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Author: Anecito Reyes Balindres Jr.	_____ (Signature)
Supervisor: Associate Professor Knut Erik Bang, UiS	
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Effects of the Arctic conditions to human and organizational performance – A review

By

Ancito Reyes Balindres Jr.

This thesis is submitted as a partial fulfillment for the degree of Master of Science in Offshore technology, specialized in industrial asset management



**Universitetet
i Stavanger**

Faculty of Science and Technology
Department of Mechanical and Structural Engineering and Material Science
University of Stavanger
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Abstract

This master thesis will focus on the effects of the Arctic conditions on human and organizational performance. The Arctic is a harsh and challenging environment and it is important to consider how the environment affects human and organizational performance.

In today's industries, highly modernized technologies are being employed as part of the operations. Small scale to large-scale industries benefit from technology. However, it is not the top concern of running one. Despite the overwhelming serviceability of these technologies lies the human being beneath. There can be no operation without the people behind. People is the core substance of the industrial operation, nevertheless human beings have limitations. These are the reasons why human factors and organizational performance are being studied.

The thesis will discuss human factors, how a distinct human being can be of influence of a technology and how it will make or break the system. I will also consider how the effect of organizational performance management influences the realization of goals of the organization as well as the systematic performance process of the industrial assets.

Finally, this research will give analysis of the arctic regions and its factors and locations. The developing industry in some part of the Arctic specifically the Barents Sea will be discussed with respect to how human factors are to be considered in this type of environment, and the organizational performance management which is needed to administer this area.

Keywords: Human performance, Organizational performance, Arctic, Conditions

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1 Introduction

This master thesis will analyze the importance of a human being in the field of business industries. How they are being the most influential from being an ordinary employee all through out being part of the whole organization. To carry out a desired outcome is to have an effective and efficient worker. But in order for one to execute accordingly, the worker must perform tasks with appropriate elements that will define the overall performance.

This concerns the human factors. A human body has its limitations, as to the physical and mental aspects. If one is working beyond that limit, it is impossible for a task to be done in accordance with the requirements. Thus it will affect the organizational performance and even the existence of the industry. This is what is to be investigated in the context of this thesis.

People and machines are the main operators of an industry of any type. These two should be fitted to each other in order to achieve the goals of the organization. As defined by Hussain & Hussain (1984), "human factors are the physiological, psychological and training factors to be considered in the design of the hardware and software, and the development of procedures to ensure that the humans can interface with machines efficiently and effectively". Therefore the machines also need to be carefully designed to take into account human factors in order tot perform well.

However, the concern doesn't focus only to this matter. Human body and machines function variously when being placed in a normal environmental temperature and in an extremely cold temperature. The latter's environmental condition can be concordant with facts to that of the Arctic region. The Arctic conditions are a major challenge to conveniently perform the tasks in order to attain the desired organizational performance.

It has been found that workers who perform daily routine work outdoors during the harsh winter have been reported to have decrease in performance and increased discomfort (Virokannas, 1996). Nowadays, the Arctic regions have been optimized for developing various industries. Among of those are the fishing, navigation or transportation, and lately the oil and gas utilization of some part of the Arctic. To make these industrial operations possible, a company must employ appropriate people and appropriate machineries.

However, the Arctic conditions affect greatly to the human and organizational performance. This review is an analysis of how human factors

and the overall performance of the organization as far as the conditions of the Arctic are concerned. Along with the study are the recommendations for probable solution to these critical conditions.

1.1 Problem formulation

Working under a demanding type of environment is never easy, considering a single person being placed into this situation. The human factors are the concerns of this issue. Operations will be extremely difficult to perform in the cold environment like the Arctic. The low temperatures, wind, darkness, remoteness are the major barriers a worker must face. These Arctic conditions will give the workers difficulty to perform tasks within the allotted time.

Moreover, these factors will cause stress to the workers, physically and mentally. It will ultimately cause negative effect as to the health of a person that will most likely reduce the effectiveness of a person to perform task thus affecting the overall performance as an organization. From this fact, these three problems are to be taken into consideration:

1. What conditions do the Arctic have that will affect the working conditions and industrial operations.
2. How do these Arctic conditions affect the physical and mental attributes of a person, or the human factors.
3. How the Arctic conditions affect the organizational performance.

1.2 Main objective and sub-objectives

Based on the formulated problem, this research aims to suggest and/or recommend the appropriate measures in order to overcome the difficulty in working effectively and efficiently under the Arctic conditions concerning the human and the organizational performance. Moreover, the following will also be suggested as bases of the main objective:

1. To identify the safety measures needed for workers to perform tasks effectively and efficiently;
2. To suggest procedures on how workers has to be exposed to the working field for them to function well for the benefit of the organization performance.

