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International Ergonomics & Human Factors Association

*Giving your business the human factors edge…*

# Making it Happen!

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## About the authors

The International Ergonomics Association (IEA) is a non-profit international federation of ergonomics and human factors societies from around the world. This document was developed as part of the Science, Technology and Practice Standing Committee (2021-2024)

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## Why should you read this document?

This document is useful for those who wish to use human factors and ergonomics **(HFE)** to improve the **productivity** of their companies, the **quality** of their products and the **wellbeing** of their employees. If this is your case, we invite you to read this real-life case.

> ***From a mess to an optimum operation in less than one week***
>
> *Workers had just moved into the new warehouse facility and in two months there were already two injuries in the shipping area. The Vice President of Environment, Health and Safety and the plant manager asked the safety specialist, with an ergonomics background, to help address this safety risk. After doing an initial assessment, the ergonomics expert assured the concerned stakeholders that he could indeed address the issue – in less than a week. Not knowing what else to do, they granted the request and agreed to shut down one of the five workstations to do a more detailed assessment of the work process and allow workers to participate in the change process.*
>
> **Observations**
>
> *The final shipping area was chaotic and cluttered, which was not unusual for a burn-in phase for a new facility. People were reaching excessive distances, walking long distances, and hurrying because they were not meeting their production goals Production goal was 41 orders per hour; they were producing 36. Errors required replacing missing orders. Shipping involved lifting, carrying and pulling boxes; some boxes were filled with light products and others were heavier. There seemed to be an excessive amount of time waiting before executing actions. Both managers and employees were frustrated.*

### Analyses

*The ergonomics professional shut down one of the five shipping workstations and engaged a cross-functional team, including the workers, in analysing the tasks and work processes. They reviewed the task requirements and why they performed them the way that they did. Discussions about solutions were suspended until a proper analysis was completed. These analyses included: tracking movements, capturing awkward postures, documenting frequency of activities, sequencing activities, and identifying barriers to productivity and safety using the corporate Kaizen process.*

### Changes in workstations

- *Unused equipment was relocated or removed from primary work area to allow more room to fill orders. Most frequently used items (scale) were centrally and conveniently located.*
- *Relocated items to be within easy reach, most frequently used items were located closest to workers.*
- *Items were kept at the same level to ensure no unnecessary movements.*
- *Only one of the five printers was operational. Four operators walked to the one workstation to print labels. Changes ensured that each station had a working printer reduced travel time.*
- *The workers were trained to use the newly designed work area.*

### Changes in work organisation

- *When discrepancies occurred, the supervisor had to sign off on changes. The workers had to find the supervisor and wait for approval. The supervisor usually approved the changes without checking. Eliminating this step reduced waiting time and the management realized that trusting the workers was a sufficient check.*
- *Orders were filled in batches (multiple orders on the bench at one time). The workspace was crowded and required awkward postures, which led to errors. The process was changed to a single order system, where only one order was processed at a time. Previous feedback from workers suggested that this was a better system.*
- *Each of the five operators were travelling independently to fetch a pallet for a large order. Changes were introduced to bring the pallets to the area, reducing the time to begin the order.*

## Results

*The analysis, redesign and implementation were completed in less than a week and produced the following results:*

1. *Productivity increased from 36 orders per hour to 44 (23% increase).*
2. *Productivity for individual orders (light products) increased 42% and 18% for larger palletised orders.*
3. *Employee travel requirements were reduced by 73% from 802 ft. (244m) to 216 ft.(65m).*
4. *There were no significant consequences of having the supervisor not signing off on changes.*
5. *Number of orders processed incorrectly decreased.*
6. *Reshipping incorrect orders and credit and rebills were reduced.*
7. *Employees and managers were excited about their accomplishments.*
8. *Injury risks were eliminated.*

## HFE Lessons

Shipping work might be viewed as just the core activity: Physical work, the repetitive motions of which can cause injuries over time. However, by looking at work as a human system you uncover layers of additional activities involved in doing this job. When optimizing such work, one first considers the bending, lifting and awkward postures required in the primary activity, thus optimizing for the workers.

However, printing, barcoding and packaging also affect the result. Taking into account those ancillary lighter activities gives additional angles for optimization of the process as a whole. Finally, looking at the work environment those activities happen in uncovers relevant barriers, the removal of which might transform that work into a more productive and competitive enterprise: Excessive walking, waiting, any source of feeling unempowered and frustrated are just examples of what to look at when seeking overall system improvement.

**Effective HFE changes can be made rapidly and effectively when people and the work are considered together and people doing the work are engaged in the change process.**

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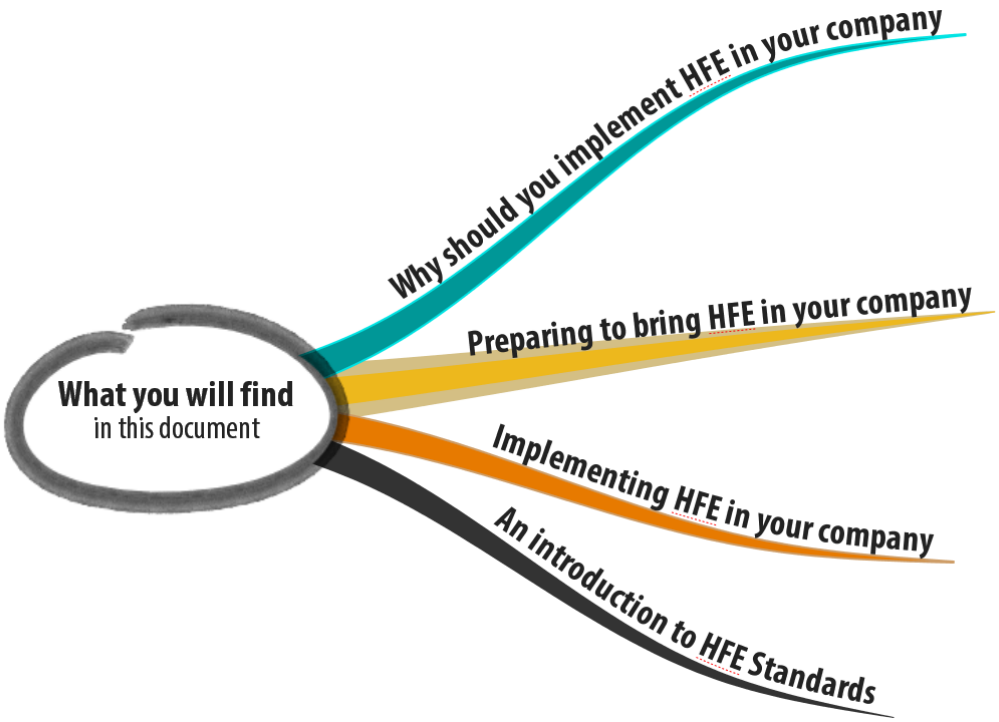
# Introduction

Any organisation or company can improve itself. Some invest in technology, others train their staff, and others develop marketing or innovation strategies. Human Factors and Ergonomics (HFE) is a discipline that can contribute to all the above in an articulated way. But how to implement it? That is what this document addresses.



It is not intended to be a map but a compass. It is the second in a three-part series developed by the International Ergonomics and Human Factors Association (IEA). It is focused on empowering Project Managers and Frontline managers to implement HFE into their systems of work to achieve efficiency in performance and wellbeing benefits to the workers.

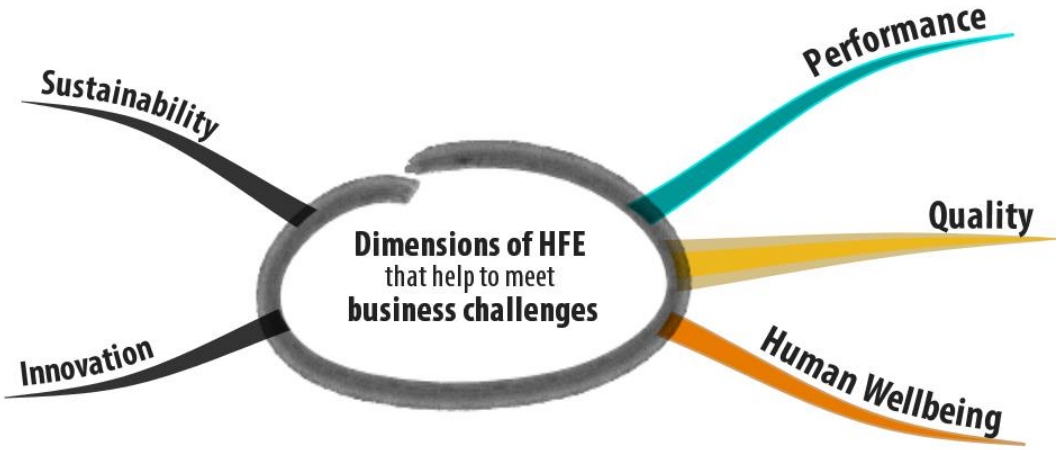
In 2022 the IEA released a publication entitled "Giving your business the Human Factors edge". This publication focused on the central role of every senior business leader to improve the efficiency and performance of their company. That publication introduced business leaders to the field of HFE. It focused on the full range of human science research to optimize the performance and wellbeing of employees in companies. That publication presented the business case for HFE as a profit centre, measuring the impact of human factors, early intervention of human factors, and using human factors to prepare for automation.

The contributors to this publication are trained in HFE related disciplines and have worked in organisations like yours. HFE education and these valuable experiences are the foundations for this document. This practical knowledge together with mind maps and real-life cases intend to answer four basic questions. First, why you should implement HFE in your company? Second, what are the key elements to prepare your company to successfully implement HFE? Third, what steps need to be taken for a successful implementation? Fourth, what are the HFE standards that support this process?

Finally, as powerful as HFE can be for your business, it is not a matter of magic. Any change process involves discomfort and therefore generates conflict. But tensions are not bad; they are an opportunity for improvement.

**We encourage you to implement HFE in your company!**

# Chapter 1
# Why should I implement HFE in my company?




Running a successful business requires making the best use of resources, processes, capital and people to meet ever changing requirements. To meet these demands, companies use Key Performance Indicators (KPIs), and key positions to monitor and create accountability for success. Successful integration of HFE Systems into a business requires technical competence as well as skills leading and working with people.

