisciplinary study which requires knowledge from psychology, education, and industrial engineering on human behavior. Feedback which has been embraced by industrial engineering since 1950s can play a very important role in enhancing working and learning of the workers.
- The critical skills for learning workers today are the ability to learn, to manage their learning, and to continuously apply new knowledge from learning to new and evolving situations at work—solving a problem, analyzing a problem, improving work processes, etc.
- Learning workers are more valuable to an organization because they can readily adapt to rapidly-changing business environment and workplace. External and constructive feedback have shown promising impacts on transforming the disengaged learners.
- Other relevant issues such as fear of learning and trust need to be considered when dealing with workplace disengagement. Note that some of the critical subjects, e.g., culture and leadership, are not part of the research but can affect how constructive feedback is delivered.
- Future research on human learning should include the issues relating to trust organizational culture, and leadership which affect the delivery of constructive feedback to the disengaged learners.

Industrial Engineering and Workforce Engagement

Productivity is the term that has always associated with industrial engineering from its inception in the early 1900s. One of the primary goals of industrial engineering is to continuously improve the level of productivity in a workplace. Being productive indicates higher cost competitiveness (due to a lower unit cost of operation and production) which is necessary for intense business environment. Productivity reflects what is generated or produced relatively to what is consumed such as materials, machinery, financial capital, and human capital. Productivity is simply the outputs divided by the inputs. Productivity improvement has resulted in a lower unit cost. When industrial engineering first started as a profession in the early 1900s, the time and motion study became one of the first techniques and practices which focused on increasing workforce's productivity. Time was adapted as a key indicator for productivity measurement. The aim was to decrease the amount of time to produce one output unit. Unnecessary motion and movement needed to be recorded and removed.

Industrial engineers further developed this improved motion and movement into a standard for all workers. Later, this work standard (or the best way) would be used for teaching and training. Then, work processes would become more stable and predictable which were important for planning and control. Physical needs of a workforce were addressed through rest, more balanced workload, and improved working environment. Economic needs or financial compensations were linked through the number of units produced. This was known as a piece rate system and was often referred to as a fair day's pay for a fair day's work. The prevailing sentiment at that time was to replace the "Rule of Thumb" (i.e., the decisions based on personal judgments and guesswork) in a workplace with a system which was fair to everyone. Industrial engineers were primarily responsible for learning and improvement in a workplace.

Thus, industrial engineers were required to engage with the workers through closed and repeated observations before developing the common work standards. Industrial engineers were expected to provide active supervision and consultation during teaching and training of the workers. This was to ensure compliance and uniformity of how work was to be performed. This led to an early success in productivity improvement for an organization and attractive financial compensation

to the workers. Industrial engineers played a role of learning while a worker was to be trained and follow a standard. Little inputs from the workers were acquired as they were expected to perform the tasks.

Later, the work and its related tasks began to shift to more diverse and dynamics at a higher rapid rate. The shift required the workers to adjust their roles and to deal with new expectations in a workplace. In addition, this development of work indicated that technical skills and knowledge were no longer sufficient to achieve this new expectation. Performing current and future work successfully would require the workers to not only have knowledge and expertise to perform the tasks but would also possess learning capability. This shift was needed to ensure continuous improvement in a workplace. During the past decade, it appears that this expectation is more common for all different types of work. Apparently, this convergence (of working and learning concurrently) in a workplace is unavoidable.

The new business environment has compelled industrial engineers to reevaluate how they deal with the workers for productivity improvement. Industrial engineers should not and cannot expect to organize a training session for the workers on learning. It is simply not possible since learning is not a standalone subject. Learning is now part of performing the tasks. In addition, motivation to learn is more conceptual and requires the recognition of learning diversity and workplace behavior. Because of this shift, a learning worker becomes a commonly-used expression for a worker today.

The shift of workplace's expectation has imposed a fundamental question about the roles and contributions from industrial engineers. Assuring that working and learning are concurrently undertaken in a workplace is very challenging due to how individual workers view and feel about their workplace. Workplace disengagement is often cited as one of the key factors in preventing effective learning among individual workers. This disengagement can stem from many factors, especially unsafe learning environment and lack of learning motivation. A failure to recognize how the individuals can learn, unlearn, and relearn is often cited for workplace disengagement. Dealing with human learning can be difficult since the subject involves many disciplines and is often viewed as a transdisciplinary study.

For industrial engineers to be relevant in both learning and productivity improvement, there is a need to recognize that a uniform view of work and worker is no longer applicable. Nowadays, a person is

expected to perform multitask within a workplace. This has imposed the urgency on learning in a workplace. Instead of the standardization of work, it is believed that current and future work will be more customized. Thus, industrial engineers need to understand about the limitations of training which is adequate when the workers are expected to perform the similar or repeated tasks. Customization of work will require industrial engineers to focus more on how the workers learn instead of assuring that the workers undergo training and follow a work standard.

The diversity of a workforce highlights the need for industrial engineers to shift their paradigm on the homogeneousness of the workers. The prevailing paradigm overlooks the need to customize learning for individual workers. There are generally three groups of workers—engaged, non-engaged, and disengaged. How to deal with the non-engaged and disengaged groups becomes essential for achieving continuous improvement in workplace's productivity. On the other hand, how to handle engaged workers should not be adapted for non-engaged and disengaged workers. This requires industrial engineers to be more empathetic with the workers. Transforming the disengaged or non-engaged workers has been expected from industrial engineers.

Due to an emerging convergence of work, learning and motivation to learn need to be facilitated in an organization. Since, training alone is not sufficient, industrial engineers are expected to search for a creative way to blend learning into a workplace. Learning helps fulfill the talent's potential possessed by the individual workers. The reason is that an underutilization of the talents (as well as skills, knowledge, and motivation of a worker) has been recognized as organizational waste. It is important to point out that training is not learning since an individual can learn without training such as hands-on experience, coaching, exchanges of ideas and feedback, etc.

While training represents primarily one-way communication (i.e., training and following), learning symbolizes two-way communication. Training has been commonly practiced in various methods such as face-to-face, e-Learning, blended learning, etc. Training's common success factors include qualified instructors, more interactive and fun environment, vigorous assessment through pre- and post-test, follow-up evaluation, etc. For current business environment and circumstance, the workers are expected to learn as learning becomes part of work. However, learning can be neither taught nor trained in a classroom.

