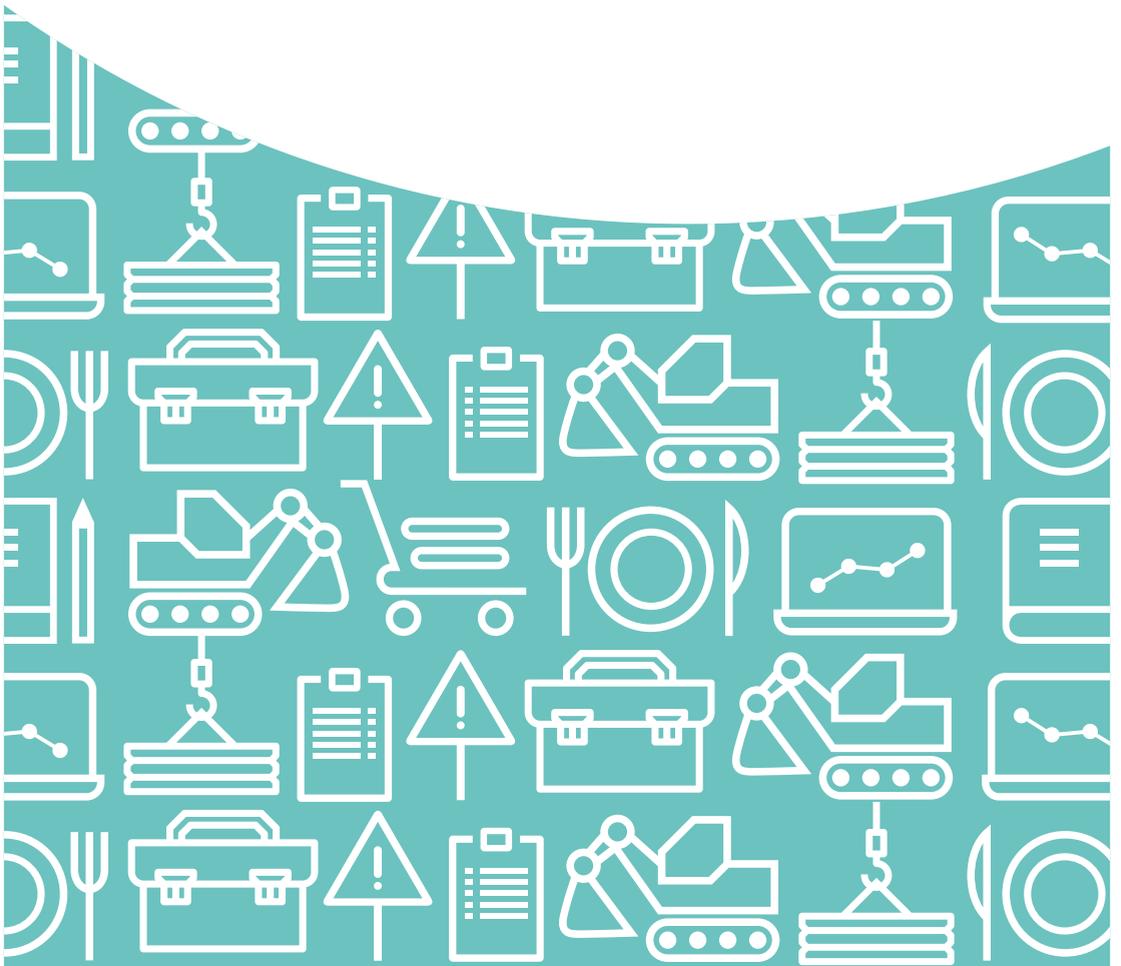




The Centre for
Occupational Safety

LEAN SAFETY WORKBOOK



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Introduction

A safe job and a safe working environment, so we can live healthily on our time off, is no doubt important to us all when we think about how we should act.

Then why do we not act the way we think?

The aim of this guide is to encourage companies and employees in a range of jobs to think about the ways they could develop their actions to make work smooth and safe.

The guide is about developing operations and competence from a range of perspectives and methods, but the most important matter is people's and the company's interest in and desire to act safely in everyday work.

What interests the company and people? When we find common factors, and thus answers to this question, we can succeed in creating common goals and common ways of acting.

The guide combines two development models and development contents. The aim of the Lean model is to develop and streamline the company's operations to reach the desired goals and to succeed. Safety, on the other hand, is concerned with implementation as part of operations and the company's core activities, outside its own bubble to prevent damage or accidents.

The Lean Safety activity model looks for benefits and success for both the companies and the people that have made it possible for the company to operate and succeed.

The operating model has been shaped through the years through development projects and discussions. It has been tested in parts and as a whole in companies of different sizes and fields, and the results have provided the inspiration to model the entire entity for general use.

Companies' and people's operations are complex and extensive, containing various moving and changing parts. This guide has consciously simplified and exacerbated these mechanisms, to present the aim and implementation more clearly to the reader, bearing in mind that the basic concept and its implementation will have to be adapted to the operating culture of the company and the people.

I hope that the guide will provoke thoughts and provide ideas about safety development and how to make them available in normal company operations and everyday work.

This updated version of the guide contains detailed new and specified examples.

Oulu
1.1.2020
Pertti Korttejärvi

1 Directional functions

1.1 Directional functions of the organization

In this guide, “organization” means a company or public-sector organization with a basic function.

The basic function of an organization is to make profit for its owners on the capital invested, and the basic function of a public-sector organization is its statutory task.

Companies are discussed below, but the text also applies to public-sector organizations.

The problem in many companies is that the basic function is obscured by departments, personal goals and competition between different support organizations, partial goals and development projects.

Safety, for example, is a basic function of very few companies, but external and internal communications might give the impression that it is the company’s end product or result.

This creates a communication problem: in many companies the staff, management and safety experts think that safety is the top priority, at least in speeches and their professed values. However, this is not reflected in practice: they have to make a profit and safety matters take second place on a daily basis.

A contradiction between communications and visible actions robs safety work of its credibility in the eyes of staff and superiors alike.

If we do not want conflict, and we do want our operations to progress, we have to think what subjects to bring up and how.

1.1.2 Values and goals

What interests the company (owner)?
Smooth production works and a bottom line that is as good as it can be.

This requires many things: systematic production without disruptions and costs at a reasonable level. The right products and services will get to market on time and in the right quality. The clients are satisfied enough to keep using company services and products in the future.

If the company is ultimately interested in the above, how are the company’s professed values involved, do they have a meaning, and at whom this communication aimed?

The function of values is to tell how, and with which principles, the company will act to reach its goal and fulfil its basic function.

External communication of values often creates and establishes a brand, but it must not conflict with the visible function. For example, raw material procurement, waste management and subcontractors’ operations often stand out when things are not done right, permanently damaging the company image if these issues breach the company’s public statements, general ethical principles or legislation.

In fact, from the perspective of the company, it is more demanding to set values and

communicate them internally: staff know the company operations very well, and if the values set are not adhered to daily, the company loses its credibility in their eyes really fast. The staff call for concrete action and visible results.

The company invest in the things that matter, and such actions as the use of resources give a good picture of essential values. When a matter is emphasized in values, strategy, and speech, but monetary resources are not invested in it or enough time given to perform the relevant actions, a conflict between communication and practice is created.

Communicating the basic function and goals of the company is often hard. The image is often of a greedy company that makes profits with no regard for anything else. The staff know why the company exists and what it produces and failing to mention this knowledge as a directive function is often considered embarrassing.

We know the basic function of the company and its goals, and we should think about how to achieve them: what we need is a systematic, smooth, uninterrupted production or service process.

What is systematic, smooth and uninterrupted? Raw materials and items for sale arrive in a timely manner, and match what we ordered, machinery, hardware and information technology work well and the work or process is free of faults and mistakes which could lead to stoppage or weak product quality. The staff do the right work tasks timely in their assigned roles.

Values and related communication should be closely connected to the company's basic function and goals. Only then do we also have staff credibility, and the company has an interest in investing to ensure and develop these matters.

When answering the question of how to reach goals, we get to concrete matters and then we can talk about values and the related actions.

From the company perspective, the goal of safety action is to enable fulfilment of the company's basic function in all circumstances.

1.2 Factors directing human action

People have many individual interests. When talking about what direct human action, we discuss values, attitudes and motivation.

When talking about safety, phrases on changing and influencing attitudes have been repeated since the 1980s.. Individuals' attitudes and stance are influenced very much by their entire personal history, all of which is very difficult to change. In any case, the change is slow, and that is why we in this guide concentrate on development of actions and changing habits.

1.2.1 Values

Values are another challenging topic on the individual level. Many people have paid no attention to them at all, and those that have name their family, health, hobbies, friends, work, and environment as important values. The order may vary, but when asked about values, almost everyone would name these without hesitation.

If we take it further, we should think about the meaning of values more.

The family is the most frequent and important value mentioned, but if we focus on it and express it functionally, we get to the point: I want to spend as much time as possible with the children and my spouse because they are the most important thing in the world.

We can evaluate work in the same manner. A person has considered something important, studied it, looked for a relevant job, and wanted to develop in the field so he or she can work for a cause that he or she considers important. Here, the values guide a person towards professionalism.

A person can also work for matters bigger than himself or herself. These matters may be anything at all, but the main thing is that the person has a reason for working in that occupation. In this situation, values do not guide work performance per se, but the impact is indirect: the work has to be done properly, so it generates the result that can help a person reach goals in other areas.

In the examples above, the performative significance of a value was emphasized. If a thing is really important to somebody, he or she will do things that take him toward the values, not away from them.

Why is this so important, despite it being so challenging?

When a person wants to realize his or her full potential, goals and the motivation to achieve them have been repeated. Motivation helps people get excited and make an effort, learn new things and do things that bring them to one's goals and through that towards values.

When a person feels that the things, he or she has done are beneficial and take him in the right direction, a single action becomes a habit through repetition and with time. When there are enough new habits, a person may have significantly changed his or her actions.

Not many people consider safety as a value in itself, but it can be viewed as deeds.

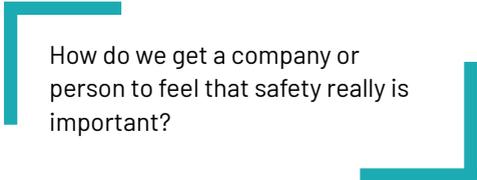
Safe operations enable other actions in line with values. If someone is seriously injured or his or health is damaged, it can be impossible to spend time with family or friends or occupy himself or herself with hobbies or work.

1.3 Factors directing safety

An individual appreciates safety, as do companies.

Where does the discrepancy between words and deeds arise? People cross safety boundaries, break the speed limit, do not follow the instructions, and the company may consciously or unconsciously pressurize them to work faster, without allocating time or money to technical acquisitions or education.

In the section on companies' and people's actions, we provided an introductory idea of why safety is not interesting and why it is not invested in: companies and people do not feel that safety is meaningful in their operations. If a thing is not felt to be meaningful, nothing is done to improve the situation.



How do we get a company or person to feel that safety really is important?

Do we concentrate on the right things? Is a scratch in the finger and a chemical spill- age the same thing?

1.3.1 Safety communications

Currently, many companies have worked hard to advance safety towards the 'zero accidents' principle. However, it has only really been achieved as rare accident free periods, with smaller accidents still happening.

For this reason, many companies' actions and communications have focused or are focused on the prevention of "smaller" accidents which may be visible to the staff, such as prohibition or restriction of knives and the increased use of protective equipment or clothing.