1.3 Scope and Delimitation

This research reviews the importance of human factors in considering the design of machines and equipment, and the proper implementation of performance management.

1.4 Research approach and methods

The literature was carried out using, as a starting point, the data base human factors/ergonomics abstracts. Copies of articles found through the search were obtained and reviewed. The reports summarized in English were incorporated in this study.

2 Arctic conditions and its effects to human performance

The Arctic is a region on the planet, north of the Arctic Circle and includes Arctic Ocean, Greenland, Baffin Island, Russia, Alaska and Canada. The Arctic circle is an imaginary line located at 66°, 30'N latitude, and as a guide defines the southernmost part of the Arctic.

The climate within the Circle is very cold and much of the area is always covered with ice. In the mid winter months, the sun never rises and temperatures can easily reach lows of - 50° F in the higher latitudes. In the summer months (further south), 24 hours of sunlight a day melts the seas and topsoil, and is the main cause of icebergs breaking off from the frozen north and floating south, causing havoc in the shipping lanes of the north Atlantic. (www.worldatlas.com)



Figure 2.1 The Arctic (www.sofrep.com)

From the figure above and the description of the Arctic as far as the climate and the location is concerned, Arctic conditions is a big challenge to the manufacturing and service industries. The extreme weather conditions and

the remote areas are two important factors that need to be studied and properly integrated in designing and planning to consider that will be favorable to human performance and the organization. A good example is the Barents Sea, located to the north of Norway and Russia, wherein oil companies have been exploring for oil and gas. Kullerud & Ræstad (2014) says the Barents Sea may become a major gas and oil supplier in the future. Norway in particular has is focusing its oil and gas industry towards the southern part of the Barents Sea (Larsen & Markeset, 2007).

However, the environment in the Barents Sea is described as a harsh and unpredictable Arctic climate (Larsen & Markeset, 2007). Large part of the Barents Sea are frozen in winter and only the southernmost part towards the coast of North Norway and Russia remains ice-free throughout the year.

In the Arctic, temperature drops down to 30° C – 40° C. The geographic location affects the environmental factors to the area that includes low temperature, wind, icing, snowdrift and darkness. Thus, this is the major barrier of this kind of workplace. The Arctic conditions are serious challenges to be faced and to overcome. It will not only affect the human performance, but the overall organizational performance.

2.1 How the Arctic conditions affect human performance

“Try to imagine changing a tyre in freezing weather, snow and darkness”.
-Professor Tore Markeset-

It is indeed a major challenge for an organization to operate where environmental factors affect largely especially to human performance. Among these environmental factors are the low temperature, wind, darkness and icing & snowdrift. Working in a cold environment is a crucial issue to human factors. Holmer’s (1994) definition of cold environment is an environment under which greater than normal heat losses are anticipated and compensatory thermoregulatory actions are required.

Extremely cold temperature can cause light to severe health problems for people working in such areas. This leads to simple errors that can lead to more severe consequences as natural responses become slower due to increased energy consumption, and the constant distraction of the condition and welfare of the team.

This becomes even more important when we need to think about the role of the human in a cold environment typical of those in Arctic regions. In this case, both physical and cognitive ergonomics must be reassessed and thought of differently, for example, it is not well known amongst engineers that cold has detrimental effects on cognitive capabilities as well as physical, according

to Davies (2012). The figure below illustrates workers under the cold environment.



Figure 2.2. Working in a cold environment (Davies, 2012)

Exposure to cold for short periods of time can produce serious effects, especially when workers are exposed to temperatures below 100° C (Kanawaty, 1992). The loss of body heat is uncomfortable and quickly affects work efficiency, he added. Thus, there is a need for the human body to have normal body temperature in order to survive and work efficiently under the cold temperature.

It has been found out that human and organizational performance decreases when working under cold. The effect of cold to human does not only affect the physical but as well the mental capability of a person. It is known that the cold exposure results in a decrement of physical and cognitive performance (Ellis et al., 1995).

Attested by Geng (2001), the hands are among the most probable locations for cold stress related to thermal discomfort and cold injuries than the other parts of the body. Moreover, exposure to cold will cause the metabolic rate of a person to insufficiently maintain the neutral heat balance. In this case, the body will cool down which leads to reduction in blood supply to extremities that can cause physical amputation, (Havenith et al., 1995). Table 2.1 shows a detailed list of stressors and its effect(s) of how the cold environment factors affect human performance.

Based on the table, the cold environment produce different kind of stressors and these stressors has corresponding effects to the physical and cognitive aspects of a person. If this will be the circumstances, then workers who work in the cold environment can not perform their operation well.