Therefore, learning needs to be facilitated which has become one of the primary responsibilities of industrial engineers today.

Given the current diversity of an organization's workforce, how individual workers learn needs to be carefully examined. Reinvigorating or rejuvenating the non-engaged or disengaged workers becomes the priority for many organizations. An engaged worker is viewed as an active learner. Thus, their learning capability and motivation to learn are not a problem. However, when viewing non-engaged and disengaged workers, the lack of both issues can be detrimental to an organization. Without these two characteristics, it is difficult to sustain productivity improvement in a workplace. As a matter of fact, for the past twenty years, there have been many studies which consistently indicate the pressing need to transform and reinvigorate the workers who feel disenfranchised in a workplace due to the negative impacts from workplace disengagement (Rick, 2012). This highlights the importance of engagement and its impacts on the productivity and performance of individual workers and workplaces which can be described as follows:

- In 2003, the study shows that more-engaged employees have a 51% higher productivity rate than less-engaged employees.
- In 2006, the study shows that engaged employees have been known to outperform disengaged employees by nearly 28%.
- In 2009, the study shows that companies with a higher level of employee engagement have a 9% higher shareholder return.
- In 2009, the study shows that 80% of employees with a higher level of trust in their management are more committed to the business, compared to the 25% who have a lower degree of trust in management.
- In 2011, the study shows that, on average, people more engaged with their job are absent 3.5 fewer days than those who are disengaged.
- In 2015, the study shows a high level of workplace engagement is translated to 22% higher productivity.
- In 2018, the survey shows that engaged workers are 37% less absenteeism and turnover, 48% fewer safety-related incidents, 41% fewer product defects, and 21% higher productivity.

Engaged workers imply that they feel passionate about the work, put a great of efforts into the work, are committed to a workplace, continu-

ously enjoy learning and improving work processes, and share the ideas and thoughts on work improvement with the colleagues. It is important to point out that employee engagement is not employee satisfaction. The term satisfaction merely indicates how happy or content a person is at work. However, this term does not consider his or her level of willingness to meet or fulfill learning expected from a workplace. In addition, job satisfaction does not evaluate the motivation to learn, and the emotional commitment needed to try and understand new tasks or work. Thus, a satisfied worker can also be non-engaged who may not contribute productively to a workplace.

It is also critical to point out that, on the contrary to a prevailing paradigm in a workplace today, most workers have clearly expressed their willingness to learn (not necessarily train) more. Currently, they neither perceive nor believe that completing the tasks is just work. 86% of worker identify learning as one of the most important opportunities that their workplace should provide to compliment with their work (Walda, 2019). This premise provides a great chance for industrial engineers to view learning as an integral part of work. An opportunity to learn can indicate the sese of belongingness, pride, and self-actualization. The reason is that this opportunity shows trust and openness by an organization to embrace the workers' ideas and suggestions as human capital.

Development and Delivery of Feedback and Research Experiment

The effectiveness of workplace engagement compels industrial engineers to be innovative and creative in many ways. There is generally an awareness of the impacts from the commitment to engage on workforce's productivity and an organization's performance. This awareness includes the importance of motivation, safe working environment, learning strategy with peers and hands-on experiences, empathy, and development and delivery of constructive feedback. For a worker to be engaged, observing his or her behavior and interactions with the peers is essential, especially how he or she works towards an organization's business goals and objectives. The reason is a recent realization of the positive impacts from informal learning on productivity and performance of the workers—learning from peers, feedback from colleagues, interactions with suppliers and customers, learning from mistakes, etc. An engaged worker often learns to adapt and improve how the work is performed and what his or her roles should be. This is possible be-

TABLE 10.1 Comparison of Industrial Engineering's Roles and Paradigm

Subject	Traditional Roles/Paradigm	Emerging Roles/Paradigm
Workforce	Uniformity so there is need to develop one-best-way to perform the tasks. Selection of a worker reflecting an important decision to ensure the compatibility between work and qualification. Skills, expertise, and knowledge representing an asset for human capital. Reference as blue-, white-, and knowledge workers	Diversity based on workplace engagement so adapting to this diversity require the individualized view of workers. Facilitating learning as part of human capital development. Learning becoming an asset for human capital as skills, expertise, and knowledge can quickly become obsolete due to the nature of work. Reference as learning worker.
Work	Specialization at work with specific needs of skills, expertise, and knowledge for completion	Multitask with rapid changes at work (and the nature of work). Brisk pace of change
Expectation of Workers	Completing the tasks productively	Completing the tasks productively and learning while performing the tasks for future improvement
Development of Workers	Providing training and education	Facilitating learning

cause of clarity and understanding of an organization's business goals and objectives.

Continuous feedback (when properly designed and delivered) need to be differentiated from evaluation and appraisal. Feedback needs to help a worker adapts and improves his or her work, increases a level of motivation, boosts self-confidence, and shows how he or she is valued by an organization. This feedback can be both explicit (e.g., continuous conversations) and implicit (e.g., repeated visits). Feedback can be applied with the integration of the Double-loop Learning concept. Providing feedback should be viewed as part of day-to-day activities of an organization's management since feedback and workplace engagement are closely associated. To develop effective feedback, industrial engineers need to ask the following questions.

- Are an organization's goals and visions clearly described?
- Do the workers understand these goals and visions?
- Do the workers understand how their work relate and contribute to these goals and visions?

- Do the workers recognize how their work can impact on the success of an organization?
- Are the workers regularly communicated through constant feedback which is not part of performance evaluation and appraisal?
- Do the workers feel that they learn something about their work?
- Does current feedback and how it is delivered take into the consideration of a worker's motivation?

Industrial engineers need to also consider how constructive feedback should be delivered. In this research, the roles of FBC are clearly defined due to its status as an external entity. Feedback is a critical part of system thinking which has been embedded in industrial engineering's concepts and practices for the past several decades. Constructive feedback was chosen because it would allow an external entity to take part while the teacher maintained their position and jurisdiction. This is essential since, in a workplace, feedback often takes place between a supervisor and individual workers. An external entity provides a source of needed motivation and excitement for continuous learning for the disengaged learners.