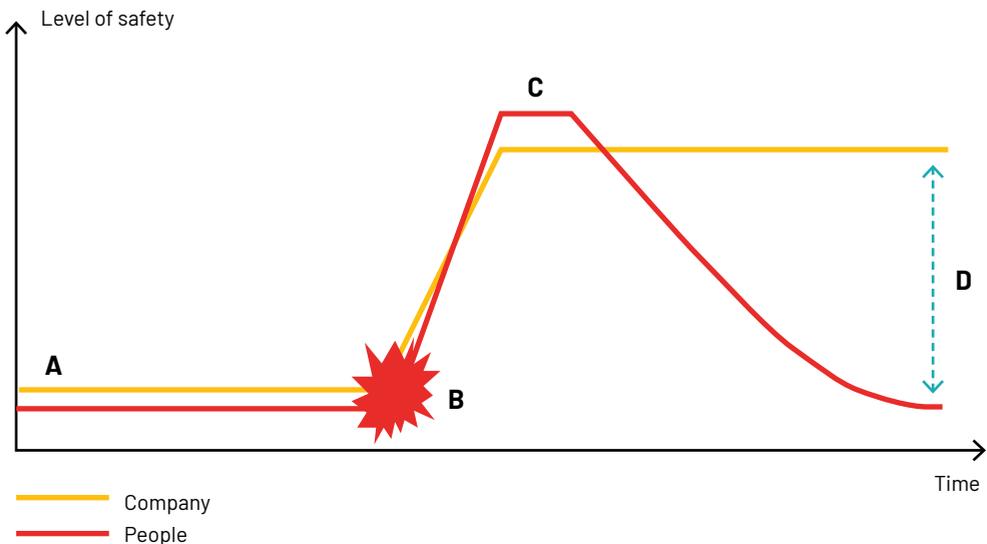
If these actions are not properly justified, the staff may resist them, because they do not feel there is enough danger to justify strict measures, and thus they are felt to slow down or disturbing work.

As severe accidents diminish, the communication generated does the same. It may distort the mental image of the focus on safety work. It may create the feeling that the company does not pay attention to large, severe risks, even though it has paid attention to them and provided the relevant instruction.

Communication does not have to be a "learning by shock" type of intimidation, nor does it have to emphasize severe risks, but the critical risk factors have to be communicated so all parties retain a realistic and relative sense of important issues.

1.3.2 Determining the safety level

Another thing visible to people in the company's operations is how it reacting to its own accidents, accidents involving others, and severe dangers.



A: When risk factors have been realistically identified and the procedures are of the right size, people and company have roughly the same understanding of the meaning and level of safety. That is when the procedures are adhered to, do not feel disproportionate or as disturbing one's own actions.

B: If an accident or severe injury occurs in one's own company or another company in the same sector, the reaction is strong, because the company wants to ensure its own operating environment, either of its own accord, because of public (media) pressure or an official order. At the same time, people feel unsafe and want to confirm their own safety: thus, everybody agrees that the safety level needs to be raised and procedures followed.

This is visible as increased instructions, prohibitions, technical procedures and control.

C: A problem arises when the initial shock and some time since the accident have passed. People's experience of their environment is restored, and the danger is not felt the same way as immediately after the incident.

The new, stricter rules are often permanent, creating a gap between the people's experience and the safety level set by companies.

D: The bigger the deviation between people's perceptions of safety needs and the safety level set by the company, the less people feel it is necessary for them to comply with instructions and working methods to ensure safety.

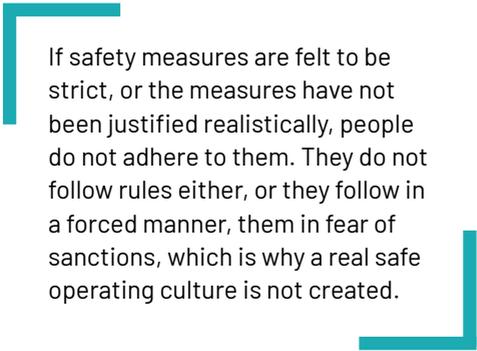
In a similar manner, companies have many procedures which have been forgotten or

archived, not told or explained to new staff or presented to old staff. A situation similar to the one after an accident is created.

Situations like this are recognizable on a more general level: e.g., airport security. The reason for the safety procedure exists but is not necessarily known or remembered, which is why the procedure is considered a tiresome hindrance.

Thinking holistically, setting the safety level plays an important role for people's experience and the company itself.

Immediate corrective measures should be adequate to prevent the accident repeating. Permanent corrective measures should be designed with care to prevent a contradiction when the situation returns to normal.



If safety measures are felt to be strict, or the measures have not been justified realistically, people do not adhere to them. They do not follow rules either, or they follow in a forced manner, then in fear of sanctions, which is why a real safe operating culture is not created.

1.3.3 People learning unsafe actions

A person learns good things and habits, but also bad modes of action. The common denominator is again importance and what each individual considers important.

Learning unsafe behaviour is generally a result of people following the path of least resistance (self-indulgence) and feeling their actions cause themselves or others no harm, but are still personally beneficial.

Factors in learning unsafe action:

- Benefits of incorrect actions are often immediate, and people feel their actions are rewarded e.g. saving of time.
 - People quickly get used to the rewards and keep looking for new ways their actions can be rewarded.
- Harmful consequences do not happen every time or are minuscule.
 - Accident, mishaps or sanctions do not follow each erroneous action.
- People adapt to risks in their surroundings and actions:
 - Adaptation.
- People's actions become automatic with repetition, and routines are always formed when possible.
- Tasks and responsibilities are not clearly defined.
 - Somebody else's problem is "not my problem".
 - Success in "close shaves" boosts belief in personal skills and abilities.
 - This is a so-called Superman effect: nothing can happen to me and I am on top of it all.
- Risks are taken by breaking the rules, because the basis and meaning of the rules is not understood.
- Risk factors and situations are not recognized or noticed: thus, there is no danger.
- Consequences of events are not understood or are underestimated.
- Copying others' erroneous actions.
 - New workers in particular learn from a model: modelling.
- Combinations of the above.

If a person has learned a dangerous or harmful mode of action, without harmful consequences, unlearning these modes of action takes arguments, planning and persistence.

In learning safe actions, both the right ways of action and the mechanisms by which all of us have learned unsafe behaviour have to be presented. We need examples from our own workplaces, but good means to demonstrate unsafe behaviour and learning can also be found in driving a car, for example.

Here, the motivation for learning new things is also discussed. You have to be ready demonstrate the meaning and benefit of a new way of acting. This may be the development or acceleration of the work process, or protecting yourself from big, critical risk factors, so the matters that are considered important can be done.

One way to motivate learning is engendering professional pride and appreciation of professionalism in the company and workplace.

1.4 Safety level as defined by critical risk factors

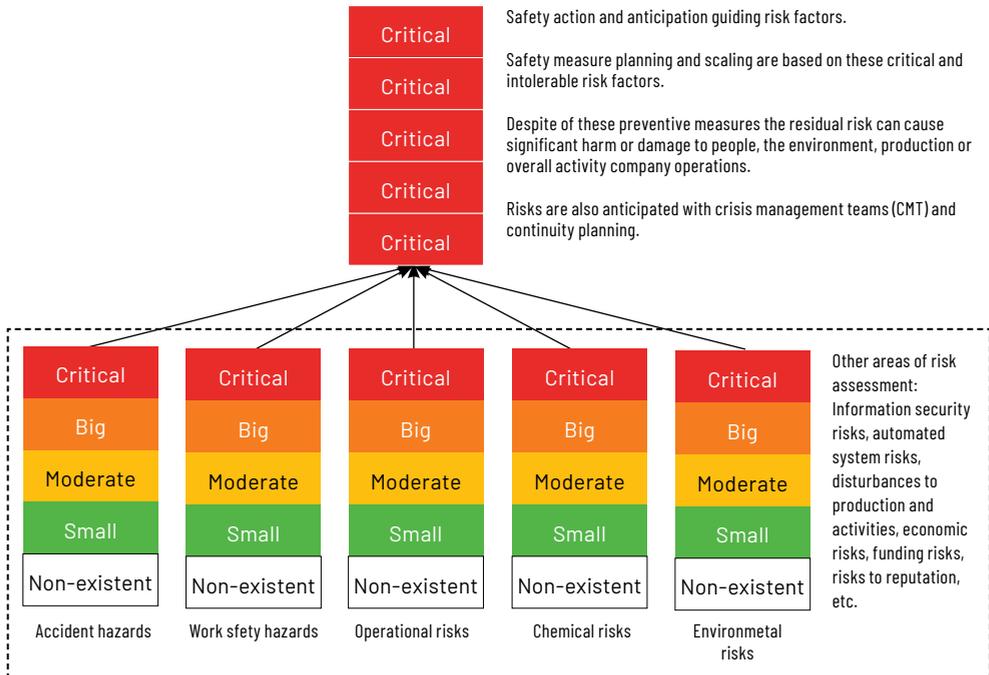
The basic safety level and communication about it should be based on the control of critical risk factors.

Danger of accident, danger of severe accident, and danger of stoppage or slowing of the production process are events that get the company's and staff's attention.

When the company's basic operations are planned to control serious danger factors by considering them in the planning of production process and work phases, a situation is created where the same action principles reduce the less harmful risk factors.

This is a prerequisite for the wide use of danger recognition and risk assessment in the planning and realization of action, processes and work phases.

Summary of risk control and risk control scale



In practice, the control of risk factors is visible as unhindered, smooth operations.

1.4.1 Principles of risk management

Risk management is all the measures that attempt to prevent risks from threatening operations, and keep the threats to people, property, and environment at an acceptable level.

Conscious risk management is always useful when there is a possibility of unfavourable events. The more significant the risks are, the more important it is for systematic risk management to be in place from beginning to end.

The first part of risk management is risk evaluation, which consists of recognizing the dangers and evaluating the amount of risk. Next is planning measures to diminish or eliminate the risk. The third part, risk monitoring, consists of measures (administrative and technical) to diminish the risk.

The function of risk evaluation is thus to identify risks and generate knowledge on their scale to help assess them. Business, including the business of a company in the same network, is the management of risks and uncertainty factors. It is, at its best, the successful choice of risks, especially when it comes to business risks.

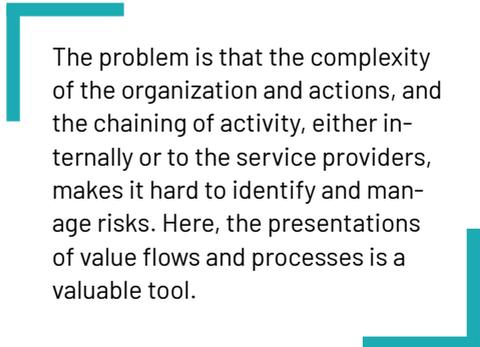
The goal of risk evaluation is to provide a basis for decisions where identified risks and their impact is assessed and where the

best management methods are assigned to each risk factor.

Self-evaluation models with the most common risks caused by operations, gathered on check lists, can be used to aid risk evaluation. Ready-made, all-encompassing risk control lists or checklists do not, however, exist but the forms are a good aid in evaluating the company situation.

Risk management also means that the company protects itself from all damage that could harm company operations. It is connected to the company's sector (economic risk, business risk) or damage to the company's own operations (accident risk).