Physically a person can be weak, unable to do task, and may not produce the desired outcome. In this case, the operation will be delayed, causing insufficient production. Mentally, negative effects to the body can cause disorientation. A person may not be able to think ordinarily and will be out of concentration which will more likely to bring inappropriateness of the tasks executed. If this thing will happen, then might as well can cause accident and worst breakdown of the system.

Table 2.1. General cold environmental factors affecting human performance (Forsius et al. 1970)

Stressors	Details
<ul style="list-style-type: none"> • Cold temperature • Ice-ad freeze • Combined weather effects • Marine ice 	<ul style="list-style-type: none"> • Breathing difficulty • Muscular stiffness • Frostbite • Lowered metabolism • Hypothermia • Bulky clothing • Stiffness of suits impairing movements
<ul style="list-style-type: none"> • Ice-ad freeze • Combined weather effects 	<ul style="list-style-type: none"> • Incapacitates mechanisms • Wind, snow, waves – impair human performance
<ul style="list-style-type: none"> • Marine ice 	<ul style="list-style-type: none"> • Precludes rapid descent to sea level
<ul style="list-style-type: none"> • Low visibility 	<ul style="list-style-type: none"> • Unstable for locomotion • Ice, fog, lack of solar illumination
<ul style="list-style-type: none"> • Stress 	<ul style="list-style-type: none"> • Frost on windows, visors, glasses • Fear of unknown • Disorientation

2.2 Application of performance management in the Arctic conditions

The Northern regions may have the extreme climate conditions. This is a challenge to the business. In the Arctic where oil companies are starting having oil and gas explorations is one good example. The exploration has been developed in this area, despite the coldness, remoteness and darkness. These aspects for sure are the greatest challenges for a business organization. It is certainly a crucial job for managers to administer an organization that involves this type of field.

Furthermore, much work has focused on methods to reduce the consequences of unwanted incidences, and efforts to ensure implementation of proper consequence reducing measure must not be reduced (Gudmestad et

al., 2007). As an affirmation to Kruger (2013), projects in this area will have high demands on the design of systems, thus there is a need for good organizational basis.

From the visualization of the Arctic area earlier and the figure below, we could right away determine the environmental factors that can affect the operation in the Arctic. Larsen & Markeset listed the following operational environment factors: the low temperature, wind, icing, snowdrift and weather forecast. These factors should be deliberated cautiously as they are the challenge for the people and the organization as a whole to function in the workplace. These factors are the determinants of the elements involved in the working process. Below is an example of a transportation industry in the Arctic.



Figure 2.3. Transportation challenge in the Arctic (www.sofrep.com)

The remoteness of the Arctic regions influences the operation. There could have difficulties in communication and navigation. Planning a system for managing performance is at risk for this matter. Connection and constant exchanging of information is substantial throughout the process. These factors can make or break and can speed or delay the operation. Generally the unpredictable weather conditions will cause the transportation of materials, goods, and the workers towards the work area to delay on bad weather conditions. Hence, it may affect the organizational performance.

Machineries and equipment are amongst the factors of making cost effective organizational operation. The Arctic area is characterized by ice water and cold environment can affect the type of materials being used in the operation. Decision making as to cost and time effectiveness of both is a crucial challenge to the managers that are characterized for cold environment.

The Arctic characteristic such as remoteness is a challenge as well. A great demand of effective transportation and communication is among the most important elements in making the workers connected to the work, to the coworkers and vice versa. These factors are extremely large cost effect influence for the organization. This type of operation to be performed in the Barents Sea demands high risk and cost effectiveness as to the transportation and storage of supplies, materials and communication. On the other hand the time efficiency is at its risk considering the travel time and the crucial weather conditions in the area.

Human are the most valuable asset as the total operation lies mainly in them. The performance of the worker relies on the good management. Human performance is the determinant of organization's overall performance, therefore there must be an appropriate system of performing the task. The need of humans to stay fit and safe in the workplace must be predetermined. Managers must consider the human; what will make them keep warm, tools and processes that will make easy for them to work in and with, and a good and suitable work place for the workers.

In arctic climates, the design of the equipment and production facilities has to be given special consideration with respect to maintenance, operations and support activities, (Larsen & Markeset). Those are amongst the important aspects that the organization must work together with. It only explains that a human body must fit it physically and mentally to the kind of work and working environment. What workers are working with (e.g. machines, tools, working area, supplies, etc.) will determine the performance of the organization, especially under the Arctic region.

3 Human factors

“The most important thing in your company is not a thing”.

- Mark P. McDonald-

This statement of McDonald (2010) is true, and this is what the content of this chapter is about. Undoubtedly business industries nowadays are outspread and are soaring. Part of it are the people and the technologies employed to make the overall operation work out, in order to achieve the goals. Both people and technology work together for the industry, however both have limitations. In this chapter, a review of what is human factors and how it is managed and applied to work.