The Hawthorne Effects needs to be recognized for a research relating to human behavior. For this reason, a school was chosen for the research since repeated observation could be made over a long period of time. In addition, there were many similarities between a school and a workplace. Both places were faced with the disengaged feeling from the learners (i.e., students in a school and workers in a workplace). Moreover, safe learning environment was deemed to be a foundation for learning (and development). Whether it was a student or a worker, he or she was expected to perform the tasks (in a classroom or laboratory and a workplace) and to learn about the tasks to improve a performance level or to adapt to new tasks. Evaluation and appraisal were regularly conducted relating to performance. Lack of constructive feedback was also common in both school and workplace as most supervisors did not differentiate between feedback and assessment/evaluation.

Key issues and consideration factors based on the research can be summarized as follows:

- The research began in 2015 and has continue until the present. The use of feedback is to support and sustain improvement in-

terventions initiated and implemented for classroom and laboratory work.

- Improvement interventions attempt to incorporate PLC as part of informal learning (i.e., the 70–20–10 framework) into how a disengaged learner studies and learns, to tackle unsafe learning environment, to help the learners feel more positive about themselves (i.e., belongingness and hope). More importantly, science experiments would be conducted outdoor more often and would recognize a product as part of an experimental report. Product can later be sold in a market for needed income.
- Ongoing attributes that have caused the feeling of disengagement include the following. The lessons are not perceived to be relevant. The methods in delivering the lessons are neither inspiring nor interactive. The evaluation does not focus on the future.
- Understanding of the disengagement feeling is important for the development and delivery of constructive feedback. For instance, the learners become disengaged since the subjects are not relevant to their future career. The learners need extra income and often look for an employment opportunity after school. Due to a lack of affordability, they will unlikely continue their education after completing their basic education.
- Constructive feedback integrates an external entity (i.e., FBC). This external entity is expected to bring more excitement and needed business experiences to the disengaged learners.
- Constructive feedback is developed in accordance with the Open-loop Learning.
- Constructive feedback, in the survey studies, consists of two categories—direct/explicit (between the teachers and the disengaged learners) and indirect/implicit (between the external entity and the disengaged learners). For the survey, the direct category is referred to as constructive feedback while the indirect category is denoted as indirect feedback.
- Continuity of constructive feedback is important due to trust and past negative experiences from the learners.
- Delivery of constructive feedback requires strong collaboration with the teachers. Within the context of a workplace, this indicates the need to work with the supervisors or managers.

Feedback and Quality of Work Life

Based on research experiments since 2015, there are many highlights on constructive feedback for industrial engineers. Despite the notion that the disengaged learners refuse to study and learn at school, the observations have shown the opposing results. They entice and react positively to constructive feedback and are willing to study (e.g., completing their experimental work) and learn (e.g., providing a suggestion on how to improve or extend a product from science experiment). The development of this constructive feedback is influenced by the insights into the disengaged learners' pain points. With constructive feedback is constantly communicated, the disengaged learners become motivated to learn. They have actively interacted with each other more through idea and experience sharing on product improvement and extension. Having their attention and is essential for learning and subsequently motivation.

Based on the experiences from the two schools, it is important that industrial engineers need to gain more awareness into the pain points of an organization's workforce. Empathy is important for feedback's development and delivery. Applying constructive feedback from an external source has proven to be very helpful. The use of an external source has enticed the attention of and positive reactions from the disengaged learners. Positive feeling about themselves (e.g., their interaction and enthusiasm) during FBC workshops and sponsored activities for product improvement and extension during the past five years can be visibly noticed. In other words, constructive feedback represents a message—implying that they have been doing things right which is to follow an instruction to study and to learn.

Constructive feedback (through the study visits) helps the disengaged learners appreciate the work that they have achieved. It reflects the endorsement of their learning efforts—implying doing the right things which shows the initiatives in improving and extending the products. Constructive feedback helps strengthen the intensity of learning which can be demonstrated by a series of creative ideas and experiments. More importantly, the disengaged learners expressed the feeling to reach out to a surrounding community based on their science experiments. This symbolizes an improvement of confidence and sense of belongingness.

Constructive feedback should not be used as a standalone initiative. The clarity on the feedback's purpose needs to be carefully con-

sidered. For instance, it was clear that feedback needs: (1) to inform the progress made by the learners (teacher and student), (2) to encourage the learners to change their mindset (FBC and student through a study visit), (3) to express the appreciation of and support on product development (FBC and student through an invitation to display), (4) to foster PLC (FBC and student through a workshop), etc. This clarity has contributed to positive feeling among the disengaged learners which can be attributed by safer learning environment, higher confidence, more friendly relationship with peers, better attitude towards surrounding communities, etc.

From the research's implications, feedback should be carefully based on the empathy identified with and agreed by the intended receivers (i.e., the disengaged learners). Feedback with proper delivery to these receivers should strengthen their confidence and sense of belongingness. Feedback has enhanced positive feeling that a learner has with his or her work and a workplace—quality of work life. Many previous studies have supported the impacts from better quality of work life and higher workplace engagement on less absenteeism and turnovers. More importantly, positive quality of work life can contribute to a higher level of productivity for the individuals and a workplace.

Quality of Work Life and Motivation to Learn

One of the important outcomes from the research is the influence of constructive feedback on the motivation to learn among the disengaged learners. The reactions to constructive feedback by the disengaged learners show that learning can still take place despite their attitude, behavior, and past negative experiences at school. The concept of feedback has underlined two significant issues when working with the disengaged learners. The first issue relates to learning and motivation. There have been three types of positive feeling which signify the motivation to learn. These feelings reflect improved quality of work life and have contributed to a higher level of motivation and commitment. They can be summarized as follows.

- Feeling of belongingness through continuous interactions with peers and colleagues based on a common or shared goal which is product development (including improvement and extension), as this development contributes to the needed extra income.

- Feeing of recognition through ongoing activities organized by an external entity, especially workshops to improve and extend the products, and invitations to display and sell these products at an international event.
- Feeling of self-actualization through study visits which corresponds to the second loop within the Open-loop Learning since it challenges the mindset of the disengaged learners about their future (which should not be defined by family background, school reputation, perceived underachievement by the academic grades and national assessments).