The basic goal of risk management is to ensure the continuity of the company activity in all circumstances. The significance of cooperation is emphasized in the risk management of the whole process and logistic chain. Hazardous factors may be single events, or trends and changes in the market that have to be predicted.



The problem is that the complexity of the organization and actions, and the chaining of activity, either internally or to the service providers, makes it hard to identify and manage risks. Here, the presentations of value flows and processes is a valuable tool.

To remove an identified danger element or associated risk, you do not have to know the scale of the risk. Even a rough estimate is often enough.

1.4.2 Realization of risk management

A company analyses risk in various fields (e.g. work safety, accident hazards, environmental risks, process and chemical safety, information security). Methods may vary, and risk probability (likelihood x impact) may be calculated by different means.

Typically, checklists are used to recognize person and accident hazards where experts use different thematic entities to recognize the hazards connected with an action. Line organization management and staff may participate in this work at different stages. This way of acting is faulty when it comes to good conclusions, because the people in charge of the actions do not identify or evaluate hazards.

Risk management (hazard identification and evaluation, measures) must be planned and organized in a way that places the people in charge of production and activity and supervising will be in charge of the hazard recognition, as well as safety development and maintenance. Experts' role is to support and inform in support of planning and realization, but they are not in charge of safety on a daily basis.

Hazard recognition and risk management uses different methods in different fields. Typical methods in occupational safety include Riski-Arvi, vulnerability analysis (HAAVA) and Pattern of Analysis for potential problems (POA).

In the evaluation of processes and chemical risks, deviation analysis (HAZOP) and tree analyses (defect tree, causal connection analysis) are typical. In other areas these methods, or corresponding, derived and appropriate methods are used.

Risk scale assessment (probability x effects) is done even on different numerical bases, even in the same company. Typical evaluation matrices are 3x3 or 5x5, or, alternatively, squaring the effect to allow a realistic description of a large effect of a small risk and the correct description of the proportion of a risk.

The challenge in evaluating effects is the combination of different matters (effect on people, the environment, operations, production, property, the economy etc.). They can be combined in the same matrix with weight coefficients, or evaluated separately.

The evaluation of risk scale is always a view formed by the risk evaluators at the time and on the basis of the available data (in their area of expertise). For example, risks to a person and to processes are difficult to compare. Because combining them does not necessarily have meaning in overall risk management, they can be kept separate.

When evaluating the scale of risk, the significance of the risk for the holistic situation should be noted. Through numerical evaluation we can arrange the risk factors in order of importance to enable preventive measures.

In hazard and risk factor management, it is crucial to recognize how risks originate and why they present dangers, because these things can be affected by preventive measures.

Numerical evaluation depicts the scale of the risk, but does not in itself diminish it. This should be borne in mind, because numerical evaluation gains too large a role compared to causal factors and management methods.

Because the aforementioned evaluation and priority guide how the company's safety operations are planned and scaled, the evaluation should be invested in and the best knowledge should be used (e.g. literature, previous evaluations, evaluations of similar institutions, accident statistics and data, experience).

The method used or calculation model, therefore, ranks risks by priority, and large and critical/intolerable risks become the basis for size classification, regardless of calculation method.

1.4.3 Management of residual risk

In many risk evaluations residual risks that are meaningful to general management are left unnoticed (unevaluated). These residual risks, true to their name, describe the situation after risk management measures.

The evaluation and management of residual risks describes the effect of measures (reducing the scale of risk) and follow-up measures (management measures) to be realized in everyday work.

Management of residual risks and describing them during risk evaluation is an excellent way of justifying the contents and use of administrative measures (plans, instructions etc.), the contents and use of technical protection measures and the meaning of one's own actions in advancing and maintaining safety to the line organization and people in charge.

When cooperating with stakeholders, risk evaluation, with consideration for residual risk is also a good tool. With documentation you can comprehensively and justifiably present risk factors for company operations in different production phases and operation, by topical area and holistically, as well as present the measures

in daily work to prevent risk factors from materializing.

1.4.4 Investigation of “close shave” situations and accidents

To develop safety, it is important to get information on ‘close shave’ situations, in which an accident almost happened. These and the actual accident situations are inspected and analysed to avoid accidents in the future. Typically, the analysis is done by a manager with participation by a person who was involved in the situation, e.g., a work safety manager and representative.

In the inspection it is important to get to the bottom of matters: how such matters as orientation, education, communication, daily management, maintenance of machines or work procedures should be changed to prevent accidents. A high number of ‘close shave’ reports says something about the professionalism of the staff with regard to safety.

1.4.5 Change management

In safety, it is important to recognize and separate change work from maintenance work and do it in a controlled manner. If changes in operation or work clearly change the production or service process, the effects of change must also be evaluated with regard to safety.

Changes can include:

- all temporary or permanent changes to machinery, hardware, ductwork and sewers
- all temporary or permanent changes in process hardware or chemicals, operating conditions or operating instructions
- testing situations in a process
- significant changes made during a project.

Definition of change

In change management, basic data are documented, as are the description of change, subject, type, duration, activities and tasks that the change affects. What effects does the change have on other people acting on the area, including the previous and subsequent process or work phase?

In a change safety evaluation, the situation after the change is examined and the change in safety level is assessed: no effect on safety level, raised safety level, decreased safety level, or the effect is not precisely known.

Checking safety evaluation and approval of implementation

The introduction of the change is decided by the person in charge of the line or area, or a person authorized by him or her. The final approval can be given when the effects of the change have been established and the documentation related to the change have been realized (final updating of operating instructions, hardware instructions, hardware data, blueprints, certificates of inspection etc.).

2 Lean safety

The first chapter considered the factors affecting a company's and its people's operations and the relationship safety has with it. Significance and benefit were important concepts in many respects. In development operations, you have to find a win-win situation. This means that all actors have to find a reason to find development work and be rewarded for it.

If the company feels that the matter to be developed does not advance its basic function and is only costly, or if a member of the staff feels that the development work only increases work load and slows down or hinders work, the motivation on both sides to do and implement development work may be very limited.

The following sections present methods in two topics and how the development and results therein can be combined.

The purpose of Lean Safety thinking is to import an operating method and tools from the much used and functional Lean philosophy. These systematically consider developmental matters in phases of developmental work and concretize them for the right kind of work environment and work methods.

2.1 Lean

The Lean way of thinking was developed to advance company operations. James Womack, Daniel Jones and Daniel Roos developed a new production philosophy in the early 1990s, Lean, following the production model of Toyota.

The basic principle is to cut out all loss, i.e., waste, as it produces no added value for the company and consumes resources for nothing. The Toyota-developed 4P model (philosophy, process, people and partners, problem solving) is based on the Lean philosophy as long-term way of thinking.

The basic function is to improve processes by recognizing the associated problems and factors that cause losses. This is aimed towards the yield of maximum added value for both the process and clients.

Furthermore, investment is made in developing and motivating the staff's skills and competence. Related to this, crucially, is the development of cooperation of the whole organization and stakeholders and nurturing mutual respect.

The basic Lean principle of action is that visual perception and continuous production flow can be used to advance flexible and timely production, with constant advancement to make it more efficient and productive.

2.2 Safety

The goal of safety action is to facilitate the company's basic function by pre-empting and preventing the risks that threaten operations, and when they materialize, by limiting their effects and ensuring continuity of operations.

Safety action is focused on people, property, (machinery, hardware, knowledge, premises, etc.) and the environment (direct and indirect effects).

A crucial function of safety action is to improve the safety, health, and working capacity of each employee. The goal is to prevent accidents, occupational accidents, health risks, diseases, and injuries.

Under the Occupational Safety and Health Act and the Occupational Health Care Act, the employer has an extensive duty of care. The employer is presumed, as an expert in the field, to know about the hazards and harmful factors in the field and in the workplace, and their prevention.

The employer's duty is, by the necessary means, work, to take care of employee's safety and health at work. The employer must consider the facts related to the work, working conditions, the broader

working environment and the employee's personal qualifications. Unusual and unpredictable conditions that the employer cannot influence are outside the employer's duty of care.

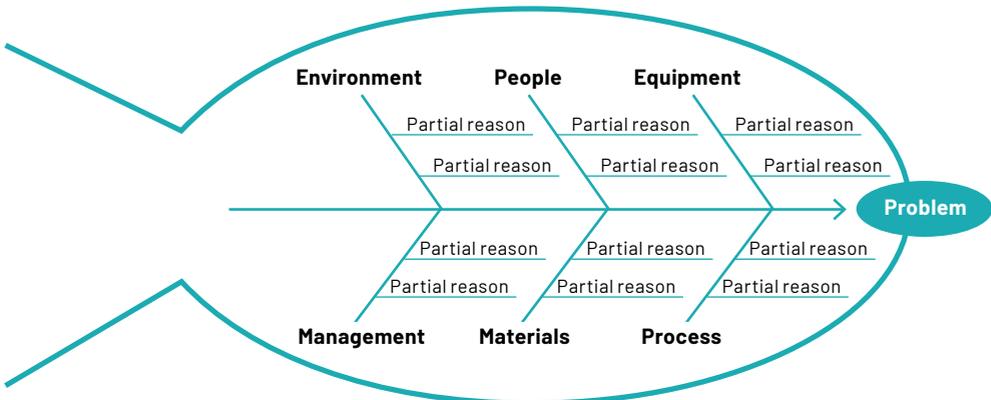
Planning of work, orientation, instruction and monitoring of work performance are part of the employer's duty of care.

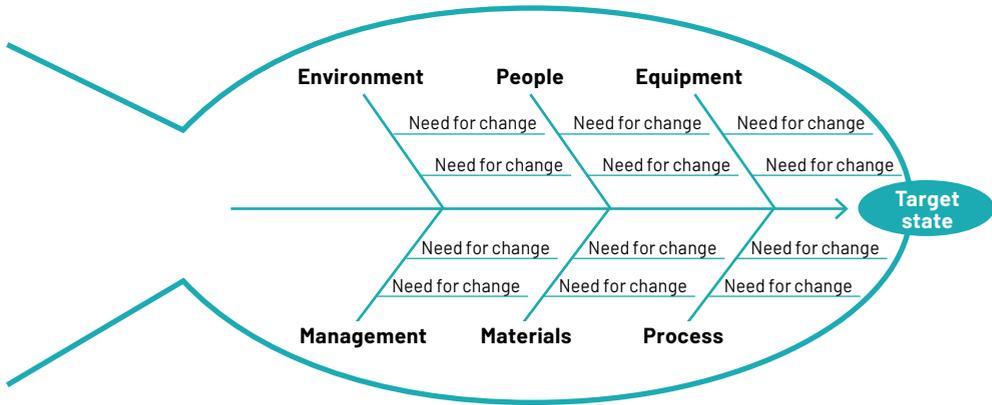
The first chapter contains an example of the implementation of risk management and the topics to be noted while doing so.

The essence of safety development is making it relate smoothly to the company's basic function and staff's everyday work.

2.3 The change in perspective of development

Safety development of is often reactionary: attention is paid to a problem when it is detected. This type of development model may be felt as incriminating and thus negative.





Let us move on to the methods of continual advancement of Lean 5 x why and root factor analysis. A typical way to describe the results is the “fishbone model”. This works excellently when there has been an accident or a disturbance and a change in activity is needed.

The basic idea of Lean Safety is to develop matters proactively and with clear goal and direct it from a positive perspective. This means looking for the right operating models because they are, after all, the main component of daily operations, and the correct actions can thus be reinforced.