Human factors is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance. This is the official definition of human factors given by the International Ergonomics Association and endorsed by the Human Factors and Ergonomics Society cited by Proctor & Van Zandt (2011).

Human factors is concerned about both the anthropological and biological features of human. In a way, the design of machines and other technology are influenced. On the other hand, the process of working together between machine and a human being are carefully designated. Below is an illustration of how the human information is processed.

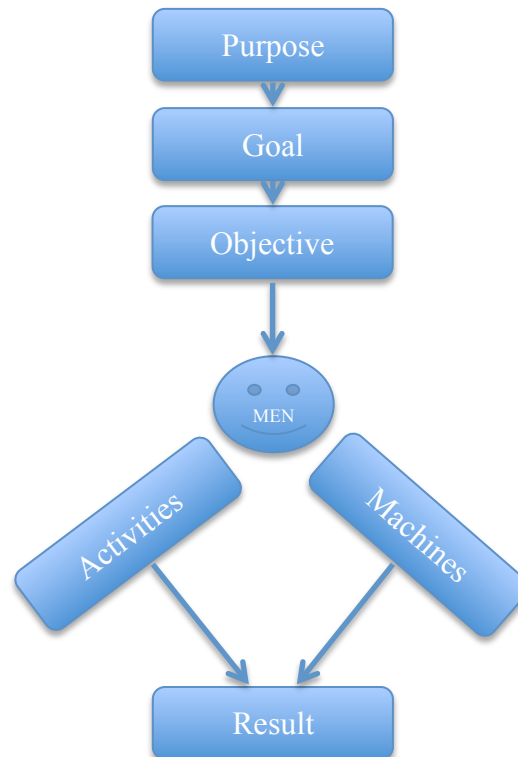


Figure 3.1. Human system elements (adopted from Nemeth, 2004)

Based on the figure the purpose, goal and objective are carried out by the people. These three can be achieved with the appropriate execution of the activities or tasks in the workplace paralleled by the suitable machines for the human factors. So then the desired results can be achieved. This uncomplicated configuration of how basic factors of the organization are being executed and achieved is one crucial act. As a matter of fact, a single misappropriation and mishandling of the activities and machines will lead to industrial breakdown.

Conceptualizing the process of carrying out the desired output of the operation, there are lots of factors that are to be considered. One of these is the environment. Working in a fair weather condition is way far different from working in a cold and extreme weather conditions. In a study made by Kumar, et.al. (2009), they stressed that “due to the complexity of machine systems, and the environment conditions, it is often difficult for maintenance and service tasks within a prescribed period of time.” “This working situation may lead to physiological and physical stresses, but also to accidents that result in injuries and long-term sickness,” they added. Generally working under an extreme weather condition is a serious matter that should be regarded. This topic shall be discussed further in the proceeding chapters.

3.1 The basic human control loop

Process control implies that there is a process for which there is a desired behavior and that there is controlling function that acts to elicit that desired behavior, that is according to Wade (2004). The same thing as Wong (2002) stated: machine or process is designed to fulfill a function and humans are required to monitor its performance and make adjustments or intervene in the event of malfunction. The basic human control loop is composed of the following elements: human (senses data, forms conclusion, takes action), manual input, machine or process plant, and data.

The humans are the ones responsible to sense the data, to conclude and make decisions. The action then entered into the machine manually (by human), and the machine does the overall processing, which favorable outcome should be expected and that desirable data is retrieved and achieved. This series of actions are just the basic human control loop, wherein it is understandable that the role/function of humans are to monitor performance and make adjustments or intervene in the event of malfunction, (Wong, 2002).

Furthermore, Pretlove & Skourup (2014) on their study about “human in the loop” also highlighted the fact that automation processes gradually eliminates the tasks of human, thus responsibilities are of supervision, control, optimization tasks and maintenance. However, the reality that humans have the abilities and intellectual capabilities that are far beyond what machines are capable of performing, so that humans are still the most important part/element of the control loop that it is not commendable that automation should eliminate or remove humans as part of the loop.

3.2 The ‘What’, ‘How’, and ‘Why’ aspects of Human errors and ‘Performance influence factors’

An error has levels of analysis: “what” happened, “how” did it happen, and “why” did it happen, (Redmill & Rajan, 1997). Senders and Moray as cited by Redmill & Rajan (1997) categorizes these levels:

- Phenomenological taxonomies (what) – emphasis to “phenomena”;
- Cognitive mechanism taxonomies (how) – intellectual aspect of human; and
- Taxonomies for biases or deep-rooted tendencies (why) – the category that fall to “why did it happen”.