The second issue is the perception that there is a serious lack of the willingness to learn among the disengaged learners. It is important to point out that the willingness to learn is closely related to the motivation to learn. The willingness to learn needs to be constantly driven by the motivation. The challenge in the willingness and motivation to learn cannot be evaluated directly by a grade or a report card. Repeated observations and interactions should be employed to ensure both the willingness and motivation exist in a workplace.

For the two BMA schools, the disengaged learners have consistently demonstrated the willingness and motivation to learn by coming up and sharing their creative ideas with others on product improvement and extension. Also, these disengaged learners can make various suggestions on how to further improve science experiments. Like in a workplace, the willingness and motivation to learn cannot be judged by performance appraisal and/or a test score in a training session. This is the reason for the emerging interests of feedback as an enable for workplace engagement.

Based on the research's findings, the disengaged learners cannot not be interpreted as slow or disable learners. Disengagement often relates to negative feeling and poor perception of a person about a workplace. Disengagement is not usually related to learning disability. In fact, some studies contribute the beginning of workplace disengagement to poor quality of work life. Disengagement every so often starts with the feeling of isolation, sense of no direction, and unsafe learning environment. This feeling is primarily caused by a lack of two-way communication and sufficient feedback. Disengaged workers regularly perceive their roles mainly on completing their work and ignore the need to learn and improve. They misguidedly believe that learning is training; thus, informal learning is not seriously considered.

This is the premise that industrial engineers need to tackle so that better utilization a workplace's talents can be achieved. Workplace disengagement has become a critical challenge for most organizations during the past decade. In this research, by recognizing and understanding the root causes of the disengagement, constructive feedback and many improvement interventions are proven to be effective which help strengthen positive feeling among the disengaged learners.

The impacts from improved quality of work life on learning can be demonstrated as follows. There are many creative ideas generated by the disengaged learners to develop new products and extend existing products. These ideas are driven by the workshops conducted by an external entity. Initially, FBC delegates presumed that the students might not be interested in learning. They perceived that most would not react to constructive feedback.

Interestingly, during and after the workshops (which aimed to blend soft skills and creativity as well as other essential skills for employability such as listening, critical thinking and reasoning), the disengaged learners reacted very positively and became engaged during their participation. For learning, they proved that it was not about whether they had learning capability, but it was more about: (1) an opportunity to learn safely and collaboratively, (2) what to learn—relevance and practicality, (3) how learning contents were delivered—PLC and constructive feedback from an external entity, and (4) how learning can be sustained—trust. Thus, the motivation to learn is not about a person's ability. It is derived from a person's positive feeling and attitude at work.

Key Lessons from the Research for Productive Workplace

Becoming a productive workplace depends on many factors. Despite the focus on digital technology, the importance of human learning cannot be simply overlooked. When looking at a workplace today or in the future, constant and rapid changes (in just about everything) can be expected. These changes require the ability of an organization to be adaptive which needs the willingness and motivation to learn from everybody (and not just the executives and the persons in a human resource unit). The ongoing pandemic of COVID-19 highlights the need to recognize the importance of continuous learning. The reason is that successful practices that have been performed over the past several decades are no longer effective. They cannot assure business survival and success, given many unexpected disruptions.

For instance, a lockdown has negatively affected supply chain operations for all industries, especially automotive industry with extensive global operations. A travel restriction has gravely disrupted the aviation industry. Work-from-home has impacted coordination and collaboration among team members from different locations. The concept of lean operations is being seriously tested and challenged which have accelerated the call for drastic changes in business operations. In addition to the pandemic, many natural disasters have negatively disrupted the global operations. Waiting for an instruction or an initiative from top management alone is not an option anymore in an organization during Industry 4.0. Soliciting the workers' ideas and creativity constantly helps reduce the impacts from unforeseeable disruptions. This also helps tackle the underutilization of the talents in a workplace. Reducing this waste should be the priority for all organizations.

During the past a few decades, productive workplace has been about how efficient the workers can perform the tasks with the application of automation and computer technology. These workers need to be systematically trained in accordance with knowledge management, especially knowledge sharing and transfer. But, in an era of Industry 4.0, they need to constantly learn about these tasks and try to achieve better performance by their own initiatives. They are expected to become more participative and creative in how they need to work in a new business environment.

This practice of asking the workers to learn from their work (e.g., mistakes made a day before) and to suggest how to improve has been continuously performed by many Japanese firms (in reference to Kaizen). The emerging development of work convergence (i.e., a person regardless of the type of work is required to perform and learn at the same time) and the popular description of a learning worker have underlined the importance of human learning for industrial engineering for many decades to come. This signifies that learning is the responsibility of everyone in an organization. And industrial engineers need to constantly improve how learning can be continuously facilitated in a workplace.

In the research, the focus is on how to develop and deliver constructive feedback to be used as the catalyst for performing and learning of the workers within an organization. Feedback is viewed as an enable for the willingness and motivation to learn. Feedback has been instrumental in industrial engineering's work and practices since its inception. Time study was and is still today a reflection of useful feedback

for the workers and the supervisors and engineers. This productivity measurement provided valuable information to manage an organization's performance from an individual to operational level. Even when designing a system (e.g., a car), feedback for human sensory is critical since how a person reacts to feedback impact on safety and driving behavior. Coupled with empathy, a delivery of feedback from an external source could potentially bring excitement which the workers who feel disenfranchised from a workplace can overcome their previously negative experiences.

After repeated observations and survey studies during the past five years, constructive feedback with an external entity has in fact contributed to learning (in addition to performing the tasks) among the disengaged learners. Simply put, transforming disengaged to engaged workforce in an organization requires constant flows and exchanges of feedback (from its contents and purposes as well as how it is delivered). Feedback should be comprehensively developed which deals with a worker, work, and working environment. The key conclusions from the research can be summarized as follows.