***Case study: Sustainable HFE needs a team working together.***

*A large automotive manufacturing company reported ongoing challenges with worker injuries, downtime on the lines due to machinery breakdown and quality problems from poorly fitted parts to the vehicles at a site. An HFE program was implemented over a two-year period involving these steps.*

1. *A HFE specialist team was engaged to oversee the program and work with an internal HFE committee consisting of managers from engineering, production, and safety.*
2. *The CEO and executives were provided with high level HFE training and a program of work with specific goals, priority areas and performance targets were set.*
3. *The HFE team trained the production leads and worker representatives from the priority areas and identified a list of case studies to investigate in collaboration with the workers from each shift. These groups met regularly during the two years to discuss data relating to each case study and options. This led to identifying and implementing innovative improvements, which were often surprisingly "simple."*
4. *A training program called "Ergonomics for Engineers" was developed to include the engineers involved in the design and maintenance of the production lines. They also identified a list of projects that they worked on with the HFE team over a period of 6 months.*
5. *A quarterly report and presentation were made to the CEO and executives on progress of the projects and measurable outcomes.*

*After two years, this site recorded a significant decrease in injuries, sustained improvement in process reliability and less complaints about quality from customers. Workers reported that the main benefit of the program was regular positive feedback from the managers and a safer workplace. Managers and workers reported that participation in the program proved informative as well as empowering.*

To add to this changing environment and increasing complexity, stakeholder demands as well as increasing and evolving environmental, sustainability, engagement and social responsibility concerns are gaining traction. This is part of the technologically driven and dynamic world we are living in. Anticipating, or at least successfully reacting to, modern issues can often mean the difference between business success and failure. In particular, powerful issues include:

- Disruptive technologies that can quickly gain competitive advantages.
- Changing workforce values make it difficult to manage as in the past.
- Scarcity of competent technical workers in a more competitive marketplace.
- Attracting, on-boarding and retaining employees in an open job market.
- Developing a reputation that draws customers and workers to your brand.

## Meeting these challenges

The key to successfully meeting current and future business demands is to use a systematic and comprehensive approach to managing people and technology. Harmonizing these elements is the primary goal of **Human Factors and Ergonomics** (HFE). HFE is a discipline that merges the best of diverse fields, like engineering, psychology, design and biology. This multi-faceted approach produces results enabling companies to be successful where single-focused approaches have failed. HFE creates viable solutions and anticipates future demands by focusing on the following dimensions.

### *Performance*

Work can be designed to improve system performance through greater efficiencies and productivity (e.g., reducing human and natural energy expenditure, transit time, scrap). This is the traditional area where HFE is effective in industrial, military, and high-tech domains. By reducing the waste in each operation, the organisation becomes more efficient and more effective.

### *Quality*

Aligning work processes and programs (quality, risk management) with company values requires a deliberate attempt to change, measure, and manage business operations. Meeting or exceeding standards for quality and complying with local, regional or international laws is essential to operational/business viability.

### *Human Wellbeing*

Designing work to be efficient, safe, and motivating will create sustainable jobs. A workplace that is inclusive, good for people, and flexible is attractive and fosters employee longevity/loyalty. This approach also accommodates a wider range of potential employees (e.g., cultures, gender, disabilities) for the company to hire.

### *Performance, quality and human-wellbeing.*

Taken together, this three-pronged approach to meeting business challenges improves current operations and sets a framework to address the future business. It also has immediate implications for improving financial outcomes by reducing direct costs (bottom line, net profit, EBITDA[1]), reducing indirect costs which incur after or around production (insurance, returns, rework, compensation claims, fines) and improving goodwill (reputation, ratings on social media). Together, those factors greatly improve attractiveness as an employer of choice which pulls in more highly qualified and motivated people.

HFE uses design in a systematic way to harmonize people and technology by improving the way work is done AND it takes human wellbeing into consideration.

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[1] EBITDA means earnings before interest, taxes, depreciation, and amortization. It refers to the cash profit of a business.

This creates a high performing organisation that consumers and employees' respect. Consumers are more likely to identify the quality design of its goods and services which have been developed using a HFE systems approach.

Moreover, this harmonization contributes to meeting business goals (increasing productivity, customer base, quality) and creates flexibility to meet future demands (sustainability, environmental, cultural inclusiveness). In addition to meeting business objectives, HFE emphasizes the company culture on dimensions such as: engagement, environment, sustainability and innovation.

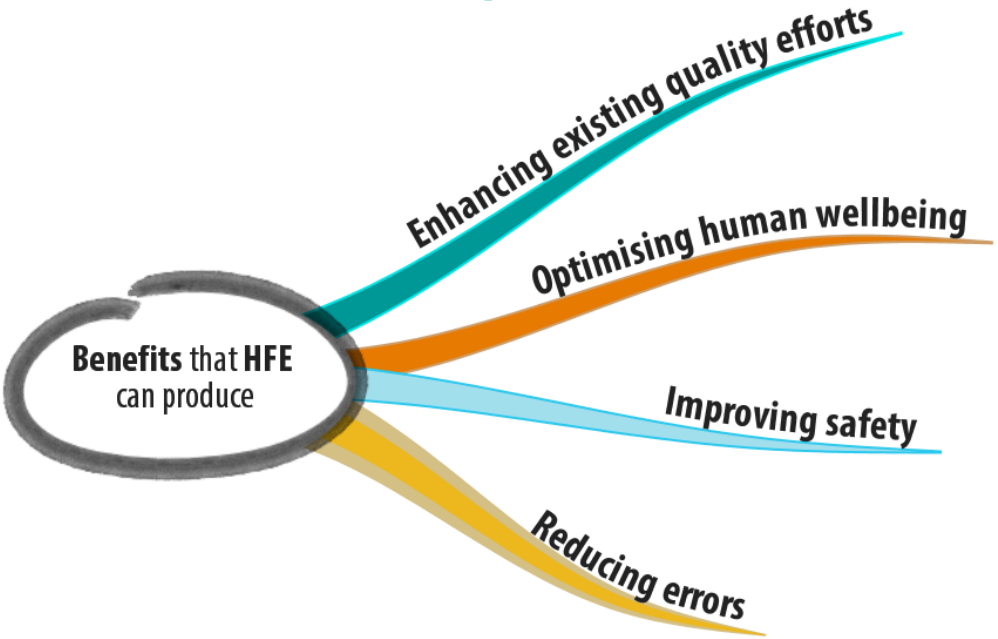
### *Sustainability*

Sustainability has many dimensions: economic, social, environmental, technological and cultural. HFE contributes directly to economic and social sustainability, because it ensures that things are done well without risks to health and safety. But thanks to its systemic approach, HFE is also able to contribute to environmental sustainability by identifying the environmental impacts that organisations can generate. Finally, continuous improvement of processes and technologies is achieved in organisations when they are attentive to emerging technologies and incorporate them to remain competitive. Here again, HFE is key to the integration of these technologies. And all the above is part of a cultural sustainability that allows a company to adapt and remain competitive over time.

### *Innovation*

Improving the company's products and processes to maintain performance, quality and wellbeing requires that human talent, in a participatory way, has a mindset that fosters a culture prone to innovation. Innovation means generating changes that are accepted in the market or in productive communities. As HFE is concerned with changes in processes and technologies, it contributes directly to the innovation of the company and its products.

# What benefits can HFE produce?




Companies, and entire industries have deployed Human Factors and Ergonomics strategies to design and redesign work systems to realize enormous benefits and, in some cases, dramatic changes in practice. Here are a few examples:

### *Enhancing existing quality efforts*

HFE has a long history with quality programs in manufacturing, by contributing to reducing unnecessary actions, time, manual material handling, injuries and product defects. Dating back to early quality in manufacturing companies, HFE concepts were taught to workers in worker engagement programs (e.g., quality circles, product design). More recently, HFE has been involved with quality improvement sciences in other industries such as health care, providing a balanced view of humans and technology in the delivery of quality care and safe patient handling

leading to changes in industry standards, codes of practice, and legislation in the health care industry.

### *Errors less likely, preferably impossible*

Errors in manufacturing (product defects, returns, mis picks) are costly and have been reduced significantly by making it easier for people to work, thus making it less dangerous and more rewarding to work. Whenever possible, the work should be designed to make such errors less likely, and sometimes even impossible. Finally, if there are technological solutions', a solid HFE approach enhances both the human and the technological interface by involving the human in the task wherever and whenever possible to enhance the human and technology interface. That is what has been achieved in our case study regarding delivering quality health care. Integrating HFE into the design of work processes, workflows, teams and sociotechnical systems delivered resulting in reduced or eliminated hazards and ultimately eliminating worker and patient injuries.

### *Optimizing human wellbeing*

By considering the physical, mental, and organisational aspects of the ways humans interact with technologies and each other, HFE has improved industrial design in coming up with popular products such as phones and computers; designing satisfying work; making it easier to use systems that enhance the systems' performance and making it safer, easier, and healthier for humans.

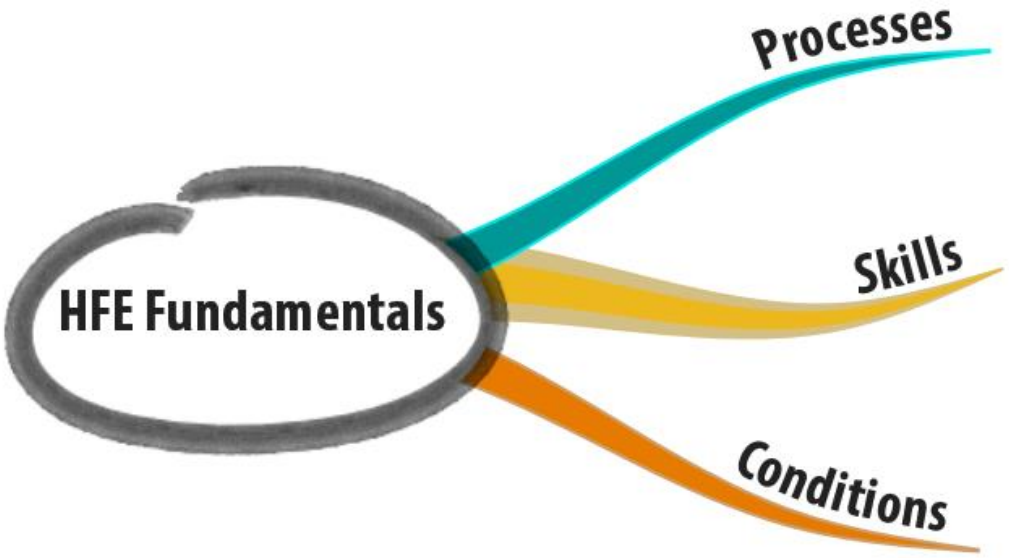
### *Improving safety*

HFE makes devices, work and systems safety more efficient for people to use by improving the design of the physical, (input devices) information (content and layout), and technological (displays and controls) interfaces. This results in fewer injuries and a reduction of direct and indirect costs.