Condition tokens, which are the psychological and situation precursors of unsafe acts, and these cover performance-influencing factors such as the man-machine interface and the immediate work environment, social factors such as climate norms and attitudes, and cognitive or information processing factors such as attention capacity, memory load and knowledge (Redmill &

Rajan, 1997). The authors provided a detailed list of performance-influencing factors and their corresponding characteristics, namely:

- Task demands and characteristics (frequency, workload, critical nature, duration, interaction with other tasks, perceptual, physical, memory, attention, vigilance)
- Instructions and procedures (accuracy, sufficiency, clarity, level of detail, meaning, readability, ease of use, applicability, format, selection and location, revision)
- Environment (temperature, humidity, noise, vibration, lighting, work space, movement restriction, control of environment)
- Displays and Controls (compatibility, ease of operation, reliability, feedback, sufficiency, location, distractions, shift work incentives)
- Stresses (time pressure, workload, fatigue, high risk environment, monotony, isolation, distractions, shift work incentives)
- Individual (Capacities, training and experience, skills and knowledge, personality, physical condition, attitudes, motivation, risk perception)
- Socio-technical (manning, work hours and breaks, resource availability, social pressures, conflicts, team structure, communication, roles and responsibilities, rewards and benefits, attitude to safety)

3.3 SRK framework

Skills, Rule and Knowledge or SRK framework introduced by Jens Rasmussen, is widely used in industrial errors and accidents. It describes three fundamental types of errors, according to whether behavior is under the control of practical sensory-motor skill routines with minimal conscious awareness; is guided by implicit or explicit rules or expertise; or where the planning of action requires the conscious application of domain knowledge, (Acton, 2011).

These errors fall to the behavioral levels of cognitive control which are related to a decreasingly familiarity with task and environment, which are the skill-based behavior, rule-based behavior, and knowledge-based behavior, (Karwowski & Rahimi, 1990). Meshkati as cited by Karwowski & Rahimi (1990) defined these behavioral levels as:

- Skill based behavior – sensory-motor performance that takes place without conscious control as smooth and automated patterns of behavior
- Rule based behavior - represents composition of a sequence of subroutines in a familiar work situation
- Knowledge based behavior - the highest conceptual level

3.4 Approaches that lead to safe and productive human performance - Fit the job to the human or fit the human to the job

The term “fitting the job to the human (FJM)” and “fitting the man to the job (FMJ)” are the terms for the origins of work psychology. The FJM is concerned with the job, particularly the design of tasks, equipment and working conditions that suits a person’s physical and psychological characteristics, on the other hand FMJ discloses on employee selection, training and vocational guidance, (Arnold, 2005).

Moreover, Bridger (1995) illustrated FJM approach with that of a suitable set of worker characteristics can be specified around which the job can be designed. He also clarified that FMJ was based on the idea that productivity or efficiency could be improved by selecting workers with the right aptitudes for a particular job.

Each has different impact as to what job or task is to be performed. FMJ is the right approach to use in managerial or supervisory position. Practically, when one has to supervise people, he should possess the characteristics and ability to man and handle his subordinates, in that case a company should “fit the man to the job”. “This assumption is certainly true in the sense of selecting people with formal qualifications or skills to fill particular posts, (Bridger, 1995).

When in search of sales marketing executive for instance, basically one must possess the degree related to the position, other than that he must have the confidence and strong personality, and a good communication skill. Those are just few of the things a person must hold that will make him fit of the job, and those qualities can be acquired and developed through training and development.

But as to safety and productivity of human performance in modern complex industrial systems, where we mean manufacturing operations, where people have to work with machineries and equipment that needs proper and continuous maintenance, the “fit the job to the human” must prevail. “The underlying assumptions of the FJM approach are that a suitable set of worker characteristics can be specified around which the job can be designed”, (Bridger, 1995). It is so because the kind of job related to this industry requires the most of the technical and mechanical attributes of a person, other than the talent and skills. These modern complex industrial systems employ high-risk technologies, and so the job, which includes the environment and processes that a person performs should be according to human’s physical as well as cognitive capacity.

3.5 Human factors and how it is affected by the cold environment

Blanchard et al. (1995) has detailed the human factors to consider in human engineering:

- Anthropometric factor – deals with the measurement of human body as stature, sitting height, shoulder height, eye height, hand length, forward reach, wrist circumference, force, weight
- Human sensory factors – human sight, hearing, smell, touch sensors of human
- Physiological factor – produces stress due to environmental factors and conditions, such as the cold climate, which will reduce the sensory capacities
- Psychological factor – concerns the capacity of the mind to think and response

The factors listed above are the ones directly concern for human being placed in the worst environmental conditions such as the Arctic. The human body has limitation as to adopting body temperature to cold environment. When core body temperatures begin to fall below the normal values, hypothermia starts (Makinen, 2006).