- Constructive feedback helps communicate the expectation of a workplace (e.g., what to expect from science education, especially with science experiments).
- Constructive feedback helps sustain the use of PLC which emphasizes learning by teaching and learning by working together among peers and colleagues from the 70–20–10 framework.
- Constructive feedback helps support ongoing improvement interventions such as outdoor experiment and new product development by increasing the level of attention and motivation.
- Constructive feedback helps overcome fear of learning by tackling unsafe learning environment which hinder group interactions and peer learning. Constructive feedback demonstrates the appreciation of behavioral changes that have taken place.
- Constructive feedback can be a stimulus which helps motivate studying and learning by instilling confidence of their activities and work (whether doing things right or doing the right things) as illustrated by the Open-loop Learning.
- Constructive feedback needs to be carefully developed by understanding the pain points of the learners (part of empathy which is often used in Design Thinking) and incorporating an

external entity (bringing some sense of excitement which differ from regular practices) to strengthen the routine interactions between a supervisor (or a manager) and a worker. Being consistent with how constructive feedback is delivered is critical.

- Constructive feedback can initially be indirect or implicit to help gain more trust from the disengaged learners.
- When using constructive feedback with the disengaged workforce, it is important to be patient as it takes time to overcome a lack of trust and to witness behavioral changes (from paying to attention to the feedback to being willing and motivated to learn by feedback).
- When a workplace is engaged, positive changes can be expected within the context of behavior, interactions, working relationships, working environment, and quality of work.

Future Research and Conclusion

Industrial engineering and productive workplace are closely associated and interrelated. Since its inception into the engineering discipline in the early 1900s, industrial engineering has always been known for scientific management. Scientific management deals primarily with productivity improvement in a workplace. It focuses on time study, motion economy, standardization of the best-way-to-perform work, training, payment based on a standard piece rate, and continuous improvement. This practice has influenced the subsequent studies and activities undertaken by industrial engineers who often view feedback as part of productivity and performance improvement. As business environment and circumstance become more complex, dealing with productivity improvement needs to be reexamined and adapted to the present.

A traditional categorization of the workers into blue-, white-, and knowledge groups is becoming less relevant. Industrial engineers have applied motion and time study through financial incentives to work with blue-collar workers while have utilized financial and non-financial incentives with the use of digital technology to help improve white-collar workers. For knowledge work, the efforts have been on knowledge sharing and transfer (e.g., mentoring and coaching). The knowledge (e.g., data and information, expertise, and experience) is presumed to be an asset needed in a workplace. And training and education are critical to continuously strengthen this knowledge.

As a problem facing a workplace becomes more complex and wicked, existing knowledge may not be applicable in a current condition. For instance, the present pandemic is raising many questions about existing practices (e.g., lean operations and zero inventory). It practically alters most operations within an organization (e.g., work-from-home and workplace digitization). Given this complexity and uncertainty, the workers regardless of the type of work are expected not only to perform their tasks but also to learn and adapt with a new working environment. This is the reason that they are today being referred to as a learning worker.

For an organization to operate successfully in an era of Industry 4.0, instigating and sustaining productivity improvement for learning workers become one of its primary goals. Despite its importance, human learning and performance are still relatively new and still evolving. This is due to the nature of human behavior which needs to incorporate many tangible and intangible factors. In this text, based on the research conducted during 2015–2020, the focus has been on the development and delivery of constructive feedback for learning. Feedback is also part of an effort to increase a level of motivation which is needed to help maintain the engagement with a worker. Constructive feedback through an external entity's participation has provided a promising result that learning can be sustained in an organization.

The research also reveals the importance of and the effects from learning environment on supporting workplace learning. This is very significant for industrial engineers since improving the balance among a worker, work and working environment has been part of this profession. Occupational safety and health incorporate physical and psychological readiness of a worker. Work itself needs to balance with this readiness, so called a work-life balance or quality of work life. To ensure productive working environment, industrial engineers have traditionally paid a great deal of attention on sensory (e.g., lighting and noise), physiology (e.g., temperature, humidity, workload, working hours, stress, etc.), and psychology (e.g., use of colors/plants/painting, incentives, and training and education). Note that color psychology has examined how different colors stimulate different moods and feelings of a worker. Today, current efforts on improving working environment are now different due to an emerging importance of informal learning. Thus, working environment currently needs to support learning with others and through hands-on experiences.

More investigations should be further conducted into the impacts from working or learning environment on quality and speed of learning. This future research is important whether it is for disengaged and engaged workers. It is believed that learning environment should be viewed as another enable for supporting workplace engagement. The reason is that learning environment can affect the psychological well-being of a worker. According to the Two-factor Theory (or Herzberg's Motivation-hygiene Theory), having safe learning environment can be perceived as a hygiene factor. A lack of learning can be clearly attributed to unsafe learning environment as earlier discussed (e.g., harassment and bullying, and being fearful to learn). To ensure effective workplace learning, this negative impact needs be removed. Future experiments can include an examination into what constitutes creative (or positive) learning environment. This is to extend from this research which mainly focused on the negative aspect of learning environment.

Given this development, industrial engineers need to recognize that learning is an individualized process. It differs from training which can be standardized. Learning deals with human behavior and feeling so empathy, trust, communication, and motivation are essential. As indicated earlier, instead of focusing entirely on traditional waste within a workplace for lean operations, the underutilization of the talents has become a priority for many organizations. This notion has been highlighted by the Balanced Scorecard which recognizes that learning and growth are the foundation for better internal business and operational processes which subsequently improve customer and financial success of an organization.

Thus, future research can focus on the roles of informal learning within an organization. Informal learning appears to inject more fun and can take place at the individuals' preferred pace. Informal learning helps the workers mentally because they and their peers are allowed to share certain expertise and skills that are needed for task or work completion. They do not have to wait for a survey on a training need and then to pause for a training program to be budgeted and organized. Informal learning views that the workers can learn something based on what they perceive to be useful for their work. Therefore, informal learning can be spontaneous, unexpected, and timely. This is major advantage of informal learning over formal training. Moreover, unlike formal training, informal learning does not have a clear methodology. Industrial engineers need to understand that learning should help in-

crease fundamental knowledge on work, expose to new techniques and methods at work, and strengthen two-way communication for future work improvement. Instead of arranging a training session on learning, industrial engineers should continue to work on finding a suitable way to facilitate learning.