The matter has been approached from the same perspective (positive validation, repetition of success, Zero Harm), in addition to the Lean Safety “Safety II” and other “Safety Differently” paradigms developed by Erik Hollnager and Sidney Dekker .

Similar content and fish bone model to the root reason analysis may be used as a method, but instead of the problem, the positive (safety, production, quality, environment) target state is the “fish head”, which can be disassembled using SOP and 6S tools.

3 Lean safety implementation

3.1 The meaning of work performance

“Do a job with a meaning.”

Each phase of production and service process should have a meaning for the end result. In the Lean philosophy, we talk about identifying the core processes and value flows and defining meaning.

This should be self-evident but, in many companies, it is not. A new company might go by trial and error, and on the other hand an older company might have come up with operations and support processes, which have never been questioned. This creates functional inefficiency and increases operations and costs.

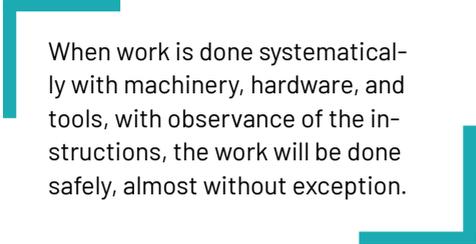
This may lead to the fact that staff cannot identify the meaning and significance of their work in the company. If a person feels his or her activity is not meaningful or important, it can lead to inefficiency, lack of motivation, frustration and burnout.

By the same token it may lead to a situation where different departments or units produce information or operations for a process or persons which the recipient party does not feel necessary. Then they are not put into practice, or people feel that they are burdened with excessive practices, projects, meetings, and emails that are not related to their own work.

Chapter 1 discussed the points of interest of different operators. Points of interest common to the company and staff include

order, a system, smoothness and freedom from distractions.

Another clear common point of interest is that work has a meaning.



When work is done systematically with machinery, hardware, and tools, with observance of the instructions, the work will be done safely, almost without exception.

The prerequisite is that one knows what one is doing and how to do it. This means identification of the parts and whole of the production and service processes, the representation and development of value flows, supply chain, and functionality of the work environment and work phases in the process to reach the desired final result.

3.2 Development of work processes

3.2.1 Value & Safety Stream Mapping

By value and safety stream we mean the product's journey from manufacturer to end client, including all the actions. A value stream consists of the company's core and support functions.

A value stream is typically characterized with a Lean tool known as VSM (Value Stream Mapping).

The idea is that at the same time as the product and supply process is illustrated, the waste generated at different phases is also demonstrated. Processes' lead time and resource needs may be illustrated. If there is waiting time in a certain work phase, then there is a problem that needs attention, and operations have to be developed.

The same paradigm can be used and planning can be combined when it comes to safety. When the value stream is described, the deviations and hazards in various process or work phase interfaces according to area of operations may be recognized and described.

In Lean, the optimal stream is recognized and planned, which enables the best desired result. The role of Safety is to bring differential analysis into this action, which in turn enables the identification and illustration of process smoothness and freedom from distractions. Here, optimally, actions are not done separately, but illustration and planning are realized simultaneously.

Hazard and operability study (HAZOP) has traditionally been used in process industry, and mainly to evaluate the flow of production processes and contributing factors.

Safety Stream Mapping thinking uses the same principle more broadly to identify, in addition to the process, deviations and risks originating in work phases and operations, and their part in the realization of the work phase and to the desired result.

The following questions may be used in this method.

An identified deviation, condition, or hazard will result in an action inside the process or work phase that:

- Slows down the work or process
- Stops the work or process
- Changes the work content or process
- Causes more work phases or takes more time
- Causes more need for protective measures
- Changes conditions or work environment
- Needs more staff resources
- Needs external staff resources
- Demands technical measures

This phase describes the actions whose functionality and safety should be developed to ensure smoothness and interference-free functionality. Deviations in operations found through several questions cause direct or indirect influence on people's operations and thus influence safety; therefore, removing the cause of the deviation increases work safety.

If a VSM has been done in the company at the same time as Lean, the results can be used to do Safety Stream Mapping.

3.2.2 Planning of functionality

The planning of functionality is a prerequisite for an effective process. The illustration of the workflow and value chain helps visualize important connections, and thus eliminate unnecessary stages and their moving about in the process, thereby optimizing the flow of the production and service process.

The JIT (just-in-time) method can be used to reduce idle time, resources, materials, and storage. At the same time, you can model the staff schedule and tasks to be done in different phases and workstations, to reach the desired results.

In practice, this method means that the right amount of resources, such as hardware, materials, and persons are available punctually, and that they do what they are supposed to for production.

A good method for the observation and clarification of the starting situation is GEMBA, which means that people observe practical operations with planned observation in workstations and the process. A GEMBA WALK can also be directed by area, and as a safety walk it is commonly applied as a working method in various fields.

The effective streaming of production also demands adequate activities and premises for the process. When all the activities and workstations associated with the process have been mapped, they are located in the most adequate spaces according to the supply chain. Workstations and their working order are planned according to the task, with the staff using the 6S method.

SOP (Standard Operating Procedure): The standardization of methods is used to create a standard work task, meaning the procedure is always done the same way and in the same order regardless of the operator. This enables both process smoothness, shorter execution time and even quality. An example of SOP development and the larger entities to be noted in it is in appendix 1.

By simplifying methods and eliminating unnecessary work, the execution time is shortened, the realization time of the work task is significantly shortened, and

a single employee's and team's tasks are clarified.

Work standardization demands detailed work instructions, careful supervision and training with instruction in the use of tools.

Work standardization eliminates "applied", unplanned work. Accident investigation and hazard/close shave investigations show that rushed, unplanned work causes hazardous conditions, and thus enable accidents and casualties.

3.2.3 Standardization of operational environment – 6S

5S-program is a crucial tool in Lean model of operations and particularly its prevention loss goals. The goal of the programme is to develop profitability and competitiveness, while at the same time considering staff welfare and comfort.

5S consists of the following areas:

Sort – (Seiri) – Sorting. The workplace gets rid of superfluous objects. Thus, space is freed up and broken and useless tools removed. Only necessary objects are retained.

Set In Order – (Seiton) – Systematizing. Good storage methods are sought. These can include painting the floors, marking workstations and other areas, clear and empty corridors, stock-keeping methods, and garbage bins. Labelling (colour codes and space tags) and various signs are also possible.

Shine – (Seiso) – Cleaning – The workplace is cleaned daily or weekly.

Standardize – (Seiketsu) – Standardizing. The best common practices are standardized with the staff, e.g. tools belonging to a work station, how often the garbage is tak-

en out, cleaning schedule, the location of aisles, etc.

Sustain – (Shitsuke) – Follow-up. When unnecessary objects have been discarded and storage space agreed, these procedures continue to be maintained.

+SAFETY: Many users have added safety as the sixth letter S, because it has been noted that tidiness, orderliness and standardization of the work environment also increase the safety of the work environment and operations.

Some users have simply called the operating model the 6S method, while others have wanted to emphasize the meaning and connection to Lean by speaking of the S+5S method.

Making a link with safety has been emphasized as a part of all operational development. It is also aimed at reducing overlapping tasks and reporting from staff and management, because many of the tasks

to be developed and inspected are the same.

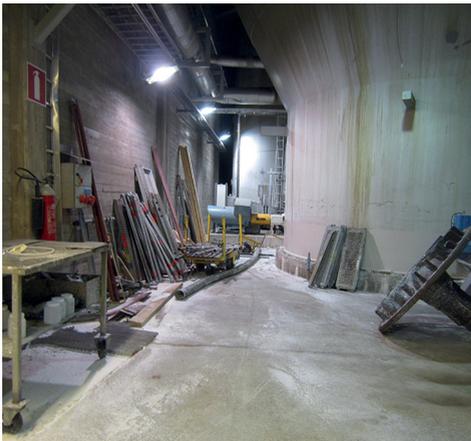
A common challenge in the development of S+5S or 6S operations is that the safety perspective is not exactly discussed, or safety is not named as an area in development work. Rather, the operating model is simply stated to generally advance safety and comfort once it has been done.

Adding Safety to the 5S-model of operations requires that the identification of hazards and risks is done or used when the operating method and work stations are planned.

The success of 6S-method is a prerequisite for the systematic review of all phases, and combining it with the standardization and instruction of the workflow.

Many phases may be combined but not bypassed altogether. This is because choosing the right tools, working space, and materials does not work if you do not know what is going to be executed on the prem-





ises and work stations. On the other hand, cleaning and general tidiness is hard to maintain if the equipment needed is not in order or in place.

Standardizing matters and operations enables upkeep and constant improvement possible and makes it feasible to measure effectiveness of operations.

The programme is a simple universally applicable operating model which crates practices for tidiness, order,

overall cleanliness and a safe operating environment.

3.2.4 Content of work performance

One of Lean's most important goals from the perspective of a single organization is to develop staff competence, as this has been shown to have a direct connection to the company's performance and competitiveness. Versatility in work duties and flexibility in different production situations increase a sense of the work pleasantness and satisfaction.

Versatile competence guarantees the trouble-free continuity, even when a single member of the staff is absent. A very important factor in the Lean philosophy is also the fact that each of the process workers also knows the others' phases of the process and understands the value they add to the supply chain, which creates meaning for his or her own work.

The emphasis on safety has created a situation in many companies where, in addition to work instructions, there is a considerable amount of safety rules and instructions. In some instances, the ratio between work instructions and safety instructions is 1:8, and staff have felt that the basic function has been obscured or its performance rendered more difficult.

Furthermore, staff instruction must be noted when it comes to quality, environment, etc. Operation control systems and standards also require instructions and documentation that need to be updated, and this area is often a burden on people in the company.

The crucial goal in Lean Safety operating model is to streamline and clarify the performance of work and related instructions by combining the essential factors and standardizing the right way of performance.

This requires a systematic grasp of development, and here a wide array of existing data can be used, and furthermore combined with Lean working.

The right performance of work means here results from identifying and describing key tasks (value stream), VSM/SSM), development of operating method (JIT, Gemba), working methods (SOP) and work environment standardization (6S), and from the development of competence for staff based on these.

Earlier examples described the combination of safety matter processing (realistic hazards and risks) with normal Lean development work, and, thus, making it an element of the correct working method.

The development of work execution methods (machinery, hardware, (protective) gear, tools, materials, procedure, working methods, environment) from the safety perspective means that the work is planned so that the known risks can be eliminated with a standardized (as far as possible) work performance in a standardized working environment.

If there are risk factors in operations that cannot be eliminated by the way work is done, they are named and emphasized in the work instructions. At the same time, the safety procedures are illustrated, if they differ from the normal situation.

When the working environment and projects are constantly changing and varying (e.g. maintenance, excavation and mining industry), tasks are standardized where possible, and the optimal situation for the working environment and work performance.

This makes it possible for the staff to monitor the state of the project. Possible haz-

ardous conditions and operations are identifiable when one has the opportunity to compare them with standardized environment and activity.

In changing conditions, it must be noticed that there may be several “right” ways of working and solving problems. In this type of situation, the work method and instructions should create the preconditions for work performance and standardize the “go ahead”, meaning the planning of a single work performance, and the preparatory measures to allow identification and processing of risk factors.