Furthermore, extremely cold conditions adversely affect mental skills and cognition (Bourn & Yaroush, 2003). Thus, operations and cold temperatures coupled with physical distracters such as noise or moving environments will affect the quality of perception, memory and reasoning, further increasing the risk of error in decision-making.

To add with (Kumar, et al., 2009) summarized the outcomes of exposure to cold, as follows:

- Reduced manual skills, dexterity, coordination and accuracy with impact on productivity and safety.
- Increased risk of musculoskeletal injuries from stiffness of muscles and joints and reduced peripheral circulation.
- Increased risk of accidents from reduced alertness, manual dexterity and coordination.
- Discomfort from cold stiff hands and feet, runny nose and shivering.
- Impaired ability to perceive cold, cut, pain and heat.
- Reduced decision-making ability.

Basically, a human body cannot sustain cold temperatures such as the Arctic's. If it is exposed above the maximum sustainability, then it will cause to injuries, sickness and maybe accident. There should be proper protection and other important elements to eliminate these unwanted outcomes, instead maintain and even improve the human performance, and the organization.

With such, there is cold protective clothing to keep the human body protected and susceptible to low temperatures. This clothing consists of several protective material layers, and protection efficiency depends on insulation capacity as well as proper coverage, (Williams, 2009). In fact, the European Committee for Standardization (CEN) developed a European standard concerning the personal protective clothing and gloves against colds as stressed by Williams, (2009).

Another important factor to consider is the illumination. This is the lightning available for visual inspection task, according to (Kumar, et al., 2009). Darkness is most common on winter especially in the Barents Sea. Freitag & McFadden (1997) in their statement “the length of periods that the sun is above the horizon at a site is determined by the relative position of the sun, the earth and the location”. Thus darkness reduces the efficiency of work.

Yeow and Sen, as cited by Kumar, et al. (2012), reported a project where an ergonomic adjustment on inspection workstation resulted in a reduction of returned products from 12% to 4.5%. Thus illumination can affect the productivity and effectiveness of an individual's working conditions.

Inability to equipment or component is associated with the placement of components in such a way that maintenance personnel find unreachable and far beyond their visual limits of inspection (Kumar, et al., 2012). The maintainability of the workplace located in the Arctic must be carefully studied and designed because workers need to have their clothing which are basically heavy and thus the motion are eventually affected. Furthermore, the workplace must be designed to have ample space for workers to have a break from exposure and has proper heating.

4 Performance Management

“When we deal in generalities, we shall never succeed. When we deal in specifics, we shall rarely have a failure. When performance is measured, performance improves. When performance is measured and reported, the rate of improvement accelerates.”

– Thomas S. Monson

Looking after the people’s welfare in the world of manufacturing and operating industries, designing machines and considering a favorable workplace for employees are the concerns of human factors. This is in order for an individual to work efficiently according to what his physical and mental capabilities are.

Furthermore, an individual has to function well and should have a systematic working relationship towards the machine, the co-workers and the whole organization. This is where the performance management has to take place. In order to achieve the desired goals, the organization should have a systematic performance management.

Armstrong & Baron (2009) defined performance management as “a strategic and integrated approach to increase the effectiveness of companies by improving the performance of the people who work in them and by developing the capabilities of teams and individual contributors.”

In order to achieve and exceed the goals, the assets should be carefully studied, organized and planned. This is a systematic process in which human beings works with his tasks together with the appropriate machines and equipment, in a place in where the process should take place and the people that are involved in the overall process. “Performance management processes need to incorporate the technological tools with which workers and supervisors are comfortable” (Smither & London, 2009).

Furthermore, the latter stressed out that processes should take into account the difficulties posed by the lack of opportunity to observe the program. It takes a good manager to make these things all work out. There are lots of factors that are to be considered in planning and making possible the organizational performance management system. To make this happen, there should be a proper communication among involved, and that there should be a support and/or alternative system specially in working with the unfavorable and unpredictable environmental factors.

4.1 Roles of performance measurement

A business manager focuses mainly in setting strategy, making strategic decisions, and achieving the desired strategic goals for the organization. Performance measurement and control systems aids to eliminate and correct the problems that hinder the link between people in the organization that may eventually lead to the right path in fulfilling the desired goal. Basically, these are the tools in helping the managers achieve their goals.

To make the strategy work for its possible, managers must possess a strategic mind to formulate or construct a standard viable for the subordinates to observe and make it all work out. He should provide a reliable system to ensure that the individuals are within the right track and not being superseded. That is why performance measurement is an effective tool a manager is using to insure effectiveness of the strategy and in constantly checking the performance of the organization. Generally, a well managed organization is the key to a successful business operation.