# Chapter 2
# Preparing to bring HFE to my company

## General approach to dealing with HFE topics

In order for HFE to work within a company and be as beneficial as possible, it needs a solid foundation in a series of practices which lie outside its methodical and theoretical core toolset. Those relate to Organisation culture, attitudes and conditions that facilitate the HFE implementation processes. This chapter describes what processes, skills and conditions are necessary for a successful implementation of HFE.



***Case study: We've spent all this money on lifting devices and training – why don't you use it?***

*An acute care hospital reported injuries to patients and nurses during patient transfer from bed to wheelchairs, transport beds to operating theatres or assisting them to stand. The hospital had purchased a range of devices to be used by the nurses to eliminate the manual transfers. These devices were found to reduce the injuries to patients and staff during transfers. Introduction and annual competency-based training on the use of these devices was conducted for all nurses to assure they knew when and how to use them.*

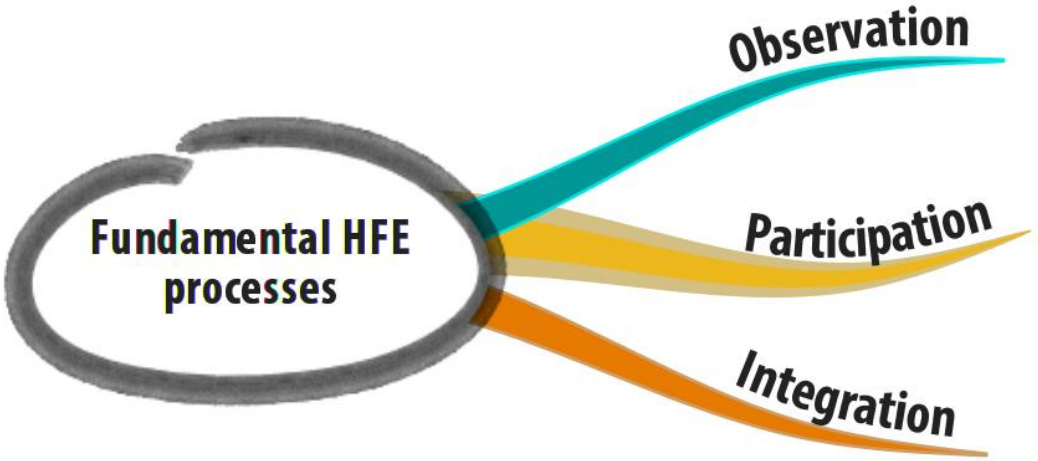
*Incident investigation reports on injuries to nurses and patients during transfers identified that the devices were not used as per the training or not used at all. Injuries to nurses were related to the use of manual force to transfer the patient.*

*A HFE specialist was engaged to investigate the primary causes for these injuries. The methodology involved observations of nurses transferring patients alone or with assistance. Photos and videos were taken, whilst respecting patient privacy, and these were used in focus group discussions with nurses from different shifts.*

*Some of the devices were not safe to use for patients with cognitive impairment such as dementia and too cumbersome to use in rooms with restricted space. The availability of the devices was an issue when they were needed quickly. A primary reason nurses did not use the devices resulted from manager feedback focusing on patients who were late for surgery or medical tests. No feedback was provided if they had used a device correctly or at all. In their rush to deliver the patient on time the nurses found it faster to not use these devices.*

***Fundamental HFE processes: Observation, participation, and integration***

To implement HFE effectively in an organisation, there are three basic processes.




## Observation

Observation is not only the gathering of information about a situation or problem, but also looking at it in a way that removes bias, filters and assumptions about what we are seeing. Like ethnographers, we must be able to understand a problem beyond the just factual issues. Factual issues are crucial but are only one way of understanding the situation. When we identify and understand stakeholders' concerns, motivations, and interests that are not necessarily immediately visible, we are better able to understand people's actions and reactions. Keen observation is a prerequisite for effective actions; without understanding the problem correctly, we may solve the wrong problem. Consider observing the work done by different groups of workers, on different shifts and maybe use photos or video to enable you and others to observe the work later, in more detail.

## Participation

Participation, involving others who are familiar with the issue, is one of the most effective ways to gain a comprehensive and deep understanding of an issue. Moreover, participatory processes encourage employee buy-in when solving problems and builds support when implementing changes or interventions. There are many levels of participation including: merely providing information; asking for input; and involving participants in decision making process and testing various potential solutions.

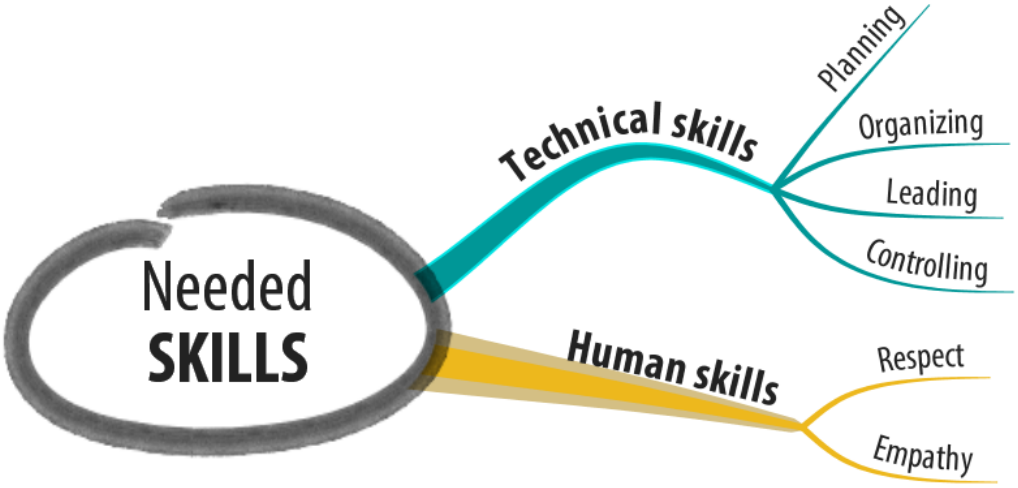
Depending on the moment, each level of participation has its usefulness. The important thing is to be clear about when and how to involve the different stakeholders to maximize information management without generating false expectations of the process. Engaging stakeholders produces a more robust understanding and increased buy-in for change.

Different stakeholders (e.g., managers, employees, worker representatives, customers, the public) can benefit from HFE by improving their interests and create value in three different ways. First, stakeholders can benefit from HFE by improved performance, operational efficiency, lower costs, easier to use products and fewer injuries. Second, participation helps stakeholders gain insights about human performance, motivation, preferences and barriers. This understanding is cumulative and will be useful in future value creation through business initiatives. Third, HFE creates value through individual pride that comes from participation, learning, sense of accomplishment and the joys that come from being part of a larger process. Moreover, empathy and fostering respect can lead to longer term feelings of trust and psychological safety with employees, worker representatives and customers. These are examples of how participation in HFE can lead to value creation.

## Integration

Integration into business operations is key to HFE success. No change in a work system is lasting if it is not integrated into both the culture, dynamics and the structure of the organisation. Integrating HFE into existing strategies, programs and language makes it easier to execute and sustain; HFE should not be a separate organisational process or value and should be given the same priority as other existing business-wide initiatives, approaches, disciplines and rewards such as managing quality, risk or sales. (note from ISO27500 - 2015, 7.3)

### *Needed skills: Technical and Human*




From an HFE perspective, both technical knowledge and understanding of human dynamics skills are critical to the success of the enterprise. Technical skills are necessary for the development and execution of business processes, and human skills are essential for operating harmoniously within our social and natural environments.

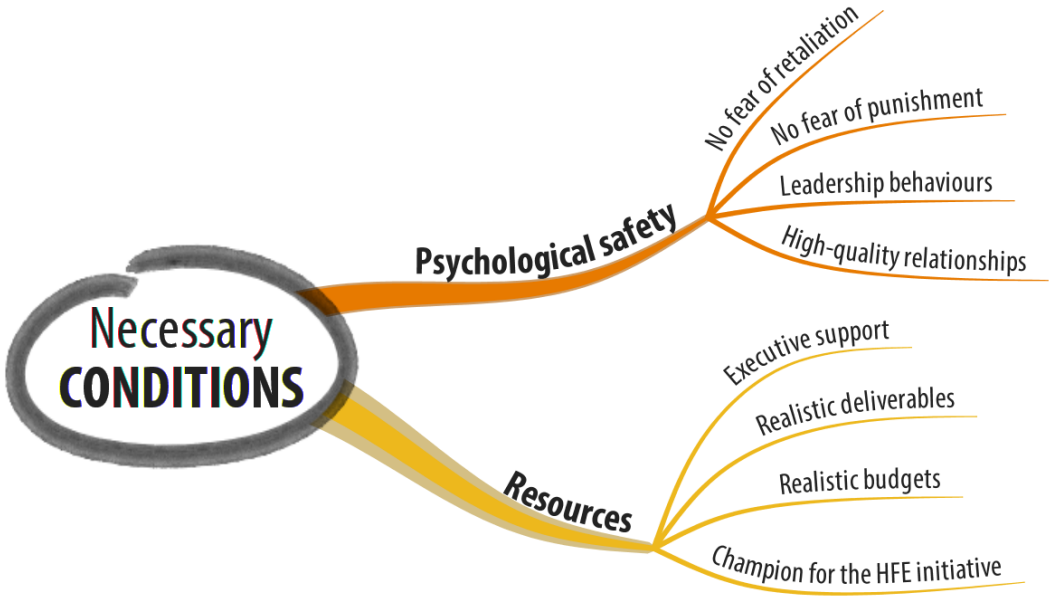
## Technical skills

Basic management skills are required, which include planning, organizing, leading, and controlling. If the organisation already has management systems in place, HFE is most effective when integrated into those processes. If such systems are not in place, introducing concepts such as strategic planning and resource management set the stage for alignment of HFE actions within top management objectives. Without these fundamental skills, it is difficult to gain the support and resources for HFE interventions. Thus, realizing the value of HFE can be limited.