The development of how work is done and writing down work instructions in this manner reduces the need for separate or loose safety instructions and practices. This does not mean that risk evaluations are not done, but rather that its results are brought in as an integral part of work performance and of professionalism.

3.2.5 Lean safety in practice

Below is an example of the execution of Lean Safety process simultaneously with Lean development activity. If a certain phase in Lean effort has already been done, the process uses the data and operational models produced.

- The decision to develop operations
 - company management’s visible commitment and resourcing
 - goals for the development process
 - shaping of the development process into adequate partial projects
 - project planning and scheduling
- Recognizing and representing the production and operations of core processes and value streams
 - service and production process, logistics, sales and marketing, support operations
 - subcontracting chain
- Identification and illustration of crucial work tasks and work phases for core tasks and streaming as an entity (Value and Safety Stream Mapping)
 - identification of contents of process and work phases
 - illustration of work phases
 - evaluation of activity and recognition of loss, slow-down factors, sources of disturbance, and hazards (stream analysis)
 - planning of remedial measures
- Planning and introduction of 6S model of operations
 - according to section 3.2.3
- SOP: Planning of work phases and task and work instructions and, based on that, work instruction preparation/ updating
 - according to section 4
 - Writing work instructions: manager, staff representatives, experts when needed
 - All shifts, managers and staff comment when possible
 - The process itself produces new information and instructs the participants in the new operation mode
 - The shortcuts and “silent” ways of working are recognized; this will be the right way of working if needed.
 - The participants take shortcuts the right way
 - Simultaneously, the risk evaluations may be updated and necessary changes made, e.g., physical protection of work phases and processes

- The instruction in new work methods and instructions for managers and the staff
- according to section 5
- Upkeep

3.2.6 Introduction of the lean safety process

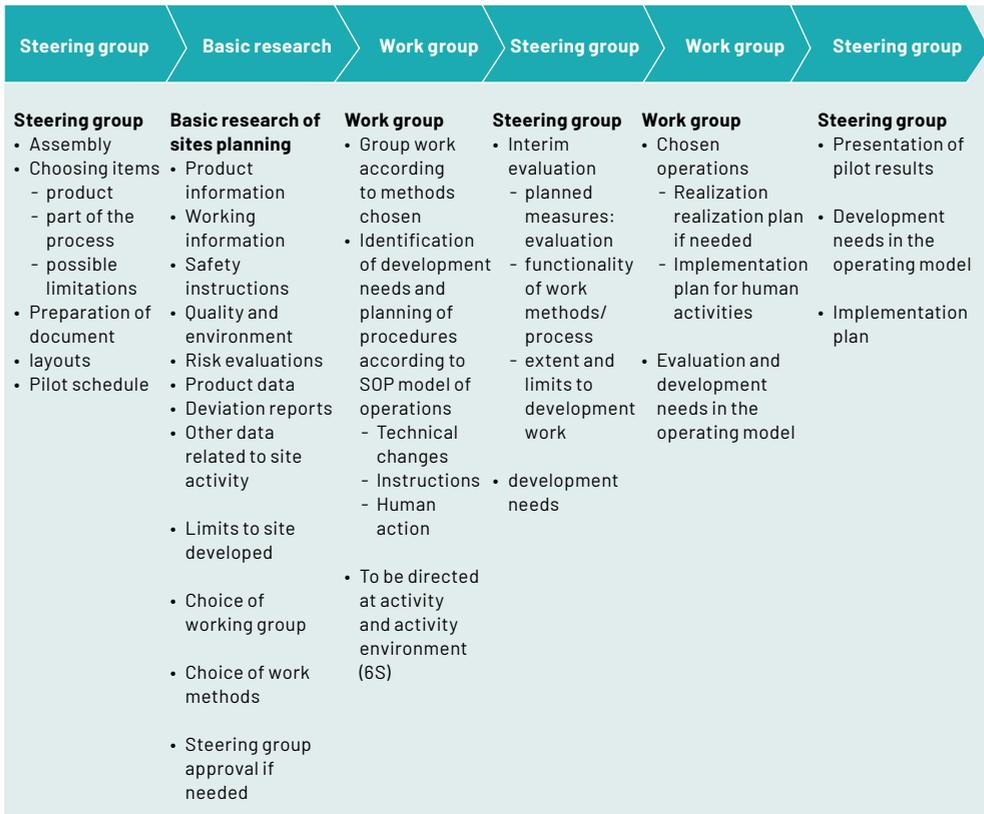
New operating methods in a company are often introduced through pilot projects, and this has turned out to be a good way of operations when the introduction of Lean Safety operating model.

The upside of a project mode of operations is the testing of the operating model when it comes to applicability, the planning of

documentation in an instructed manner so it is usable in the company, simultaneously showing visible results, and that the persons in the project learn the practical implementation of the operational model and can systematically advance it. After the project phase, the operating model transfers to part of the company operations development process.

Below is an example of work pacing and contents in a Lean Safety introduction project.

Lean Safety testing and introduction



4 Development of work methods

Regardless of the field of operations, work tasks have to be planned and staff instructed in them. There are different work instructions for different companies, operations and different situations. Within the same department you can find instructions that are a sentence or 150 pages long, hand-written, visualized with images and video recorded. In addition, of course, there are environmental and quality instructions, operating instructions for machinery and hardware, general emergency and safety instructions, with risk evaluations and safety guidelines that are specific to a certain department, work task, or tool.

Additionally, the staff and managers collect information, make observations and report in to their superiors and support organizations in different areas.

The most usual comment, or, in practice, experience in this area from staff, and often from management as well, is that there is no time for work, as all the time is spent on futile things, and time is wasted on irrelevant matters and reading instructions and applying for permits.

Another common comment is that instructions are unsuitable for the job at hand. Here, it is possible that instructions have not been updated. More commonly, though, the staff have developed a new way of working, or stick to the old one, because they feel the employer provided instructions that do not give the opportunity to work in the required timeframe, or the required (easier) way.

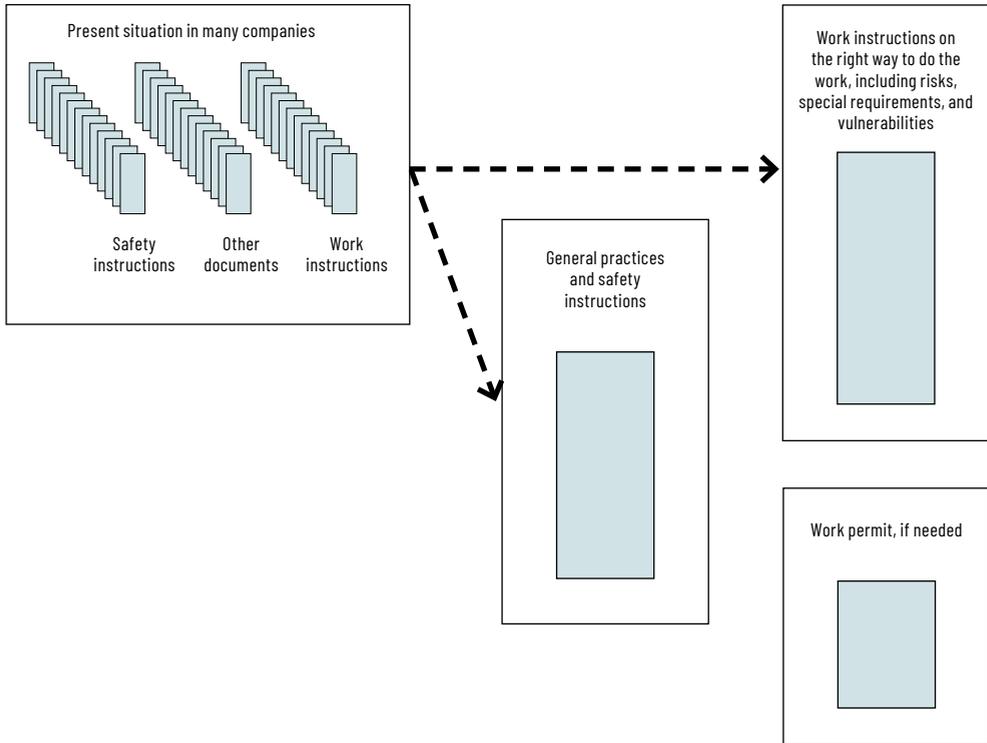
The significance of the work assignments to the result and the next work phase should be the first matter in instructions. Without that, the employee might feel indifferent to the work task involved. With Value Stream and job descriptions, it is possible to show the significance of the task. Sometimes, the task has had in fact had no significance and it has been removed from the tasks to be executed.

With work assignment description (SOP, appendix 1), meaningless matters are eliminated and at the same time different employees' responsibilities and tasks are determined. They should be clearly marked in the work instructions.

In the description of the assignment the following should be noted:

- Sufficiently specific so the work can be done right, new employees briefed, and the superior can control the execution of the task.
 - The best experts, i.e. the persons working on that particular task, determine how much specificity is enough.
- Employee is able to recognize normal work and abnormal/dangerous work.
- Contains the right procedure to ensure safety: no need for separate instructions.
- Contains other quality requirements, etc.
- Uses and includes risk evaluation in the right way of execution.

The right technique work instructions



When writing work instructions, it is good to ask oneself, in connection with each phase and task, whether this matter is or should always be a part of the task, whether there is a separate safety sheet etc.

If the answer is yes, the matter is added straight to the work execution process. Examples include the limits of a lift working area, fall protection, protective clothing and personal protective gear, quality control, and taking of samples.

This reduces overlapping instructions, and, simultaneously the need for updates. At the same time making changes, for example the direction of supporting organizations, goes via work phase executors, thus eliminating the need for them to come as separate documents.

The following kind of table of contents may be used in the description of the task: Example appendix 2.

- Work task
- The significance of the work task or work phase
- Responsibilities and obligations
- Description of the task
 - Issue of the task (from whom, with what information)
 - Notifications needed (the superior, the control room etc.)
 - Planning needed on the work site
 - Machines, hardware, tools, personal equipment
 - Precise naming, standardization
 - Materials needed
 - Preparation
 - Inspections of machines, hardware at the site
 - inspection list?
 - Inspection of work environment/work site
 - Inspection list?
 - Preparation of work site for the work task
 - Description if needed
 - Description of execution of work phases to necessary precision. If, for example, a machine has a separate instruction manual, reference to that is enough. Staff are briefed in its use
 - For example, the steps for locking and supporting the machine are standardized work phases in the work instructions described. Separate instructions are not needed. The work instructions should not be collection of references and hyperlinks
 - Instructions may have images to demonstrate a work phase, but they should be of good print quality

- Finishing the work
 - Cleaning the area and returning accessories and tools
 - Notifications when the work is finished
- Action in an accident and abnormal situations
- Operators, authors of updates, times.
- There may be attachments, for example, of more accurate execution or measures. Similar contents have been used by different industrial operators. The contents should be applied according to the function of the company and content of the work phases.

For the standardization of the work methods, developing and standardizing the work environment with the 6S method would be best. If the company has already introduced the 5S model of operations, you should say what you think about the functionality of the work environment, pacing of different items, and the work premises, and, if needed, update the former operational model.

It is important to involve the persons who do the work in the development of methods and making the work instructions, because they can then be introduced to the significance of the work task and create the opportunity to affect the content of their own work and commit them to compliance with the method.