Basically, profit is the primary concern of every business. It has to be well managed and planned. Every flow (in and out) or the resources should be taken into account and must be considered in the profit planning. Profit planning is the manager's function to plan how much profit the business needs, so to determine the resources to be used in the business ahead of time and to balance the needs and the obligations to come up with the plan and purposely to realize the BUSINESS GOALS.

However, to be able to achieve the goal, there are things to consider, they are as follows:

- Balancing Profit, Growth and Control.
- Balancing Short-term results against Long-term capabilities and Growth opportunities
- Balancing Performance expectations of different constituencies
- Balancing opportunities and attention
- Balancing the motives of human behavior

Balancing Profit, Growth and Control

The manager's innovative skill focuses on the three aspects, nevertheless the tension between them is never-ending. In this case, performance measurement and control systems are essential. In a way, managers can investigate the flow of the resources, whether the business is making profit or not and the profit plan has been implemented the way it should be, seeing to it that control does not overpower the profit planning systems. Thus, the systems are visual guide for managers to be aware of the correspondence among profit, growth and control.

Balancing Short-term results against Long-term capabilities and Growth opportunities

For managers, it is their task to give attention to the current or the so-called short-term earnings. However, long-term capabilities should also be given concentration. There are several things to be considered in managing long-term investment in capabilities and growth opportunities, so that tension with short-term profit demands should also be managed with the use of performance measurement and control systems.

These systems aim to connect or transmit information to the organization, produce a framework for adequate resources, provide guidelines for systematic growth, establish or constitute short-term profit goals as well as to allocate resources for long-term needs. All of those are for one purpose, namely: the achievement of goals.

Balancing Performance expectations of different constituencies

In business, there are number of bodies involved, or referred to as constituencies. These are people or group of people and/or institutions that associated in the entire business cycle. Among of the most relevant are the owners, managers and employees, customers, suppliers, lenders and government agencies. Each has its distinct function and interest on the business, and must be identified by the managers in order for the performance measurement and control system to be effectively used.

Managers must also take into consideration and balance the possibility of change of interest among constituencies when using the systems so that the organization can adjust to abrupt conflict of interest.

Balancing opportunities and attention

Another organizational tension that is taken into consideration is between opportunities and attention. In business, the reality is there are too many opportunities and there is only little or limited management attention. Managers may tend to expand, explore or even venture into new business but they lack time and attention, and that there are limits in many aspects, specifically resources.

Though opportunities are just around the corner, the fact that managers have also number of obligations and concerns for the business, which has to be given attention, is the essence to be brought up in framing a performance measurement and control systems. Managers, through these systems make advantage of these limited resources, so to level up with the unlimited opportunities.

Balancing the motives of human behavior

Business organization is normally composed of managers, subordinates and other employees. These are people from different walks of life and have distinct human behavior. A manager, which is the maker of performance measurement and control system of the of the organization in business, assumes his employees posses self-centeredness or that they will think of

their own self, their interests at the expense of others and worse of the whole organization.

This reality is not healthy for the business. This problem can be solved if managers are aware and sensitive to the needs and wants of the employees. Managers should identify what are the things that stops the employees to act what is right and good or the business, thus it is the most important reason of formulating the performance measurement and control system.

The managers should emphasize the roles of each individual in the organization and their function for the realization of goals. Through these systems, the managers can convey to the employees what are their importance in the organization, what can they do for the success of the business, how can they eliminate “organizational blocks”. Performance measurement and control system can motivate the employees to be business oriented rather than being self-centered and is a vital bound to a harmonious business organization.

4.2 Decision –based management

Decision-based management is a type of business management that operates in accordance with its decisions, may it be strategic and operational decisions (Frankel, 2008). These tree types of decision are interrelated since an organization requires these to be able to have continuous operating system, which is effective.

In the field of production, decision-based management can be applied accordingly to a company’s system. A production company organization sets its strategic decisions prior to the production process. The managers identify, set and decide on its goals and objectives. Decision will be based on the target market, the range of when the products are to be supplied. Also the type of products the company will and can offer, considering the resource and the ability to acquire more.

Another aspect is the target production result for a certain period of time, the possibility to reach the desired return of investment. Along the process of working out for the goal, tactical decisions are to be made, that are part and portion of the production process.

Tactical decisions are needed when there are changes encountered along the way. It could be with the technology, as machines also has life span, the need to alter or reconstruct, or acquire new machines needs to have a good decision considering also one element of the changes which is finance. Political, social and economic changes may also affect the production, which needs efficient decisions. These changes can either be amendment of rules and regulations inspired by political people.