## Human skills

It is worth highlighting two key human skills: respect and empathy. These two foster an environment of trust, which is required to generate a lasting change. Also, keep in mind that implementing new ideas or programs that generate individual and organisational changes moves both people and the company out of their comfort zone. And when you move out of the comfort zone, discomfort and conflict are potential outcomes. This can lead to personal angst and organisational conflicts. Trust is the antidote for these reactions. If people and the organisation can trust each other and the change process, they will be open to change. Trust is gained by a spiral of trust and empathy rather than a spiral of discomfort and conflict. Respecting differences, opinions and points of view creates an open atmosphere in which people are willing to participate. Trying to understand these different perspectives acknowledges the importance of working together in a participatory way. These human skills are keys to making the technical skills workable. Without integrating these human skills into the organisation, generating lasting change will be difficult.

***Necessary conditions: Psychological safety and resources***




## Psychological safety

Psychological safety describes people's perceptions of the potential consequences in taking interpersonal risks and has been shown to impact people's willingness to contribute ideas, share information, and speak up. This willingness is a fundamental requirement for observation and participation processes to yield meaningful information. Fears of retaliation or punishment can be powerful and sometimes subtle deterrents that prevent information sharing. People are more willing to provide honest answers to questions or participate in activities when they feel their actions will not have negative consequences.

Improving organisational practices, leadership behaviours, and good relationships can improve the feelings of psychological safety. When people feel safe, they are willing to share more information about patterns, organisational culture, or alternative explanations – which are helpful in determining if we are solving the right problem or if we are simply solving a problem in the right way.

The HFE interventions require appropriate resources including access to people, safe physical space, and leadership support and each are critical requirements for success. Organisational issues are usually complex and have many possible causes. Time is needed to explore each explanation with the possibility of discarding or refining that search for a solution. This practice of extensively researching an idea that we propose and then re-examining the potential confounding or supportive effects as part of the bigger business picture can have several iterations. This iterative process recognizes that the first explanation, idea or solution may not be the best one. The best solution is often created from improvements upon several contributions of many stakeholders over various iterations.

***Recognizing Required Human Skills***

The human skills identified here are embodied in people who are good at facilitating discussions, meetings, and leading projects. Their combination of respect and empathy to create trust and psychological safety enables the execution of the fundamental skills (observation, participation and integration). Identifying and tasking these individuals to shepherd these HFE work processes is a boon to the likelihood of HFE success. Rather than looking for the position in the company, looking for human skills in people is a boon for success of HFE. Perhaps you have witnessed these behaviours that exemplify the fundamental skills and necessary conditions listed above:

### Respect

Asking for people's input; asking follow-up questions; probing with 'why' questions; making sure everyone understands what was just said; giving people equal opportunities to voice their opinion, no matter their stance; withholding judgment on what people say; controlling the communication flow so people can speak without interruption; ….

### Empathy

Empathy is shown when people are allowed time to express dissenting opinions; introducing sensitive issues that need to be discussed and making it safe for people to do so; ….

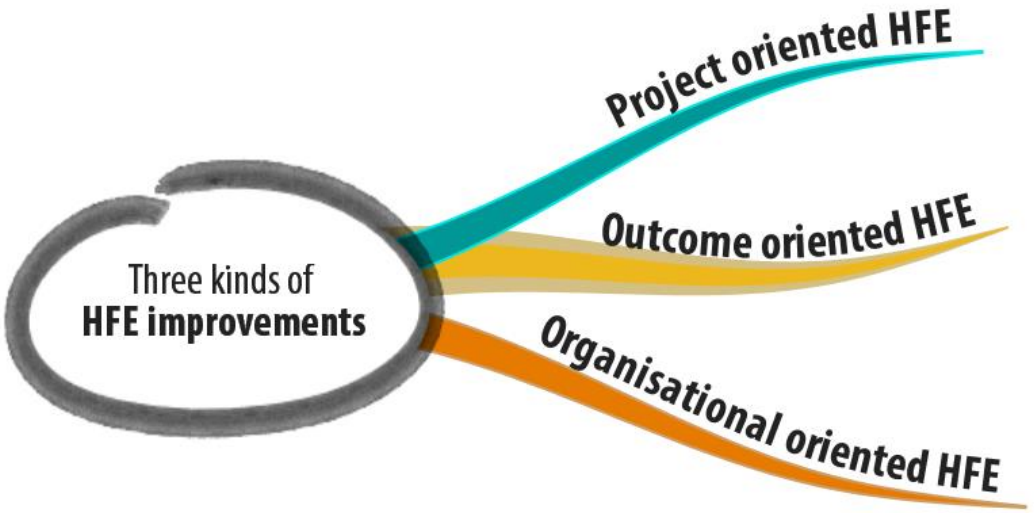
### Psychological Safety

Making it safe for people to say what they are thinking; disregarding organisational rank when considering a position; ensuring that the openness and trust is accompanied by no retaliation; leading by respecting the people being led.

***Resources***

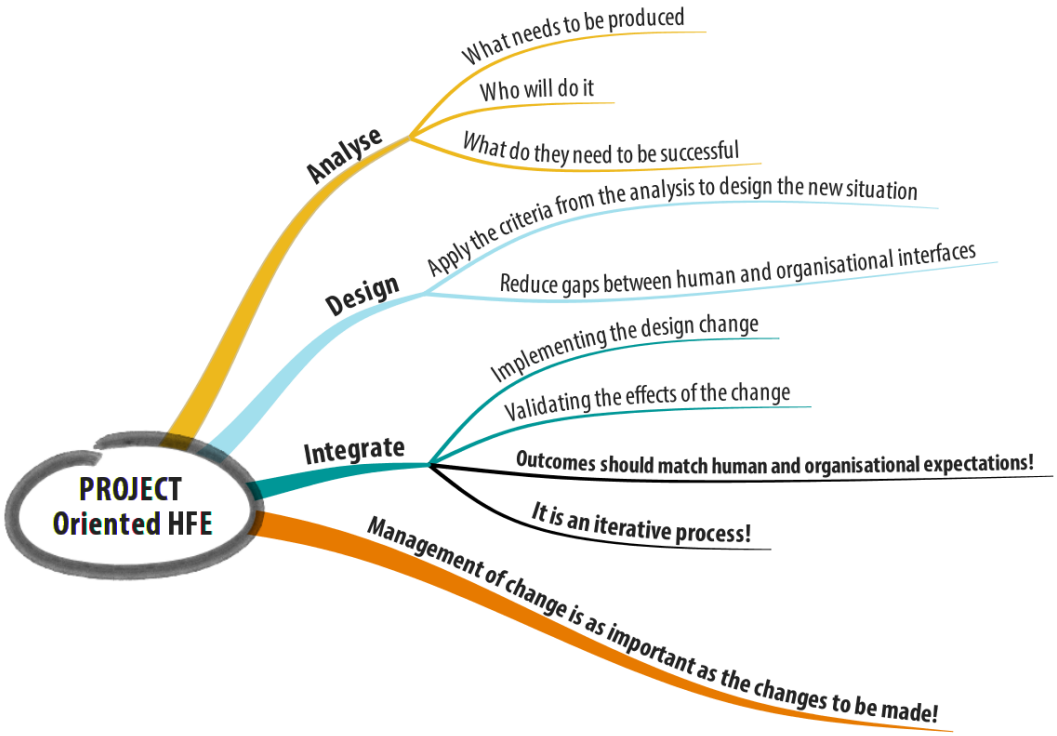
The reality is, in organisational life, without resources, nothing can be done. First, and foremost, is executive support. To get upper management commitment, HFE initiatives must provide realistic deliverables that correspond to organisational objectives and Key Performance Indicators (KPIs). These initiatives should be backed by realistic budgets, and proper allocation of people with the right knowledge, skill, and authority and time. Whenever possible, there should be a designated champion for the HFE initiative should be identified who is directly responsible for managing the project, tracking and measuring the progress and communicating progress to senior management. Three kinds of HFE changes are presented here. Each level may require a different management leadership; but all require the same change management processes to shepherd successful outcomes.

## Managing Three Kinds of HFE Improvements



It is vitally important to define the scope of the HFE improvement you want to achieve. A well-defined scope will allow you to manage resources, activities and expectations.

### *Project Oriented HFE*




This is perhaps the most well-known use of HFE science in organisations. A single HFE professional or a team are brought in by the manager to address specific issues, either human related or outcome related. Human related examples include injuries, discomfort, complaints, pain, staff turnover, absenteeism, and difficult tasks.

Alternatively, HFE professionals are invited to solve a problem or change a process like late deliveries, slow customer service, wrong items shipped, damage or loss, and reducing incidents. Using their training about people and work processes, HFE professionals design changes in the equipment, work process, or environment to improve the conditions for people, and at the same time, improve performance. This type of engagement focuses on the internal workings of the organisation to make it more efficient and safer.

HFE change processes in these projects will probably involve three phases:

### 1. Analysis

Determine the criteria for humans to perform the task successfully and understand the current situation. In short, what needs to be produced, who will do it, and what do they need to use to be successful. This may involve identifying and measuring:

- physical, physiological, and biomechanical requirements and capabilities.
- behavioural, social and cognitive patterns of individuals and groups that affect performance.
- technology interfaces, and technology and tools that affect mental and physical processes.
- organisational factors that define and impact individual and group performance.

### 2. Design

Apply the criteria from the analysis phase to design a situation that will improve performance within the company expectations and meet acceptable requirements. The design changes will address the gaps between human and organisational interfaces and could include changes in hardware, software, tasks, jobs, organisation, environment, or training.