5 Developing competence

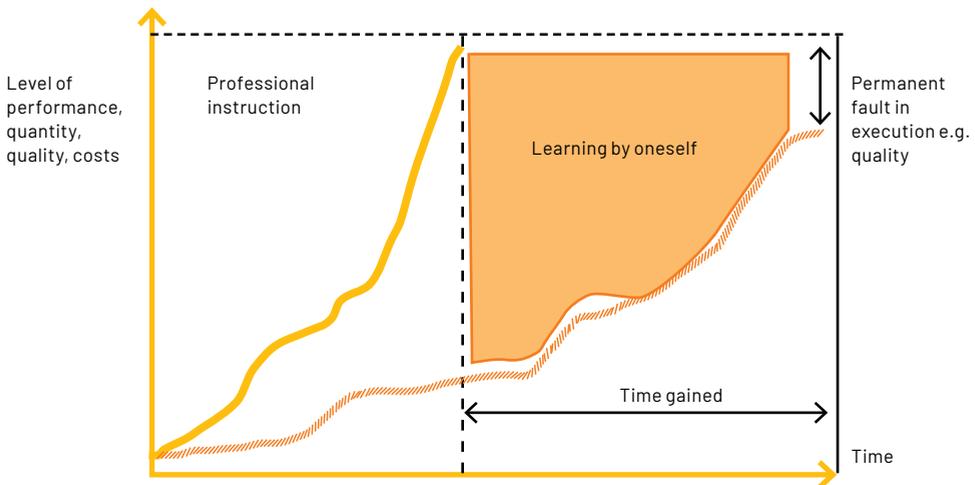
Developing competence is a means for the company to ensure the result required by the actions of competent and professional employees.

With professional instruction, competence can be systematically developed. Challenges in professional instruction arise in defining the extent and content. At its worst, it applies the “turn the key and let’s try” principle using ostensible doing, which culminates in form ticking and signing.

At its best, professional instruction is a process in which each work phase and work task has standardized methods and instructions, and knowledge-based goals based on them for the instructee.

The goal of the instruction is to reach a state where the instructee can follow the company’s basic function, and the goal set for the work, to do an independent work performance. Within the right work performance, we are talking about the right result, work method, sequence of work, effectivity, safety, and quality.

It is good to bear in mind the Lean Safety principle: when the work performance is planned and standardized correctly, the goals of professional instruction are not mutually exclusive. Effectivity and safety credibly have their place in the formula.



Systematic professional instruction contains the following areas:

- company level principles and practices of work instruction
- work phase or work task competence goal by specified task
- professional instruction plan by work phase
- planning and execution of personal instruction
- authentication of competence and finalization of instruction.

Process functions and responsibilities have become a challenge in professional instruction. They have to be unambiguous, so the instruction process reaches its goal and the content and execution can stand up to judicial scrutiny e.g. in the event of a product fault, machinery or hardware breakdown, or in the event of accident.

The employer is in charge of the planning and contents of the instruction process and the concrete execution of the professional instruction (the resources used). The practical execution is the liability of the immediate superior, in accordance with the line organization responsibilities. This liability is constant: the instruction task may be executed by many, but the liability of employees' instruction remains with the employer. The documentation of the contents and execution, and the acceptance of the execution of professional instruction, meaning the permit to execute independent work, is therefore an integral part of the professional instruction process.

The work instructor executes a work task given to him or her by professional instruction. He or she is liable for the contents of the work performance (instruction), meaning that the one to be advised gets sufficient correct information for the work task to be executed according to the instruc-

tions given. This is why it is so important that the work phase has instructions and a plan on as how to advise on them, so no area is left uninstructed.

From the perspective of the work instructor it is important for the work instructions to be up to date. The verification of the work instruction contents before the start of the professional instruction must be a part of preparation of the instruction duty. This ensures that a situation in which the instructor instructs a different execution of work performance than instructed. Faulty work performance may lead to accidents, reduced efficiency, quality faults, and breakages in machinery and hardware.

If the instructions and execution are in conflict, the work instructor has to verify the right way of action with the employer. The work instructor must not independently change job descriptions or the contents of the work performance.

Another important matter during work instruction is to record the things that have not been instructed. For example, a work task or the maintenance of a certain machine has not become topical during the instruction, insofar as the information is necessary for a new employee, so that he or she does not try to execute the task as it comes up. Similarly, for the employer, the manager is able to react when the right situation comes along (the completion of instruction or more accurate planning and work permit).

From the perspective of the instructed employee, the execution of standardized work performance and, in changing work, good instruction of boundary conditions, makes it possible to observe and react to changes and to special circumstances. In particular, for an unexperienced worker it is nearly impossible to recognize deviations or hazard-

ous condition in work if there is no point of comparison.

A standardized work performance or work instruction does not have to recognize everything abnormal in the work, or document procedure, but it has to be accurate enough for the employer to recognize an abnormal circumstance or situation.

At the end of professional instruction, the employer representative accepts the instruction done according to operating model of the company and gives the employee permit for independent work. At the same time, he or she states that the instructor has done his work task, and the employee is transferred to normal employer instruction and control.

5.1 Knowledge goal

The knowledge goal defines the contents of professional instruction. For the instructor it shows the content path and ways the new employee learns to reach the level of putting the learned things to practice. From another perspective, it clearly defines for the new employee what is supposed to be done and which matters he or she has to adopt so the job or task at hand moves from trial period to permanent employment.

The knowledge goal answers the question of which skills the instructed person has after the professional instruction. If the employer representative or professional instructor cannot answer this question, the

Levels of professional competence

Expert

Uses reliable, objective data, but final results may be based on intuition, "latent" information. Usually works flexibly and appropriately for the situation. The experience-based latent information is a crucial part of expert competence.

Very skilled worker

Knows work tasks in practice and is able to use his or her knowledge and skills in new situations. The meaning of intuition in solving problems is advanced. Understands skill more comprehensively, not just as the sum of separate skills. Is aware of the fact that one uses different skills in different situations.

Skilled worker

Is able to evaluate what is important and what is less important. Makes independently conscious choices on what to do. Can put things in order of priority, make plans and weigh up different options. Is able to consider the special features of the workplace.

Advanced novice

Can apply work-related rules and instructions. Is able to take special features of the workplace into account somewhat. Needs help to distinguish the important matters from the less important.

Novice

Is able to follow work-related rules or instructions in familiar surroundings and familiar interaction situations. Is able to use his or her learned knowledge and skills in practiced, frequent situations. In instruction for the new employees the goal might be an advanced newcomer, with readiness through experience and repetition to qualify as a skilled worker.

instruction has not been provided with a set goal with clear content. It is not enough to answer that the goal is a work task of an operator or customer service. Rather, the knowledge goal matters and its contents are concretely named.

Becoming a professional takes time and requires work hours and repetitions. The knowledge goal should be set accordingly so the newcomer is not under excessive pressure.

In the instruction and development of professionalism of an experienced employee, it is good to take into account the things learned before, and experience in operations. A personal plan should be made accordingly to retain motivation for learning new things. Thus, it is important to speak of the knowledge goal for experienced employees.

In the experienced (skilled and very skilled) employee, instruction and development of competence to the next step can be used in the likes of inner development and planning duties or projects. They should be recorded so that competence is preserved, such as on an employee education card or similar, even though staff in the middle management or the human resources management change. An individual person may well have top competence about a single area of work, and this information should be used in the likes of maintenance stoppages, planning of new functions, and professional instruction. The employee is often a key figure in realization of production, through his or her own professionalism.

5.2 Work-phase-specific and personal work instruction plan

A work-phase-specific work instruction plan is by its nature an instruction document containing how the instruction is executed and what it contains. It is based on the overall policy or the model of the contents of work instruction.

The content example of work phase specific plan: Appendix 3

- Accurate description of work phase or task
- Knowledge goal
 - basic knowledge and skills of own work task
 - machinery, hardware, tools that need to be mastered at the end of instruction
 - significance and goals of own work in the operations of the company
 - prior and next work phases
- Acquiring initial information and the contents of initial conversation (superior, work instructor, instructee)
 - What is executed and what is discussed (e.g. work experience, education, special skills, possible limitations)
- The contents and compilation of personal professional instruction plan
 - When it is made and who participates
- Other persons taking part in the professional instruction
 - Task titles (e.g. the operator of the previous work phase, expert on work phase or machine, human resources, safety, union representative etc.)
- Instruction in the right execution of work
 - How to instruct the person to the work task (theory, demonstration of the execution, instructed trial, instructed execution, independent execution with monitoring)

- Which work instructions are to be used
 - All objects to be used are named
 - Verification of knowledge
- E.g. exam, interview, demonstration of execution of work performance
- Who is taking part?
- Finalization of instruction
 - Which documents/records should be made?
- Who participates?

Personal work instruction plan (Appendix 4) contains the corresponding headings, but accurately tells the following about the person:

- name of the superior and work instructor
- the contents and execution time of initial conversation
- setting of knowledge goal
- other participating persons (by name, not job title)
- schedule and execution plan
- realization of the evaluation of knowledge

In everyday life there are always changes and absences, etc., but the personal plan gives the instruction a “red thread”. The order of the instruction is important to keep if the work requires the learning of a certain skill, before it is possible to move to the next phase, or if matters are combined during the work performance.

From the perspective of the instructee, an appointed instructor or a superior coordinating the whole, keeping the red thread in mind, is important. because otherwise there might be a situation, in which the new employee is with the instruction form every day with a different person, and the person does not necessarily know what should be instructed to the new employee.

Through the appointed instructor, professional instruction will stay solid in its content and efficient, even though there might be various instructors.

5.3 Execution in practice of professional instruction

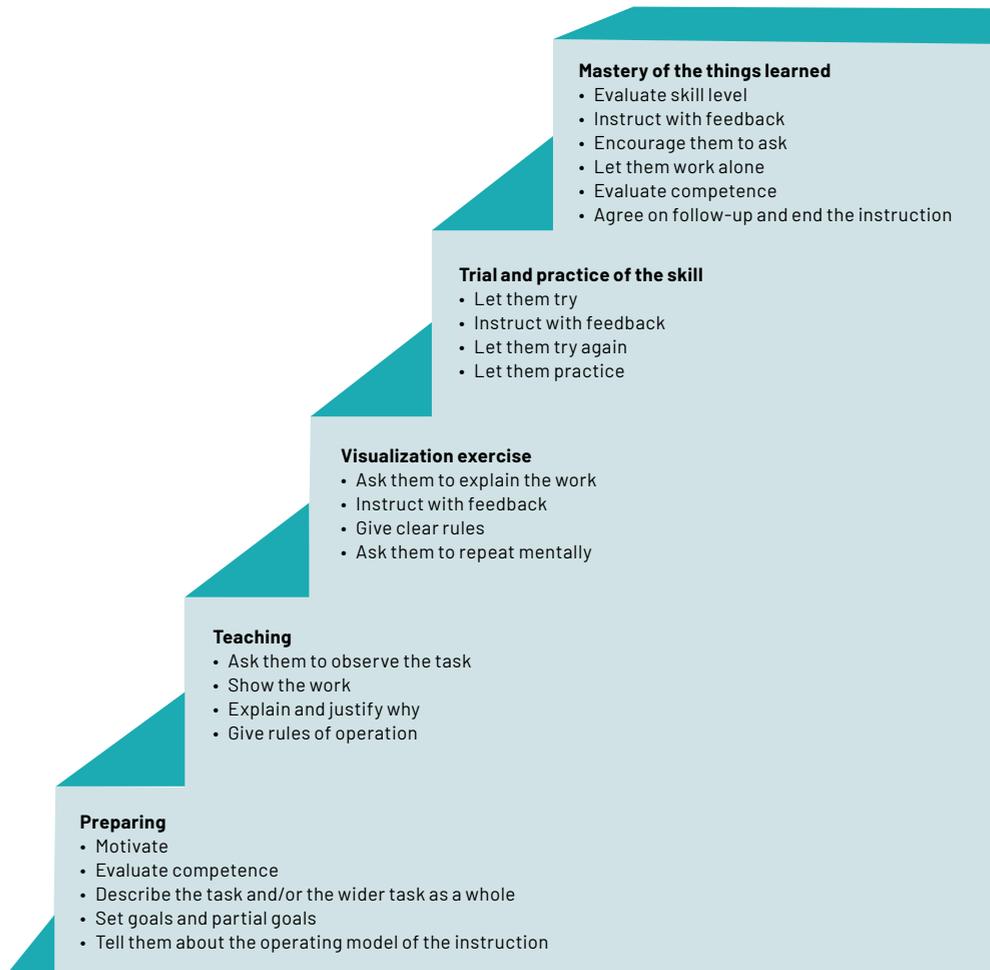
First, it is surely good to distinguish between familiarization and professional instruction. Familiarization is the general and common matters and practices of the workplace and common workplace. These may include the basic functions of the company, general goals, strategies, employment matters, liabilities and obligations, general practices e.g. data privacy, safety, action in an accident. Familiarization is done in many workplaces as an internet course or by the management and HR or safety experts.