Finally for future research, dealing with learning workers successfully require industrial engineers to recognize the possible impacts from feedback on psychological capital (Grabarek, 2018). Constructive feedback and PLC can potentially contribute positively to psychological capital for a worker. Psychological capital refers to a set of resources a worker needs to have so that he or she can continuously improve his or her performance at work. There are four different resources in this term— self-efficacy, optimism, hope, and resilience. In reference to performance management, psychological capital is essential for learning and growth. And, learning and growth are the foundation for achieving excellent performance (i.e., productive internal business processes, quality and innovation of products and services for customers, and long-term profitability for an organization).

For self-efficacy, it refers to a person's confidence to deal with and overcome the difficult challenges at work. For optimism, it means an expectation of positive outcomes from working and learning. A worker with optimism is often motivated to work and improve how he or she works towards organizational goals. For hope, it indicates a circumstance that a worker can develop various alternatives to complete the work if his or her first attempt fails. Hope implies the ability to learn and adjust how the tasks are performed. For resilience, it illustrates the ability for a worker to continuously improve from current and potential challenges at work. This challenge can include a failure during work that a worker has experienced. A resilient worker has learning capability to adapt to changing situations and business environment successfully. Future research on how constructive feedback and PLC through informal learning and the Double-loop Learning influence the level of psychological capital for individual workers should be examined.

For the research's limitations, despite workplace disengagement is regarded as transdisciplinary, the use of feedback represents the focal point of the research. Feedback is fundamental for the overall philosophy and practice of engineering. There are several issues such as organizational structure and chain of command as well as organizational culture and leadership which have been excluded. These issues

can potentially be a strong contributor to effective workplace learning and worker's development, especially when delivering constructive feedback.

During the research's experiment, there have been fruitful collaboration and partnership with the teachers. Therefore, these issues were neither considered nor explicitly integrated into the research setting and experiment. In addition, more insights into how trusts play a role in overcoming poor experiences in a workplace will be critical for the development and delivery of constructive feedback. Trust can be an important mechanism to reinforce a continuous use of constructive feedback in a workplace.

By unlocking the roadblocks to learning capability and motivation of human capital, an organization in the future can be ready to face any dramatic shift in its business circumstance and environment. There have been more frequent occurrences of unexpected events that have negative impacts on an organization's operations, so called the black swan events. For instance, global businesses have had to deal with volcanic eruptions floods, earthquakes, tsunamis, geopolitical conflicts, and pandemics over the past two decades, while maintaining high performance and competitiveness. Constant revisits on how learning workers learn and how to sustain their performance at work are needed as human learning and performance are a long journey without having one perfect or absolute solution. Thus, the subjects and research relating to human learning are expected to be part of the essential research for industrial engineers for years to come.

Discussion Topics for Self-Reflection on Human Learning and Performance

1. Within the context of Industry 4.0, why should a worker today be viewed as a learner? How does it reflect the need to better utilize the talents in a workplace? Hint: define the term talents and explore the term underutilization carefully so that these definitions and scope can connect with the term learner.
2. How should an organization differentiate between work capability (to perform a task) and learning capability (to improve a task that has been performed)? Hint: this differentiation can focus on skills needed for work and learning capabilities.
3. Many organizations are faced with handling and anticipating

customer experiences. Nevertheless. According to the report *Experience is Everything: Here's How to Get It Right* (PWC, 2018), technology cannot solve customer experience problems. It is only an enabler. How does this notion encourage more learning in a workplace? Hint: examine the term Customer Delight and how individual interactions provide an opportunity to learn about customers.

4. What are the challenges facing the design and development of a training program which deals with the title of "how to learn" for an organization's workforce? Hint: discuss these challenges within the context of the 70–20–10 framework.
5. What are the differences between "Doing the things right" and "Doing the right things" when a person completes his or her tasks at work? Hint: discuss these differences within the context of the type of feedback needed that can resonate with this person as a feedback receiver.
6. What are the differences between "Knowledge worker" and "Learning worker"? Hint: discuss the shift from the knowledge to learning as an asset within the context of Industry 4.0—rapid changes in technology, regulatory requirements, customer expectations, competition, etc.
7. Based on several surveys, the following findings are highlighted. 37% of supervisors/managers/engineers are not comfortable in giving constructive feedback to their staffs/workers. Only 58% of supervisors/managers/engineers believe they have given sufficient feedback to their staffs/workers on a regular basis. What should be suggested to these supervisors/managers/engineers when they try to develop and deliver constructive feedback to their staffs? Hint: discuss your thoughts within the context of the research described earlier in this text.
8. Commonly, there are many factors (that an organization can control such as workflows, working environment, motivation, and opportunity to interact with stakeholders) which affect value-added productivity. Explain how feedback can specifically support one of these factors when improving value-added productivity. Hint: develop a scenario to illustrate your response. Or develop a diagram that exhibits the cause-and-effect relationships from feedback to the term value-added.

9. The following suggestion reflects continuous seriousness for workplace engagement (which can inevitably affect productivity management within an organization). This suggestion proposes the need to separate the spectrum of learning workers into five categories- disrupted, disengaged, non-engaged, engaged, and inspired. This represents the extension from the initial spectrum which consists of disengaged, non-engaged, and engaged groups. Given the current business environment in which more complex and wicked problems are emerging, what can be the potential benefits for future development and delivery of feedback in a workplace? Hint: consider the thoughts on the behavior and motivation of a worker in each of the five categories.
10. Based on recent studies, the following findings are highlighted. The workers spend about 35% on an average of their time in the activities in which they can learn and improve. Over 80% of the workers participate some forms of informal learning activities. What should an industrial engineer presume about learning in a workplace by a worker today? Hint: discuss your thoughts on the willingness and motivation to learn.
11. From the following statement ("Knowledge is a commodity, to be the smartest person in the room all you need is a smartphone. What is far more valuable than knowledge is the ability to learn new things and apply those learnings to new scenarios and environments. This is what the employee of the future needs to focus on, learning to learn." From Center for Learning and Performance Technologies), how should an industrial engineer switch the focus from training to learning as part of productivity improvement and management? Hint: consider work convergence into the response.
12. Develop your research model by: (10.1) determining and identifying the key variables (or components), (10.2) determining the cause-and-effect relationships between/among the variables, and (10.3) determining what you (as an industrial engineer) would like to see as an outcome of the research model, given the following facts and results.[1]