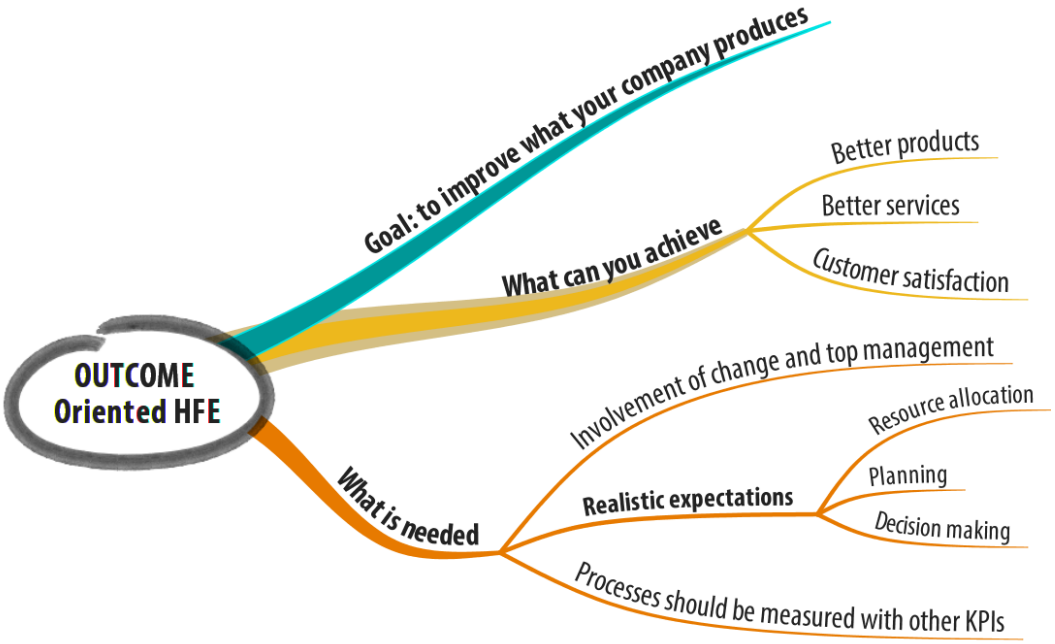
### 3. Integration

This involves implementing the design change and validating the effects of the change on the desired performance to determine if you achieved the desired result. In a successful redesign, the process should be stable, reliable, and the outcomes should match human and organisational expectations. This should be repeated iteratively to ensure that change is managed as people and conditions change. **The management of change is as important as the changes to be made**. Those impacted by the change need to be brought on the journey rather than have the change imposed.

When management and employees and other stakeholders experience successful HFE, they and others gain confidence that this process can solve challenges in other areas in the organisation. It can also improve employee trust in the company for caring about, listening to, and engaging people as part of a solution.

An example of methodology for a Project orientated HFE to address musculoskeletal disorders (MSD) in the workplace using a participatory model is APHIRM.

***Outcome Oriented HFE***

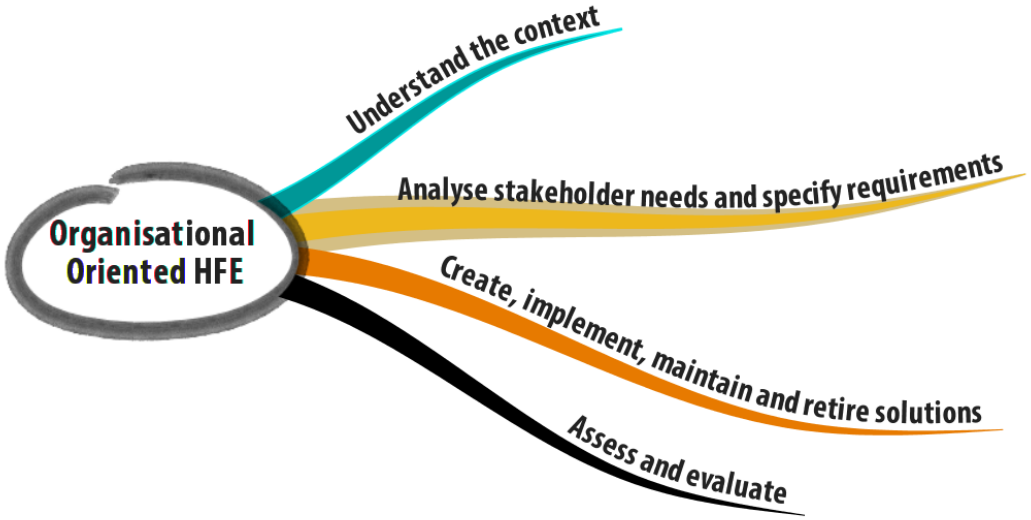



At a broader scope, senior management of organisations can also focus on improving what they produce. The consumers of the product benefit from HFE improvements through better products, services, customer satisfaction, quality and usability. The organisation's focus is on the design of consumer products together with the product maintenance and consideration of the lifecycle environmental impacts.

Like with all successful transformations, the management of change needs to go hand-in-hand with existing higher level management structures. Management needs to understand the approach and have realistic expectations for resource allocation, planning and decision making, as good results are seldom immediate.

Just as we learned in quality improvement, management needs to support and encourage a process for sustainable success. Management needs to understand the approach and have realistic expectations for resource allocation, planning and decision making. The processes studied and redesigned should be measured, aligned and reported with the other KPIs that produce the desired organisational outcomes.

***Organisational Oriented HFE***




In Organisation level HFE undertakings, we think about organisation-wide outcomes as the result of the throughput process that is the Organisation. This requires examining the organisational context at all levels. Rather than aiming to improve individual workstations, jobs, or processes, the aim is to understand how the Organisation, as a process and as a whole, promotes or undermines the coming into being of larger-scale outputs. Making these improvements at a system level makes it easier to do it at each individual level.

When thinking about the organisation as a whole system and asking how the system encourages or hinders successful and unsuccessful performance by individuals or units we can think about organisation-wide outcomes as the result of the throughput process that is the organisation. A metaphor here would be to see the organisation more like a logistical supply chain. A chain is only as strong, fast or effective as its weakest link. The question becomes how does the organisation undermine or promote the outcomes we expect? Think about it from a supply chain context. What are the HFE issues at each stage from suppliers, purchasing, logistics and transport, storage, manufacturing and processing, marketing and merchandising, customer experience and operations maintenance and monitoring processes?

Organisation oriented HFE works best if a trained expert or team of experts is designated and empowered to oversee the whole change project. They may do or oversee all stages, from analysis to design of solutions to their implementation. Organisation oriented HFE will require engaging one or more professionals with the technical training and organisational skills to conduct an analysis and then design and oversee the implementation of solutions. The benefits of this strategy are that company-wide changes at this level can produce a culture that values, understands and has the know-how to solve problems and produce results. This approach requires strategic thinking that can be summarized in four steps as outlined in ISO 12501 – 2018.

***Case study: What is best for vegetables is also best for humans!***

*A supermarket reported increase in fresh food damage and waste as well as worker injuries as a result of poor handling and storage practices. An HFE project was undertaken to study the vegetables from the farm, storage and transportation to the display and sales at the store.*

*Through participation of farmers, drivers, warehouse and store staff the method of packing the vegetables was the primary risk to be addressed. It involved large containers which were difficult for the farmer to pack, heavy and awkward to handle, as well as damaging the vegetables during transporting and storage.*

*A simpler packing system was introduced with less items in each pack that could be filled on the farm and left in the pack until it was displayed in the store. This enabled less manual handling of the product between the farm and the store display. These packs could be palletised for movement by forklifts rather than manual handling from the larger containers. There was less damage to the vegetables and less injury risks to the workers.*

## Understand the context

Step back and look at all those who interact with your organisation and how changes will affect each stakeholder group and its interests. Knowing who is involved, their expectations, and how they are likely to be affected will set the stage for better understanding and greater trust and respect with these stakeholders. Identify the changed activities and how each stakeholder may be affected by the organisational and technical risk factors.

### Analyse stakeholder needs and specify requirements

Identify the needs and interests of all stakeholders so that requirements can be developed for workable solutions. Understand how each stakeholder measures success. Thinking about system requirements beforehand is one way of ensuring that stakeholders' needs are met.

### Create, implement, maintain, and retire solutions

Build your processes that create solutions that meet these requirements. These solutions may change over time as partners' needs or perceptions change. Produce and implement solutions based on these requirements.

### Assess and evaluate

Continuously assess and evaluate the change process, because systems change in cycles. To better evaluate cyclical processes, employ a framework like Plan-Do-Check-Act (PDCA) or similar. PDCA looks at problems, solutions, changes, and their effects. This keeps the change process dynamic and responsive to changes in the situation. This is valuable in any change management process to understand change as a series of cyclical processes which allows us to identify actions for change more proactively.

Keep stakeholders informed about changes, results, roadblocks, and successes. Their continued engagement will help ensure stronger relationships in the future with the other stakeholders.