Professional instruction is teaching the actual work task, but for the instructor of a new employee it is important to have updated information about the general matters of the company.

A five-step model is widely used In Finland in the execution of work instruction, and it has shown to be good action model in particular practical work tasks.

In the planning of professional instruction and the work phase, the specific plan of a work task the five-step model is depicted to an appropriate manner and accuracy. This standardizes the methods of instruction between differing instructors and shifts, while at the same time improving the quality of instruction. It is easier for the new instructor to begin working in his/her own task when the way of instruction is at least described in a general manner.

Five-step method



It is important to note the different learning styles and motor and writing skills required of people in tasks in a personal work instruction plan. The instructor's job is to modify the general model and schedule for the instructee so that it fits.

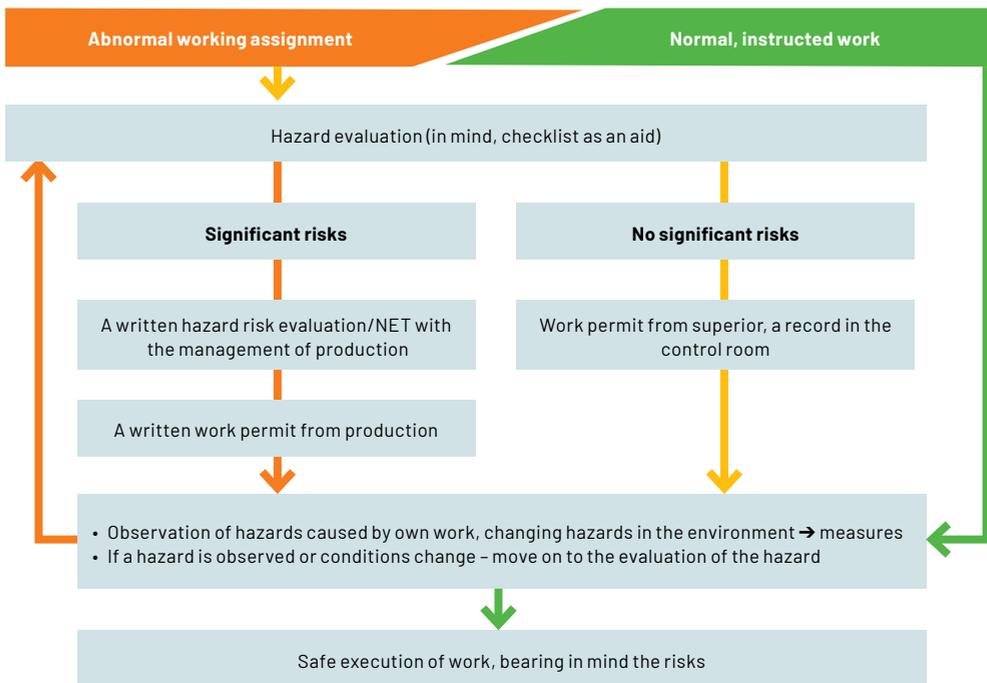
6 Observing and reacting

A standardized and visualized working environment and standardized work assignments give the employee a real opportunity to actively observe and react when abnormalities or change in conditions occur.

A person recognizes an abnormal situation or a change in operational environment, but first has to know what is normal.

It is often challenging in companies when that the environment is uncontrolled or messy and the right method of working has not been described. This means that normal similarly repeating work or a standardized environment cannot be identified.

In a changing environment, when the work tasks or work objects constantly change, a frequent challenge is that the preconditions of the work performance or environment have not been described or instructed to the person.



This easily leads to a situation in which the employee does not recognize an abnormal situation or an circumstance and operations in a changing situation may be unplanned, with reflex reactions.

From another perspective, the employer can react so that there is no “normal” work at all; rather, everything is to be evaluated and work requires permits. This sort of action has typically emerged as a reaction to a serious accident, disaster or hazardous situation. As stated in the first chapter, it can work for a little while, but as a permanent way of acting it is heavy on resources and effectivity on the employers’ and employee’s side. This way of working cannot be considered meaningful when thinking about the basic function of the company or the work performance of the employee.

Development work for the methods and environment, and developing people’s competence and control of it give a good chance for the right kind of reaction in the company’s and people’s operations.

6.1 Observation

Reactions of people are largely based on observations that we constantly make on our environment. As previously stated, a standardized environment and work methods help us observe changes.

We react to the smell of smoke, a strong sound of acceleration or braking, or a visual detection of ice on the footpath in the same manner.

Reacting in this kind of situations is based on earlier learned models of what is normal, abnormal or dangerous, or, if there is

no previously learned model, our action is based on reflexes.

People who have been in a dangerous situation, accident, or been the victim of violent crime or robbery, often say that it happened “out of the blue”, meaning that the situation was totally unpredictable, surprising, and nothing could be done.

However, in lots of these cases, in the light of accident investigation, eyewitness reports, or the person’s own story, it could be observed that the dangerous circumstances or faulty action had been present for years, or had developed in such a way that it could have been observed.

A common factor in several of these stories is that the person has been doing something that required his or her complete attention, or that he or she has been in such a state of mind that weakened or removed concentration on the matter at hand or immediate environment.

Examples can easily be found in everyday life:

Driving on a long journey makes us numb: we might go in “autopilot”, unable to remember what happened during the journey, or where we are when someone asks.

Using a mobile phone when walking or driving strongly reduces our ability to perceive and react. It has been compared to drunken driving in terms of the reduction of performance in sudden situations.

Similarly, listening to music when walking or riding a bicycle takes away one of our senses. In another example, “runner’s flow” reduce the runner’s attention to the environment and traffic.

The most dramatic example in recent years of a temporary loss of perception and the hazardous situation it causes is a mobile phone game in which children or adults search for virtual characters in a real urban area.

Acting under the influence of alcohol of course affects our ability to perceive and act.

Examples from the workplace:

Fatigue easily causes a slackening of concentration (perception) and makes one prone to faulty work performances.

A quickly done and often unplanned job requires concentration, and we may not notice matters in the environment, such as traffic, people, stairs and thresholds, as we concentrate on the matter at hand.

A task repeated identically and repetitively work causes an “autopilot” similar to while driving, meaning we perform the work without thinking about it.

Using a mobile phone or filling in forms, whether it be written or on a computer at a workstation, quickly occupies our attention, obscuring events occurring around us.

6.2 Levels of perception

The earlier examples described a situation where we do not perceive the environment actively. How could we activate ourselves in such situations where we should have a good performance even in fast situations?

“Levels of perception” is a way to structure our actions, and it is meant to describe our state of mind, mode, in different situations and environments.

The operating model was originally developed for people working in military and of-

ficial capacities, and have since been used in operating models to manage hazardous situations and safety-critical environments, and increasingly in recent years, to visualize people’s activity in everyday situations, at home, in traffic and even in work activities.

Perception is described in the operating model as colours. The same colours can be used to visualize instructions, areas, or tasks.

The white level of perception is “out of the blue”. In a white state of mind, we do not actively perceive our environment, and things and changes in the environment go unnoticed.

It is good to be in a white state of mind when we are on the sofa or sleeping but when driving, moving among people on the town or working it can be dangerous, as we cannot observe our environment and anticipate. Instead, our activity is responsive and based on reflexes.

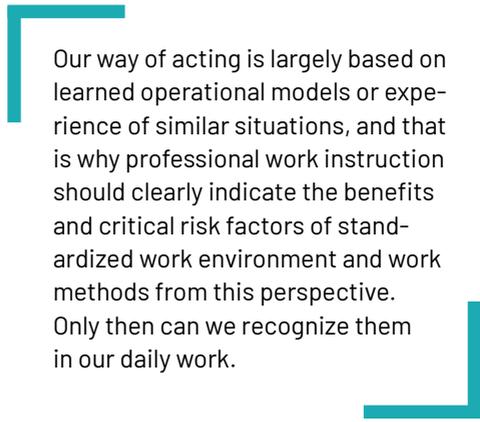
The green level of perception means a situation when we actively observe our environment. This does not mean that our head is spinning like an owl and we are alert all the time about everything.

In a green state of mind, we are active and concentrate on the thing we are doing with consideration for our environment.

In a green state of mind, it is possible to observe hazardous circumstances or a situations before they happen: oil or water on the floor, a broken bannister, a leaking valve, a strange smell or taste, a car approaching a crossing at high speed, a moose by the side of the road, a ball flying onto the road, or a shady character approaching.

The perception time can be very short, under a second while driving, or it may be information of a dangerous condition, locale, or course of action that we recognize in the basis of earlier information.

Observation, however, gives us the opportunity to predict and act logically and systematically in the situation. We can go away, warn others, stop a machine or hardware, slow down, brake, or give way while driving.



Our way of acting is largely based on learned operational models or experience of similar situations, and that is why professional work instruction should clearly indicate the benefits and critical risk factors of standardized work environment and work methods from this perspective. Only then can we recognize them in our daily work.

A yellow level of perception represents anticipation and preparation. When we make an observation, we have the chance to choose our course of action.

We can prepare for known conditions ahead by wearing the right kind of clothes and equipment, doing a control and evaluation of the work site more meticulously, or contemplating possible traffic hazards based on the weather forecast.

In a fast situation, anticipation, preparation, decisions to act and action are very near each other.

Red is the level of action. In this phase we act based on an observation made.

The action may be braking the car, acquiring a better balance or evading a slippery spot, attaching a harness or stopping work because of a flaw or danger observed.

The important thing is that we act on observation, whether the action is quick or we have more time to execute it.

In many workplaces the moments for thinking about it all, the making of safety observations and the issuing of work permits guide this as proactive action. Thus, thousands of observations are made a year, depending on incentives.

Observation should lead to proactive preparedness and, through a decision, to the right course of action. An observation in itself is not enough.

The black level of perception means a situation that comes all of sudden (white) and for which we are not prepared or do not have existing operating mode or competence.

The black state of mind is also described by the term “blackout”, because in that state of mind a person acts instinctively, based on reflexes.