1. See https://www.clearcompany.com/employee-engagement.

a) Workplace engagement can be enabled by expectation, encouragement, environment, and feedback.
b) 43% of highly-engaged employees/workers receive feedback at least once a week.
c) 67% of employees/workers whose managers focus on their strengths (i.e., positive feedback) are highly-engaged in a workplace.
d) 65% of employees/workers say they want more feedback on their work.
e) 57% of employees/workers say that want more corrective information as part of feedback instead of praise.
f) 92% of employees/workers agree that the negative contents in the feedback, when delivered correctly, is an effective way to improve their work's performance.
g) 80% of newly-hired employees/workers prefer on-the-spot feedback over formal reviews.
h) The level of employee/worker engagement increases when they receive more honest feedback.
i) Work units with the top quartile based on the number of highly-engaged workers consistent outperform the bottom-quartile units in safety accidents (less than by 48%), quality defects (less than by 41%), productivity (higher than by 21%), profitability (higher than by 22%), and customer rating (higher than by 10%).

References and Further Reading

Grabarek, P. (2018, 10 December). *What is psychological capital?* Workr Beeing. https://workrbeeing.com/2018/12/10/psychological-capital/

PwC. (2018). *Experience is everything: Here's how to get it right.* https://www.pwc.com/us/en/advisory-services/publications/consumer-intelligence-series/pwc-consumer-intelligence-series-customer-experience.pdf

Rick, T. (2012, 3 April). *Top 10+ reasons why employee engagement is important.* Meliorate. https://www.torbenrick.eu/blog/leadership/10-reasons-why-employee-engagement-is-important/

Walda, M. (2019, 12 June). *The impact of employee engagement on productivity, retention & more.* Wrike. https://www.wrike.com/blog/employee-engagement-productivity-retention/

Final Remarks

The book is based on the author's research and personal interests in the areas of human learning, productivity, and performance. Human learning has become essential for managing the productivity in a workplace and an organization today. Human learning is regarded as the foundation for business success and long-term competitiveness. Tackling the underutilization of the talents within an organization is a long-standing challenge for and requires strong commitment from the researchers and the practitioners alike. I strongly believe that this subject will be critical for all organizations whether they operate in the private, public, or social sectors. For the private firms, learning helps maintain creativity and innovation. For the public agencies, learning indicates more efficiency for public service delivery. For the social organizations, learning means higher cost-effective operations and more resourceful to support the operations.

I have been fortunate to witness this trend globally through the discussions and conversations with many academicians, scholars, and colleagues from various places within Thailand and around the world. For many, human learning helps sustain digital integration into a workplace. This is because digital technology is only a supporting mechanism for people to perform their tasks better and allow an opportunity to learn faster. Technology has been a substitute for the workers in many operations but, unfortunately, technology cannot be used for learning on all activities. People themselves still need to learn and improve their tasks. That is the reason why they are called learning workers.

In a current business environment, an organization needs to be able to deal with and overcome complex and wicked problems very quickly. In the past, overlooking the talents of its workforce did not pose a serious problem to an organization as the use of digital technology and external experts were adequate. Given more frequent business disruptions such as pandemics and natural disasters as well as more integrated globalized value chains during the past two decades, training and education are viewed to be too reactive. They do not allow an organization sufficient time to prepare and respond. Human learning in a workplace is believed to be a way to help tap the workforce's talents

(and one of the most important talents for an individual is learning capability). Although it may appear to be simple, learning can be a serious challenge to an organization due to the diversity of the workers: engaged, non-engaged, and disengaged. Unfortunately, the current proportion of non-engaged and disengaged workers outnumbers the engaged ones. Note that a high-performance organization needs to maintain the ratio of 4 to 1 for engaged to disengaged workers.

Even though the waste of human potential and talents was not originally part of the operational wastes advocated by the Toyota Production System, many executives and engineers recognize its significance to the achievement and sustainability of excellent performance. This waste focuses on unused workforce talent, especially learning (to solve a problem or to be creative in coming up with a new way to work). The waste of the talents in an organization takes place when the perceived roles of the workers are to merely follow the instruction and execute the work as planned. Whereas, the executives, managers, and engineers are responsible for planning, analyzing, innovating, and improving work and operational processes.

By separating the workers from their knowledge, expertise, and experiences; it is difficult to improve the productivity and performance of an organization. For instance, in the office, non-utilized talent is as follows: not providing an opportunity to seek employee's inputs and opinions, and not sufficiently facilitating learning and development. In manufacturing workplace, this waste is visible when a worker is not asked to come up with an idea to improve the work and not being provided an opportunity to participate in informal learning. Industrial engineers need to be able to engage these workers so that they can identify a problem and develop a solution(s) for this problem. Industrial engineers should further recognize and accept that the workers are the ones who are capable of learning and coming up with potential solutions (for organizational-related problems).

This book is based on the 5-year research (from 2016 to present) which focuses on how an organization can sustain and support learning of its workforce, especially the disengaged learners. The research has adapted a school which resembles a workplace due to their similar characteristics. There are many significant implications from this research. The first one is that, despite the negative perception about attitude and behavior, the disengaged learners entice and react positively to constructive feedback. The encouragement by constructive feedback

from an external source has successfully supported and maintained the willingness and motivation to learn. Constructive feedback also ensures a safe learning environment which allows the talents from these disengaged learners to better utilized. This utilization becomes visible, especially with new and creative ideas (i.e., product improvement and extension during science experiments).

The research demonstrates that the disengaged-learners can be transformed and become engaged by constructive feedback. Being disengaged from a workplace does not mean a person cannot learn. This waste of the human talents can be reversed with better workplace learning. Overcoming years of poor experiences in a workplace requires trust and consistency. Furthermore, the research has confirmed the importance of informal learning, based on the 70–20–10 framework, in a future workplace. The open-loop learning concept has played a critical role in developing and delivering constructive feedback during the research. Lastly, there is a need to differentiate between assessment with evaluation and feedback. This notion is important for the effectiveness of feedback.