# Getting Professional Support

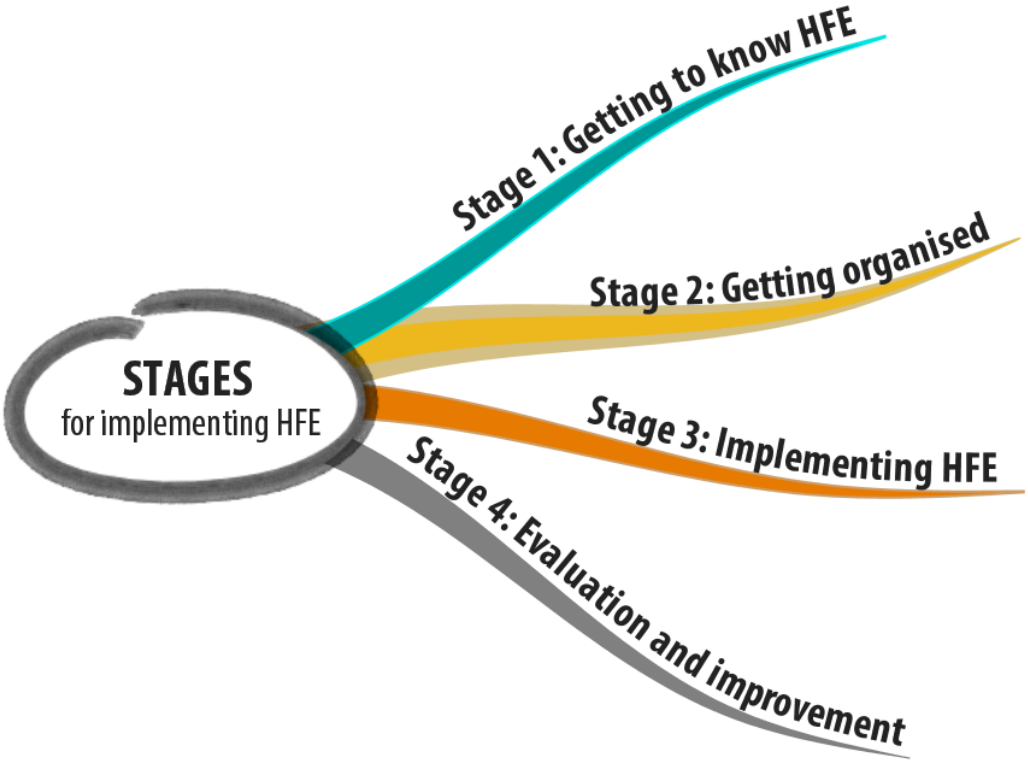
You can enlist help to implement HFE in your organisation by engaging a professional Ergonomist or Human Factors specialist. There are several ways to find a specialist. First, contact organisations that successfully implemented HFE in their organisations. You can get recommendations by making inquiries with industry groups, local business networks, or contacting an organisation featured in a publication. These recommendations can be valuable because they are based in experience. Second, you may contact a professional HFE society in your country. You can find contact information from the International Ergonomics Association (IEA). The IEA represents more than 50 professional societies around the world (https://iea.cc) Look under *Member Societies* and *Networks*.

# References

BCPE Core competencies July 2019. https://bcpe.org/downloads/

Participatory methodology to address MSD. http://www.aphirm.org.au

# Chapter 3
# Implementing HFE in my company



***Case study: Just design software that actually works!***

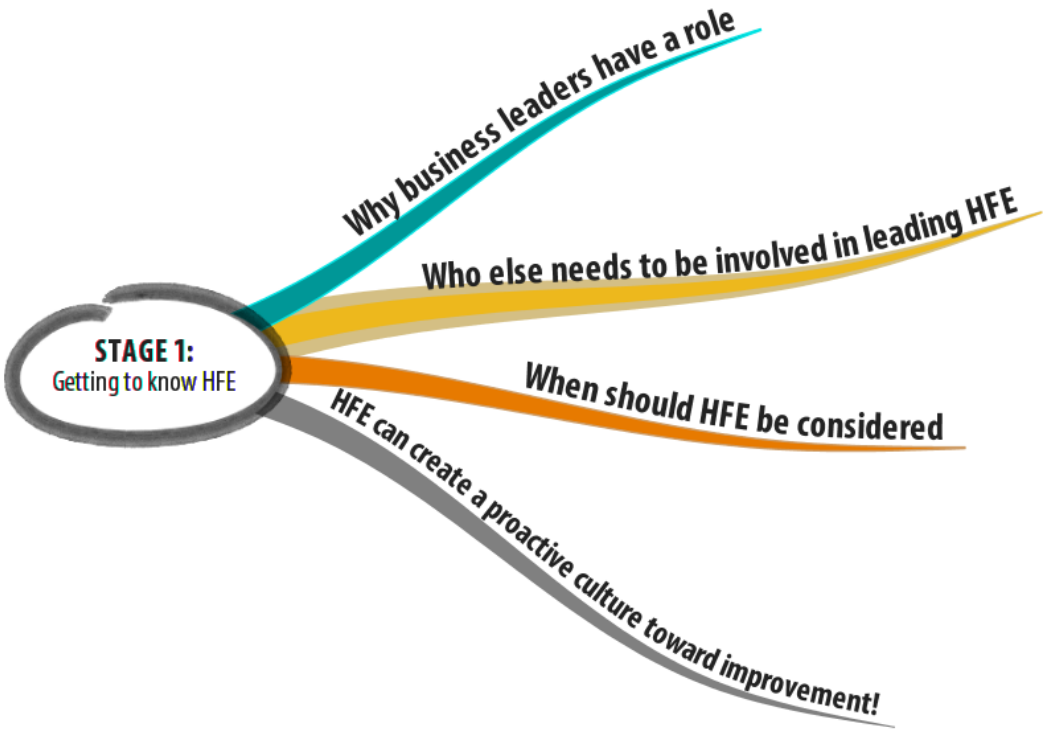
*In the competitive world of telecommunication companies strive to create exceptional customer experiences. However, the gap between imagination and reality often leaves much to be desired. A budding telecom company in Asia sought to penetrate the market by focusing on low-income customers. Initially, they launched their business with pre-paid SIM cards, but after three years, they shifted their strategy to post-paid plans, aiming for a steady revenue stream from fixed-term contracts.*

*Despite their enthusiasm and innovative ideas for post-paid plans, the company neglected a critical aspect: usability. Their ambitious designs fell flat because they overlooked the practical experience of their customers who found signing up for the plan very difficult. It wasn't until two frustrating years later that they finally understood why their post-paid plans were floundering.*

*During a critical usability training session, the trainer issued a bold challenge to the team: apply for a post-paid plan using their own app and website. What should have been a swift 10-minute task devolved into a frustrating 30-minute ordeal. Not even one of the five groups managed to complete the application process. The stark reality hit hard—the system they had painstakingly developed was riddled with flaws and far from user-friendly. The gravity of the situation was underscored by the realization of the immense lost revenue and goodwill from countless potential clients. The session was a wake-up call, revealing not just technical deficiencies but also the urgent need for a customer-centric approach.*

*This eye-opening experience marked a turning point for the company. They realized that understanding and improving the actual user experience was crucial to their success. The company began investing heavily in usability, determined to bridge the gap between their vision and the reality of their customers' needs.*

# Stage 1: Why HFE is important to my company




***What role do senior executives have in HFE and why?***

The senior executives, including the owners of the business, have legal, ethical, and moral requirements to ensure that their systems do not result in injuries or ill health to their staff, contractors, visitors, and customers. Senior executives need to encourage the application of HFE through all levels of their business. Without the support of the senior executive, the effective implementation of HFE will be limited.

They also need to provide the financial and human resources to integrate HFE across their organisation. The senior leaders need to demonstrate commitment at a personal level by supporting their line managers to address HFE as part of their accountabilities and to provide them proactive feedback to embrace HFE in their respective roles. The reputation of an organisation, the design of their products, or services they deliver, can be directly enhanced through the integration of HFE championed by the senior executives.

### *Who else is involved in leading the HFE initiatives?*

HFE should be led by the manager taking advice and consulting with technical and non-technical stakeholders within the workplace. The technical stakeholders include HFE specialists as well as those in engineering, architecture, product design, industrial process design , psychology, medicine, and allied health disciplines. The non-technical stakeholders include engagement and consultation with workers and their representatives, together with customers if the HFE initiative relates to a service or product that is provided by the organisation. Each of these stakeholders has their own perspective on the key HFE elements that ensure optimum system performance and safe outcomes.

### *When should we be concerned with HFE?*

HFE should be considered at multiple stages of an organisational HFE process. These include:

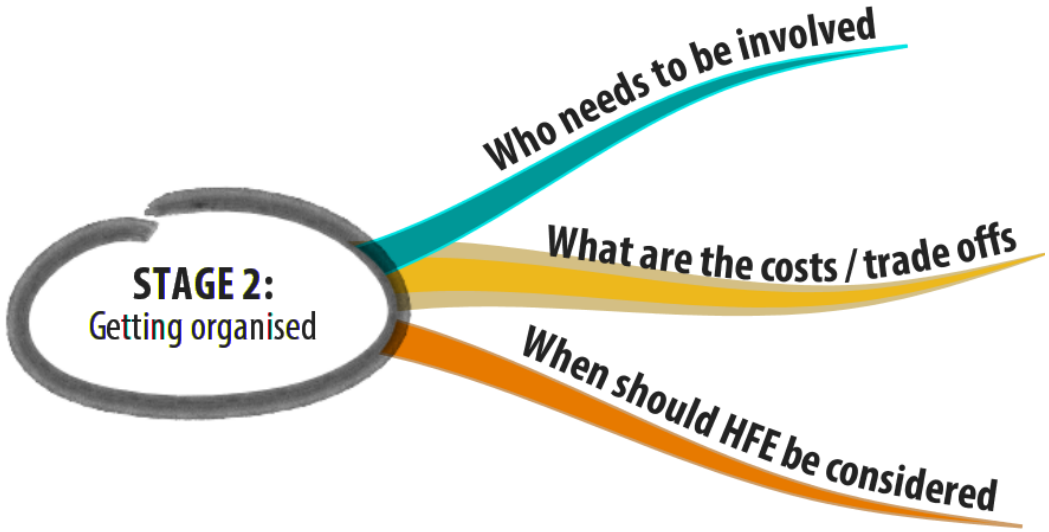
- Strategic planning and establishing goals and objectives.
- Prioritizing the allocation of resources.
- Making operational decisions involving engagement with groups such as engineering, facilities, design, product design, etc.
- Establishing customer requirements for the product or service and the associated production or manufacturing operations to ensure these customer requirements are met.

- Evaluating the performance expectations of the system to ensure that the objectives for each level of the executive, managers and the frontline workers achieve their required outcomes.

***Defining HFE within the company culture and business objectives***

By integrating HFE within all levels of management and the workplace, a proactive culture can be created. This culture reflects the values of the organisation to provide a safe and healthy workplace and to achieve their system goals. This culture encourages the participation of all stakeholders to identify, assess and develop systems that meet the organisation's safety and business objectives.

## Stage 2: Getting organised for implementing HFE in my company



### *Who needs to be involved?*

The roles of those to be involved will depend on the issue being studied, and the level of technical expertise required to understand the work system. The key stakeholders include:

- Line Managers - responsible for the operation and/or design of the area or issue under review. This person must provide input concerning the "big picture" relating to the key performance measures, productivity, and quality requirements that need to be met.
- Subject Matter Experts (SME) - These include relevant individuals such as architects, engineers, industrial designers, quality advisers, work environment specialists, sustainability advisers, human resource advisers, and safety specialists. The HFE specialist not only is a SME but can also facilitate the consultation and engagement of the other SME's.
- Representatives of the workers or users - who will operate the work system or product.
- Maintenance and engineering staff - who will repair, clean, and refurbish the area or product.
- Other "influencers" who have a trusted relationship to all parties and have an input into the HFE process. These may be customers, contractors and suppliers involved in the life cycle of the product or system.