In a rapidly occurring and possibly scary situation human stress reactions emerge and logical thinking may be obscured, as fight or flight reactions overwhelm us. Even remembering the emergency number may be hard in situations like this. The person might also forget what exactly he or she was doing at the time.

Our reactions in rapidly occurring, surprising situations may sound absurd when heard of in a normal situation: the stopping of the swing of a steel or paper roll by hand or the stopping of a falling knife by a foot.

Common to these both situations is that the person is surprised by the situation and does something instinctively, like a reflex.

6.4 Developing perception and visualization

Green-yellow-red

The above points contain examples of how the levels of perception may appear at home or in the workplace.



People need examples to develop perception competence, and in this context visualization according the 6S method and the standardization of work instruction play an important role.

Perception ways of action (Gemba Walk) can be directed at different areas and when the observation is directed at safety, we can use standardization of tasks, environment and visualization so that the executors can observe and pay attention to important things.

Colours can be used also in documents to visualize the execution of risk evaluation measures, or in connection with a hazardous object in the work environment.

When the working environment and working methods have been standardized, we can indicate in the remaining risks the work situations and conditions where a person has to consciously move to a green state of mind, and, if needed, via yellow to red.

In the same way, the extra dangerous jobs where superiors and employees have to make an accurate plan, preparations and decisions of action, and thereafter execute them, can be recognized and refined.

People can be given tasks through examples, to recognize levels of perception and think about in which situation white state of mind originates. Driving and using a mobile phone are good example tasks for this, simultaneously advancing everyday safety.

White-black

In the same manner, it should be demonstrated with examples from people's own workplace, how the white and black levels of perception can affect safety and how to avoid them.

Examples can be found in the accidents in one's own workplace, field and accident reports, and, of course, in our own leisure time.

7 Work right, fail safe

It is impossible to reach perfection or flawlessness.

The pursuit of perfection or flawlessness when it comes to production or service processes or human operations is a good direction, as long as you remember that the goal is moving with the same speed as the progress forwards.

The first chapter discussed values and points of interest. To pursue actions while moving towards values gives rise to the right actions and development of activity both at the company and individual level. Operating in this direction is not the easiest ways and is also long, but the results are worth pursuing.

In this guide we have supplied you with the route and measures that for their part take the company and human operations in the right direction, towards goals and success.

From the perspective of the company, the road to success may be effective and smooth and give the desired result, and from the human perspective it may be work which is significant and smooth that gives the opportunity to have an impact on the work while bringing success and maintaining performance and health.

Demanding flawlessness and perfection may slow down operations and decrease motivation to do the right thing. That is why the word "adequate" is often emphasized. The goal of development should be clear, but if the final required level does not have a basis, development work goes the wrong way, and is felt to be a burden, not an opportunity.

People make mistakes, which is only natural, as after all we are not machines. Even machines break down and cause trouble and dangerous situations.

The crucial idea in this operating model is that we make the goals of the company, people and work environment good enough, preventing trouble and dangerous situations.

If for one reason or another a trouble or a hazardous situation materializes, the structure and way of acting can cope with it, we can recognize the faulty action, react as necessary, and thus keep company operations, human safety and health out of danger.

When we do our work right, it is totally possible to make mistakes without any danger.

Work Right, Fail Safe!

Have a safe working day!

Appendix 1: Standard Operating Procedure

Operation and documentation model for the leader of SOP process.

The instruction describes the methods used in the execution of end reporting and the topics of SOP process.

The leader of the SOP is advised to write down the plans made and execution with end results in the same document.

Accurate description and demarcation of the topic and area
What is developed: area, task, or machine/hardware
Potential for development, deviation, need for change
Where did the need for change emerge? For example: <ul style="list-style-type: none"> • Differences in approach • Recurring malfunctions • Accident, hazardous situation, recurring safety anomalies • Effectivity losses • Quality deviations • Deviations in environment
Leader of SOP processes
Name of the person in charge
SOP basic report
The goal of the basic report is to describe the current state (machine, hardware, process, work method, work instruction etc.) of the item to be changed In the basic report the info on the item is as extensive as possible, so the SOP can be directed right and uses up-to-date information in planning. Sources of information depending on the item and the need: <ul style="list-style-type: none"> • Work instructions • Machinery or hardware specific instructions • Risk analyses • Dangerous situations and accident reports (external sources may be used) • Process and operation descriptions, PI diagrams • Production data • Deviation reporting (safety, quality, production, environment) • Interviews, videos • Inquiries In this section the execution, sources used and conclusions are described
The goal of SOP
Concrete goals are set based on the demarcation of the site and acquired data from the basic report At the same time SOP to be done is demarcated as accurately as possible

Team
Persons are named that participate in the making of SOP. Also, experts etc. taking part for this time only are named
The description of the method of working of SOP team
<p>The team methods and schedule are described here. Options for methods, depending on the handling and planning accuracy e.g.</p> <ul style="list-style-type: none"> • Ideation, brainstorming • Observation at the target, safety walk, interviews • Conception mapping • Value Stream Mapping • Safety Stream Mapping • POA, the analysis of potential problems • Event tree analysis, causal connection, fault tree • Flow chart, fish bone • HAZOP • LOPA <p>The search for and creation of solution proposals, not only the description of the problem and description of the condition, action or chain of events leading to it, is crucial in team work</p>
Technical changes required by SOP
Need for technical development procedures is described Development or purchase need is recorded
The effect of SOP to instructions on the site
Work instruction and safety instructions, etc., to which changes have been made or to which changes should be made or new instructions added.
The effect of SOP to work methods on the target
The change in the workflow is described as accurately as possible: what kind of concrete changes in operation do the technical changes and the adjustments of instructions cause
The assessed effect of procedures: production/quality/safety/environment
Assessment of the effect: gets better, stays the same, decreases, slows down, gets faster etc.
The effect of SOP on previous/next work phase
The realization/introduction of SOP in the target and schedule
How does the introduction in different shifts and operations happen? Who familiarizes/ instructs etc.
With technical changes: the schedule for acquisitions and installation, if possible also to be noted: temporary measures/changes in instructions before the technical change
Follow-up
Method and schedule for the follow-up of orientation
What measures and things to be noticed does the follow-up contain?
Does there have to be any new indicators in the follow-up

Appendix 2: Work instruction model

Work task or work phase	Location, target etc. specifying information
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The goal and the meaning in company operation or the next phase of the process
Responsibilities and tasks in the work performance

Work phase description	Detailed description (image, warning sign)	Hints to the employee: different work methods, tricks etc.
<ul style="list-style-type: none"> • Work sequence • Verbal description of work phase to sufficient accuracy 	<ul style="list-style-type: none"> • Can be a picture example of work environment in 6S work phase • Can be a detailed piece of information or an image of a particular technical detail etc. 	<p>Things to be noted (safety quality, environment)</p> <p>Particular risk factors and protection in the work phase in question</p>
Starting work phase or task <ul style="list-style-type: none"> • Need for planning • Preparative work • The controls to be made • The notifications and permits needed 		
The right technique of the work phase <ul style="list-style-type: none"> • to sufficient accuracy from the beginning to the end 		
The finalization of the work phase and the notifications needed		
Action in an abnormal situation <ul style="list-style-type: none"> • Identified potential trouble • Operation model in an abnormal situation 		
Action in accidents or emergencies		

Appendix 3: Work phase or work task specific instruction plan

Group	
Field of competence	
Task entity	

Work phases
Add here an accurate description of the tasks to be instructed in
Goal of learning
Add here a list of single work tasks and entities, machinery, equipment, data and automation and automation systems etc. that are to be learned at the end of instruction
The matters to be instructed in
Describe here the meaning and goal of the task to next work phases and significance and goal of the task of the end produc
The basic knowledge and skills with regard to employee's own task (knowledge basis, understands the contents of the task)
Safety action and its justification with regard to own task (anticipation, crucial risk factors, use of protective gear, exposure agents)
The initiative discussion and compilation of personal work instruction plan
Describe here the cooperation of the instructee, superior, and the work instructor to make a personal plan (meeting, the contents and goal discussion)

Other people participating in the instruction

Name here the persons or tasks that are used in the work instruction in more detail (previous or next work phase, production assurance, other professional person)

The instruction of the right execution method

Describe here how you are going to show the instructee the right work method to the person, and in which sequence (theory, work instructions, showing the work performance, instructed trial, instructed execution, working independently under supervision), using other work shifts

Name the work instructions, with which you are going to instruct the work from the beginning to the end

Communication and reporting

What communication happens before, during, and after the work performance. From whom the employee gets the information regarding the task, with whom you are in contact with during the work performance, and where to report

Verifying the competence

Describe here how the competence is verified. (exam, interview, demonstration of work performance etc.)

Finalization of work instruction

Describe here how the end discussion between superior, the instructee, and the work instructor is executed

Appendix 4: Personal work instruction model

Factory	
Department	
Work phase or duty	
Time and authors	
The employee to be instructed	
Name of the work instructor	
Name of the superior	

The plan is made in the beginning of the instruction, and completed if need arise

Personal info and starting situation
Advance information when possible. Can also be recorded during the initial conversation (education, work experience, goals)
Knowledge goals
The work-phase-specific instruction plan, the future job description and experience are recorded, limitations and extensions are also recorded
Other persons taking part in the instruction
Name the persons that are used in more detail (earlier and next work phase, usage assurance person, another professional person)

The instruction of the right execution method for the work

Describe here in which order you will instruct the person (theory, instructions, demonstration of execution, monitored execution, instructed trial under supervision, instructed execution under supervision, independent execution)

Name the work phases if they differ from the work phase specific instruction plan

Communication and reporting

Describe here how the communicating takes place before, during, and after the execution of work if it differs from the operational model described in the instruction plan. From whom does the employee get the information on the work task. Whom are you in contact with and to whom do you report?

Verifying competence

Describe here how competence is verified (exam, interview, demonstration of work performance etc.) and who others were present in the occasion

Demonstration of skills 1: subject matter, time, participants, the machinery and hardware needed

Demostation of skills 2: subject matter, time, participants, the machinery and hardware needed

Demostation of skills 3: subject matter, time, participants, the machinery and hardware needed

To be filled in at the end of the instruction

The matters left uninstructed
Record here the topics left uninstructed or that have not been verified

The approval of instruction

Name of the instructee
I have received the task-related work instruction in (title of the task) and can work independently following the instruction given to me
Signature and date
Name of work instructor
I have given (name of the instructee) work instruction in (job title) according to work instruction model, work phase specific plan, and personal work instruction plan
Signature and time
Name of the superior
I have supervised the execution of (instructee's name) the work instruction according to the model. I approve the person's work instruction as done and I approve of the instructee's independent work in the aforementioned task according to instructions
Signature and time

LEAN SAFETY WORKBOOK

The aim of this guide is to encourage companies and employees in a range of jobs to think about the ways they could develop their actions to make work smooth and safe.

The guide is about developing operations and competence from a range of perspectives and methods, but the most important matter is people's and the company's interest in and desire to act safely in everyday work.

The guide combines two development models and development contents. The aim of the Lean model is to develop and streamline the company's operations to reach the desired goals and to succeed. Safety, on the other hand, is concerned with implementation as part of operations and the company's core activities, outside its own bubble to prevent damage or accidents.

The Lean Safety activity model looks for benefits and success for both the companies and the people that have made it possible for the company to operate and succeed.