Despite meaningful insights regarding the feedback's impacts, workplace disengagement has continued and will remain the important challenge for almost or all organizations for years to come. I have been inspired by these conversations and dialogues over the past two decades which have led to the recognition of the significant impacts of human learning on workplace productivity and business performance. For some, in an era of Industry 4,0, successful facilitation of learning will determine long-term competitiveness and survival of an organization. Instead of getting the best out of a person at work, it is important for an organization to allow this person to be the best at what he or she does. This shift has had and will continue to have profound effects on the guiding philosophy of industrial engineers in the foreseeable future. I would like to take this opportunity to express my appreciation and gratitude to all my colleagues and friends from Finland, Hong Kong SAR, Poland, Slovenia, and Taiwan ROC who have provided this inspiration.

I always consider myself to be fortunate to have studied industrial engineering at Texas Tech and Virginia Tech. Both institutions emphasize the importance of history of industrial engineering and many subsequent developments over several decades. My appreciation of the value of and contributions from industrial engineering in the society

and the economy since its inception in the early 1900s have continuously grown. This is because productivity improvement remains an important organizational strategy. The studies, performed by Frederick Taylor, and Frank and Lillian Gilbreths, have highlighted the need to recognize the human component in a workplace which magnifies the significance of human learning. Both historical and contemporary views of industrial engineering have provided the foundation for this research which yields various useful insights and findings into human learning.

Appreciation Note

I would like to take this opportunity to point out a handful of people who have had lasting influences in my life. First, I would like to thank my mother (Sanpang Phusavat) for having the will and the vision to send me to the US to complete my high school diploma. She has been a very good role model. The memory of my late Father (Piew Phusavat) has always motivated to be a caring person with human decency. I would like to express my sincere appreciation to the late Mr. Robert Norwood (from Foothill High School in Bakersfield, California), the late Dr. Richard Dudek from Texas Tech University), and the late Dr. Paul Torgesen and the late Professor Benjamin Blanchard at Virginia Tech. They have taught me to be a good citizen and to appreciate myself as an industrial engineer. Lastly, this book would not be possible without the support and understanding from my wife (Kanlada Phusavat) and the love of our two children (Kiranapa and Kasidhad Phusavat).

About the Author

Dr. Kongkiti Phusavat is the Professor at Department of Industrial Engineering, Kasetsart University in Bangkok, Thailand. He is currently a Visiting Professor at Department of Industrial Engineering and Management, Oulu University in Finland. Dr. Phusavat earned his master and doctoral degrees from Department of Industrial and Systems Engineering, Virginia Polytechnic Institute and Sate University or Virginia Tech, USA. Dr. Phusavat attended Texas Tech University for his undergraduate study in Industrial Engineering after completing his high school education in Bakersfield, California, USA.

His research and work interests include productivity and performance measurement, quality improvement, workplace learning, acquisition logistics, design process and systems engineering, safety and health in a workplace, and engineering education. Dr. Phusavat is the author of the book with the title of *Productivity Management in an Organization: Measurement and Analysis* and has contributed book's chapters to several international texts in the areas of business process management and reengineering, and human learning. Dr. Phusavat has published more than 115 referred journal articles during the past 15 years.

Presently, Dr. Phusavat is Editor in Chief of *International Journal of Innovation and Learning*. The journal is a Scopus-indexed journal and is now part of the Emerging Sources Citation Index (Clarivate Analytics). He has also worked with several leading international journals and publishers as Senior Advisor, Associate Editor, Editor, Editorial Board Member, and Reviewer. Dr. Phusavat was recognized for his 2009 Outstanding Paper Award by Emerald Group Publishing for his article published in *Industrial Management & Data Systems*. He was again the recipient of the 2015 Emerald Literati Award—Highly Recommended Paper.

Currently, Dr. Phusavat is serving Thailand's Board of Trade in two capacities, the Chairman of Education and Skills Committee of Joint Foreign Chamber of Commerce in Thailand (since 2016) and a member in Thai Chamber of Commerce's Education Committee (since 2014). For the areas of education, and skill development and training, he served as the advisor to Bangkok Metropolitan Administration's Governor for

health and human services during 2013—2016 and was also appointed to assist National Reform Council's Education Committee during 2014–2015.

Since 2006, Dr. Phusavat has played a prominent role in international collaboration and partnership in education between Thailand and Finland. For his efforts, Dr. Phusavat was awarded the Order of the Lion of Finland with the honor title of Knight First Class in 2015. Also, in 2017, Dr. Phusavat was granted the title of Honorary Professor from Maria Curie-Skłodowska University, Poland due to his tireless work on broadening and expanding research and academic collaboration with Kasetsart University. Recently, in 2021, Dr. Phusavat was awarded the Knight Grand Cordon (Special Class) from the Order of the White Elephant for his life-long career and commitment as a civil servant in Thailand's public sector.

Finally, Dr. Phusavat has performed the role of an external examiner for the universities in Australia, Finland, Malaysia, and United Arab Emirates. He has helped evaluate research and project proposals from several leading funding agencies in Asia and Europe such as Austrian Science Fund, and Thailand's National Broadcasting and Telecommunication Commission and Ministry of Digital Economy and Society.

The book is based on extensive research and experiences in the areas of human learning, productivity, and performance. Human learning is essential for business success and long-term competitiveness because the ability to become productive depends largely on how well an organization can utilize the talents of its workforce. Tackling the underutilization of the talents is a longstanding challenge for the researchers and the practitioners alike. Not only human learning is crucial for private firms, its impacts on organizational productivity and performance also include public agencies and social organizations. For the private firms, learning helps maintain creativity and innovation. For the public agencies, learning indicates more efficiency for public service delivery. For the social organizations, learning means higher cost-effective operations and becomes more resourceful to support the operations. How an individual learns and how to sustain the motivation to learn, given the recognition of learning diversity in a workplace, are extensively discussed since these subjects are the foundation of human learning. This book reflects the transdisciplinary research that is based on industrial engineering, industry psychology, and education.

ToKnowPress
BANGKOK · CELJE · LUBLIN
www.toknowpress.net