These stakeholders may be engaged at different times during the HFE program development. This can be an iterative process when the HFE issues can be considered at different stages of design through a range of different projects.

Ideally, one or more of the team members should have HFE training to lead the program to ensure that the HFE systems process is being followed.

### *What are the costs / potential benefits for implementing HFE?*

The costs and potential benefits depend on the scale of the HFE program in your company. Some of the costs may include:

- Time required for the stakeholders to commit themselves to consultation meetings, participation in trials, and documenting results and recommendations.
- Development of prototypes as well as making modifications to the workplace.
- Time and equipment utilised for making measurements associated with the HFE assessment. This may include methods such as video and photography, dimensional measurements of the work area, and survey tools involved when consulting the workers.
- Potentially, biomechanical measurements and other HFE methodologies associated with collecting data on the impact of the current and proposed changes on the health and wellbeing of the workers.
- Data associated in measuring the key performance indicators (KPI's), including productivity and quality, where appropriate.

The potential benefits for implementing HFE include:

- The reduction in health and wellbeing risks to the workers with associated reduction in staff turnover and training, and reductions in injuries.
- Less need for rework arising from damage and errors in the product or process.
- Improvements in workplace culture arising from the participative methodology and engagement with the stakeholders during the HFE design process.

### *What are the stages to implementing HFE into an organisation?*

HFE programs are often developed in stages.

#### Phase 1 - Planning

- The planning stage looks at historical data including injuries, incidents, staff turnover, and reported problems with the product or work system. These problems may relate to down time and quality / errors with the current processes.
- Briefing meetings with management representatives. This ensures engaging them with the objectives of the HFE program. Without their leadership and guidance, the program will have little likelihood of sustainable success.
- Engaging the workers to ensure that their issues and concerns, and expectations are considered prior to the development of the program.

#### Phase 2 - Methodology Development

A good method involves working with the stakeholders to identify how the HFE program will be implemented. Some examples may include:

- HFE project governance team. This team involves representative stakeholders from managers and workers, to oversee the progress of the program with key deliverables and timelines.
- Observation and survey inputs. The criteria to define and refine the issues being assessed are assisted by informed observation and consultation with the stakeholders. Other tools such as using photographs and videos can assist in documenting current issues. They can also be used in workshops with stakeholders to explore the concerns in a controlled setting to enable consultation. This is often referred to as *participatory HFE*.

- Once the issues have been agreed upon and prioritised, the next criteria relate to identifying any additional steps required. These often include using HFE assessment tools which are best overseen by a HFE trained professional or researcher. There may be several tools required depending on the HFE issues being assessed.

### Phase 3 - Analysis and Recommendations

Once the methodologies have been completed, it is necessary to analyse the data and the stakeholder feedback. This analysis will provide an opportunity to compare the HFE issues against research findings, standards, or other criteria used to assess risk.

On the basis of this analysis, recommendations can be provided to the key stakeholders to allow implementation projects to be developed.

### *How should HFE be implemented?*

The implementation of HFE should be based on the recommendations of the HFE studies that have been undertaken on site. The implementation requires oversight by some form of consultative committee to arrange the recommendations into short-term, medium-term, and longer-term changes.

To ensure the implementation is successful, presentations and engagement with senior managers are required for them to sign off the agreed interventions and support their implementation. Their support includes the allocation of appropriate resources to implement the recommendations. They also can provide positive feedback to the stakeholders who participated in the project to acknowledge their contribution.

### *What are the roles of the key actors in the process?*

The key actors in this process include:

### Managers

This includes all levels of management who are legally, ethically, and morally accountable for the safety and wellbeing of the workers, and for the systems performance, such as productivity and quality.

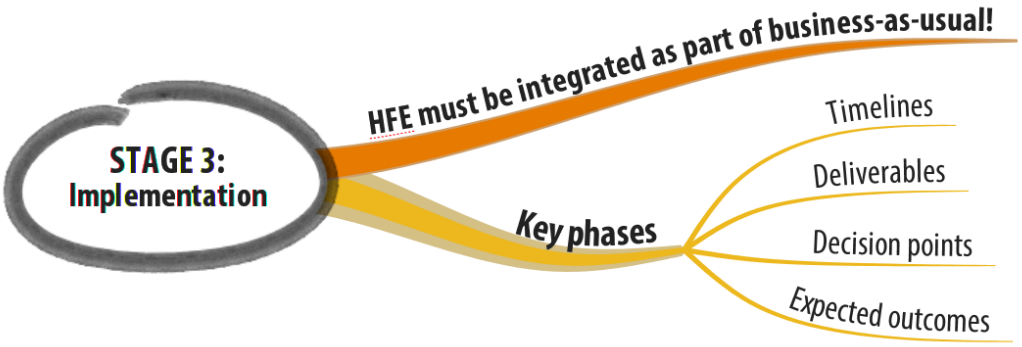
### Workers

Involvement with the workers is fundamental to a HFE program. The concept of a participatory model is essential to ensure that their physical, psychological, and social requirements are met through the outputs of the HFE program. In relation to product design, the equivalent participatory model is essential with the customers of the product being developed. This ensures that their physical and cognitive requirements are considered during the design process.

### HFE specialists

These may be internal professional staff or external consultants or researchers. They may be brought into the program on a contract basis for the duration of the program or for assistance with specific projects in the program. During their engagement, they can work alongside the other participants to share their knowledge and assist in integrating HFE into the workplace for the future.

# Stage 3: Implementing HFE in my company




***How do we ensure sustainable/continuous benefits?***

To ensure that the benefits of the HFE program continue, the process and projects must be integrated as part of the business-as-usual process. **If a separate HFE project is conducted as a "one off" it has a high risk of being unsustainable.** The requirement for HFE must be embedded into the company business objectives, department goals, business structures, and part of an individual's performance expectations. The results of the HFE integration into manufacturing operations needs to be reflected as part of a company-wide strategy. This strategy needs to reflect the intent to introduce and embed HFE as part of the business model. This strategy then forms the aspirational goals of the business from which specific projects and action plans for implementation can be developed.

## *What are the phases of the project implementation?*

### Timelines

The timeline to implement the program will depend on the complexity of the HFE projects. Typically, a site wide HFE program may take more than one year to develop and implement. However, HFE analysis of a specific work setting may be done in a matter of days or hours if the access to the appropriate stakeholders is available.

### Deliverables

**The deliverables from the HFE program will be multifactorial.** Not only will they address the safety and wellbeing risks to the workers, but also the systems improvements such as productivity and quality.

### Decision Points

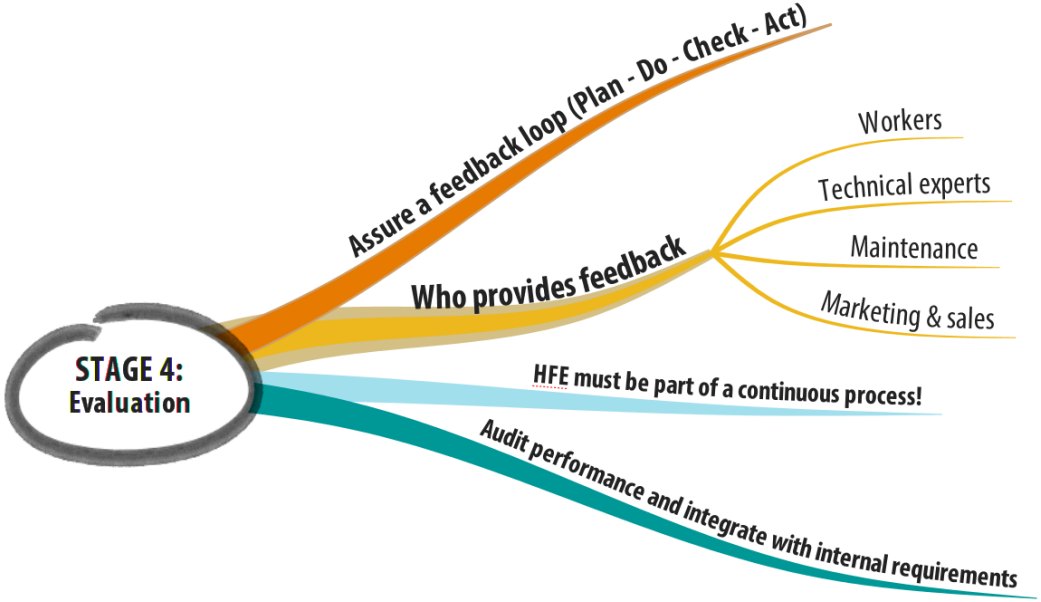
There are a range of decision points that need to be aligned with the program methodology. The HFE governance committee transfers the decisions that need to be made into an implementation plan. Once the analysis and recommendations have been provided, the business case for changes can be made.

The decisions in relation to adopting these recommendations will require support from the senior managers, together with the appropriate resources.

## *What outcomes should be expected?*

In line with the objectives of HFE, the outcomes will improve safety and health of the workers and improvements to the system performance of the process or product. This may include productivity and quality of the products being created. In relation to the HFE application to product design, customers of the product should see the benefits both from a physical perspective in being able to use the product, and also from the cognitive benefits on being able to understand how to use the product intuitively.

# Stage 4: Evaluation and continuous improvement of HFE in my company




***Feedback loop – PDCA (Plan, Do, Check, Act)***

As part of the quality assurance process a feedback loop is required to assure that the benefits of the HFE intervention have been achieved. This loop involves:

- Plan – conduct the consultations with the workers and other stakeholders together with data collection to plan the intervention.
- Do – implement the recommendations. This includes both physical changes to the workplace, and work system changes to support the intervention with the workers.

- Check – collection of data and consultation with the stakeholders to assess the impact of the intervention.
- Act – make changes and adopt a continuous improvement approach toward ensuring the HFE issues have been addressed.

### *People providing evaluation of HFE*

The impact of the HFE intervention will be experienced by a range of stakeholders who should be involved in the evaluation process. These include:

- Workers – to assure that no further hazards have been introduced through the intervention and that the benefits to their physical and psychosocial work environment are achieved. Consultation with the workers can be part of an informal and formal process. The informal process involves regular shadowing and conversations with workers while they are undertaking their work duties. The formal evaluation can be undertaken using surveys, focus groups, and committee meetings involving representatives from the different stakeholders.
- Quality and Productivity Evaluation – the relevant technical experts including managers, will need to use data associated with the changes that have been made to ensure that system performance issues have been addressed. This includes quality, productivity, and other relevant factors such as the number of rejects, and errors that may be identified.
- Maintenance and Maintainability – those who are involved in conducting planned and unplanned maintenance of the work system should be part of the evaluation process. They can identify any difficulties associated with maintenance of the work system such as access, manual handling of replacement components, and safety associated with the work. This evaluation should include the location and access to maintenance support infrastructure such as lifting equipment, trolleys, and environmental design including lighting, dust and fume extraction.

- Customer feedback– feedback from customers is integral to the evaluation process. This includes any issues relating to the product or system that may be perceived as a benefit to the customer because of the HFE project.

### *HFE as a continuous improvement process*

While the HFE project may assess a product or system of work at a particular point in time, it is important to recognise that assumptions may have been made and can change. For example, the workers who were involved in the studies may move to other jobs and a new cohort of workers may replace them. Through their integration and training, the new workers may have a different perception of the hazards and the effectiveness of the HFE interventions. There may also be other changes relating to the materials that are being used and the production demands, which can impact the HFE assessments. Consequently, the HFE project should be part of a continuous improvement process where the PDCA model is an ongoing process.

### *Integrating design thinking into the HFE Program*

The design process fundamentally reflects the outcomes of HFE studies. There are a range of ergonomic assessment tools that are used in integrating design thinking into the HFE program. For example, EQUID (Ergonomic Quality In Design) is a process tool that describes how HFE can be integrated at each stage of a product or process design.

### *Organisational learning and knowledge transfer*

Organisations will continue to have new workers, managers, and line supervisors who were not involved in the original HFE program. Consequently, processes need to be in place to support organisational learning and knowledge transfer to new people engaging with the process.

There is also the opportunity in larger organisations to transfer the knowledge gained from one workplace through the HFE program to other sections of the organisation where this knowledge can assist in their safe systems of work. Further, sharing this learning at an industry level assists in raising the standards of safety and quality across the whole industry.

### *Auditing performance and integrating with internal requirements*

There are three primary auditing systems that should be considered to assure that the HFE benefits can be sustained.

- Line Manager Supervision – the managers who are accountable for the workers in a particular area where the HFE program is being conducted have the primary responsibility to ensure that the agreed systems of work are being implemented as designed. This day-to-day monitoring provides a continuous focus on the safety in the workplace driven by managers that have the legal and ethical accountability for the safety of workers and other people including contractors, maintenance workers, and visitors at the site.
- HFE Advisors – there is also an auditing requirement for those who have specific training in HFE to monitor the metrics and maintain a consultation process with the workers and other stakeholders. The HFE Advisors can focus on the risk factors that have been addressed during the HFE program to ensure that the interventions continue to address these risks.
- External Auditors – The use of "fresh eyes" through the periodic use of external auditors provides an opportunity to assess the HFE program holistically. The scope of these external audits should not only address the safety issues relating to the workers, but also the broader systems' performance issues such as productivity, quality, errors, and reject rates. It should also take into consideration feedback from external stakeholders such as customers and contractors who interface with these products and systems of work.

***Case study: Even good ideas are not immediately implemented.***

*One of the most important factors in printing of banknotes is the printing quality. To this end, the agency had a workstation dedicated exclusively to inspecting the printed sheets. Operators checked 3,500 sheets of paper on both sides every day, i.e. 7,000 pages in total. To ensure that they did their work responsibly, operators placed their personal stamp on each page; an activity that took approximately 15 to 20 minutes. Because of the force that this stamping required, several people developed occupational diseases (carpal tunnel syndrome) and underwent surgery.*

*After analysing the workplace, the HFE specialists recommended changing the stamping process to a side marking process. This change required less than half the time, did not cause injuries to the workers and cost almost nothing. Despite these advantages, management did not implement the change and the project was shelved.*

*Two years later, the institution refurbished its printers. Because this equipment guaranteed print quality on one side, only the side of the sheet had to be inspected. This meant that the operators had to check, handle and stamp 7,000 pages – double what they did before, both in terms of time and movements!*

*When management realised that they now required twice as much time for this task, they remembered the proposal made by the HFE specialists. The implementation was quick, and the effects were positive.*

***Lesson:***

*Although fully justified, good design changes can take time. Tradition, organisational cultural norms, and focus on other outcomes can impede even the best of ideas. Presenting solid ideas need to be accompanied by patience, persistence and real concerns for people and systems.*

# Chapter 4
# HFE Standards


The ISO website mentions multiple standards that include quality management standards, environmental management standards, information security standards, occupational health & safety standards, risk management standards, social responsibility standards, IT service management standards, food safety standards (among others). These standards can be content standards and process standards.

### *Why should I use Standards?*

The Standards produced by the International Standards Organisation (ISO) as well as government standards organisations, industry associations, and governments, provide evidence-based guidance that line managers can use as part of their HFE methodologies.

# Standards for HFE implementation

There are many types of standards that can help line managers implement HFE in their design process including organisation-oriented standards, standards for product / service outcomes and standards for HFE projects. Classification of standards includes “design standard", "process standard" and "concept standard". The "design standard" is included "for product/service outcome" and "HFE projects". The "process standard" and "concept standard" are included "for organisation".


# Organisation-Oriented Standards

The focus of these Standards is to assist organisations to improve wellbeing of their workers and system performance of their operations. These Standards outline the “big picture” on how companies can implement a management system to integrate HFE.

These projects are often referred to as the "ergonomics/HFE project". They are often aligned with international standards relating to safety management systems but include specific elements relating to HFE.

In some countries of the world, the adoption of these systems based on the ergonomic standards can result in certification by governments or external agencies.

These models are like certification of other areas such as quality management and environmental management. These certifications are proudly shared by the organisations with their customers and the community.

### *ISO Standards for Organisations*

The ISO Technical Committee TC 159 has produced two key Standards relating to HFE integration into organisations.

- ISO 27500 "The human-centred organisation. Rationale and general principles. Geneva: ISO (https://www.iso.org/standard/64239.html)
- ISO27500 – 2016 and 27501 – 2019 relates to "The human-centred organisation. Guidance for managers. Geneva: ISO (https://www.iso.org/standard/64241.html)

Examples of International Standards relevant to each principle of the human-centred approach in ISO/FDIS 27500:2015(E)

| Clause Principle | Relevant Standards |
|---|---|
| 4.2 Capitalise on individual differences as an organisational strength. | ISO 6385,<br>ISO/TR 7250-2, ISO 9241-5 |
| 4.3 Standards for developing products<br>Useability related information | ISO 9241-5, 11, 20, 171<br>ISO/IEC 2506n CIF series. |
| 4.4 Adopt a total system approach | ISO 26800, ISO 6385, ISO/TS 18152 |

| Clause Principle | Relevant Standards |
|---|---|
| 4.5 Ensure health, safety, and wellbeing are business priorities. | ISO 11399, ISO 28803, OSHAS 18000, ISO 31000 |
| 4.6 Value personnel and create meaningful work. | ISO 26800 |
| 4.7 Be open and trustworthy. | ISO 26000 |
| 4.8 Act in socially responsible ways. | ISO 26000 |

The Human Factors/Ergonomics Societies in countries around the world have been involved in the development and supporting the implementation of these Standards and certification program.

## Standards for Product/Service Outcome

The reference to Standards through the design process of products and services is frequently based on HFE research relating to design of products and systems.

These Standards refer to user characteristics such as their physical size and capabilities, as well as their cognitive capacity to understand instructions and information provided to use and maintain the product or system.

An example of a HFE tool used to combine the steps in developing products is the EQUID (Ergonomic Quality In Design). This is a design process guideline that maps the steps on how to integrate HFE through the design process.

Products or systems that are based on HFE Standards can lead to accreditation of the product or system by external agencies. This takes into consideration the useability and maintainability based on the population of users.

# Standards for HFE Projects

HFE skills can be used to facilitate the problem solving at a company level when challenges arise.

This may be the reporting of injuries or unplanned incidents that warrant an in-depth investigation to develop specific recommendations to address injury risks while maintaining or improving system performance of the specific work area, or job.

These projects will vary in time and level of HFE input required. Due to the participatory ergonomics methodologies, a major benefit of this project-oriented HFE is gaining the trust and changing the culture within the company by listening to issues that are raised and addressing them.

There are multiple Standards that can be used to assess technical areas such as heat, noise, lighting, workstation design, slips, trips and falls, and supporting diversity and inclusion within the workplace.

### *Other Standards and Guidelines*

Besides the International Standards Organisation, industry associations and government agencies provide Standards and Guidance. These include:

- ACGIH (American Conference of Governmental Industrial Hygienists). They provide threshold limit values (TLV) and action limits (AL) in HFE areas such as hand/arm vibration, whole body vibration, lifting, upper limb localised fatigue.

- ANSI (American National Standards Institute). Their “human system interaction" Standard is based on ISO9241 relating to computer users. They also have guidelines for the design, installation and use of machine tools and construction ergonomics.

Some industry associations and trade unions have also developed Standards, particularly for industry groups. These include the oil and gas industry through the American Petroleum Institute (API), pharmaceutical industry, brick layers international unions, and labourers' international unions.

Many governments around the world have developed voluntary Standards or guidelines for HFE related areas. One example relates to the prevention of manual handling associated injuries which has multiple government-based Regulations, Codes of Practice, and Guidelines.

You are encouraged to search out Standards relevant to their HFE needs through their government agency and their national or International Standards Organisation to assist in their HFE projects and product design.

# References

IEA - EQUID Design Process Guidelines Version 2.0 https://iea.cc/wp-content/uploads/2014/10/EQUID.pdf

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IEA
International Ergonomics &
Human Factors Association