The society, which the word to associate is the consumers. Their responses to the products are of constant change, which has to be overlooked. And the economic changes wherein the instability of which effects most of the production. Above all there should be a serious thinking and decision making with the environmental change. This is said to be the most important (Frankel, 2008) since this have an unpredictable outcome or result that may cause delay of production, its can be inability of workers to perform their job, damage or loss of resources and assets, or inability to transport are the environment changes' impact to a production company.

A Decision-based management is governed by the long-term and short-term decisions, and decision making is also applicable even up to the company's day-to-day activities, that is called the operational decision. Time is very precious in business, that is why there is a need to be precise on every decision made even on a daily basis, as in a production type business, the operation is continuous. The interrelation from strategic down to tactical is extended to operational decisions.

A most specific illustration is that a calamity strikes and it hits the production site, destroys the new materials and causes some employees who are affected also of the situation to come late and worst not to be able to come to perform heir jobs. The management then needs to decide as new materials replacement for the day and the reinforcement of people in order to continue the operation and avoid the delay of production and delivery.

4.3 How the characteristics of the modern organizations affects human and human performance

We can not deny that everything that we have and do that are part of our everyday existence of this modern age are all influenced by the modernization or automation, where everything is almost governed by technologies. This is the reason why organizations of the "twenty first century" are also changed. It can be labeled as virtual, networked, lateral, adaptive, boundary-less, flat, participative, learning and horizontal. Mankin (1996) listed some of the common characteristics of modern organizations, they are:

- Flatter hierarchies, where formal and vertically defined reporting structures are replaced by layers of integrative, cross-functional teams.
- Flexible, dynamic, overlapping, and broad categories that replace rigidly bound functional areas and specializations.
- Offices and work spaces defined by where workers can actually generate, process and communicate information (at home, in a client's office, or on the road in an airport, plane, or hotel room) rather than by the location of building plants.

- Working relationships defined by interaction needs and functional interdependencies rather than by organizational boundaries.
- Flexible, reconfigurable information infrastructures made up of interconnected webs and matrices of information and integrated data bases. Teams and individuals can reach in and pull out the information they want, along with the tools they need to analyze, use, and add value to it.

Organizational forms affects tremendously in humans and its performance, but in favorable, uncomplicated way. As in this organizational form, some boundaries and constraints are lowered or can be eliminated, with the advent of new technologies and practices. With the introduction of this kind of organization, a person can work on with lesser supervision, lesser pressures, thus giving accessible/manageable and ease of work. Said to be eliminating physical activities, humans doesn't have to exert forces rather make themselves excel mentally.

In such manner that work involves mostly of monitoring processes/systems simply thru the computer screen makes work easy and that he may do his task as a part of an organization individually or independently that from his chosen area of work (i.e. home, public places, anywhere comfortable), as long as he has the access to communicate electronically to his co-employees, subordinates, and staff, he can be able to function well and make his part of the team. In a way everybody could still meet up with his or her thoughts and opinions and/or participation for the attainment of common goal. Humans and the whole organization can lessen costs and duration, not sacrificing their performance.

5 Conclusion and Recommendation

Definitely the Arctic conditions are a challenge. Challenge to perform task as an individual, affecting the rest of the organizational composition. In other words, cold environment affects human performance, and human performance affects the overall organizational performance. It is a give and take process. If the human physical and physiological aspects are being affected, positively or negatively, how the cold environment so then is affecting the organizational performance. It is then that the extent of human performance is parallel to the organizational performance, as shown below.

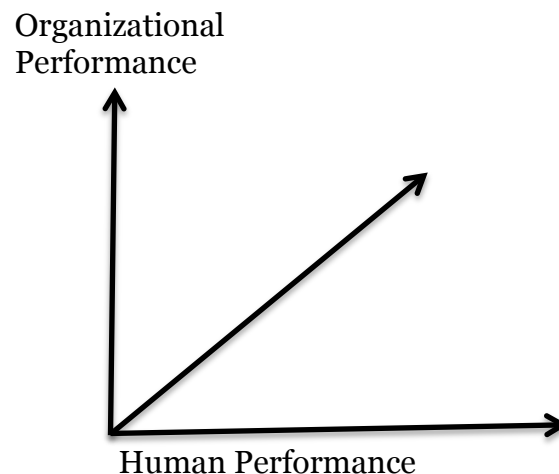


Figure 4.1. Relationship between Human and Organizational Performance

To achieve the desired goal, through high human and performance level, it is necessary to essential to consider and have the human factors as influence of the planning and designing as well as decision making. In this case stress, breakdown and down time will be eliminated. Imrhan (1992) has proposed guidelines for this concern, these are:

- Visual access
- Anthropometric access
- Design features for physical access
- Task simplification

Visual access

Darkness is one condition present in the Arctic. This feature together with the proper illumination concerns about the workplace and the facilities needed in

the operation. It has to be visible by the workers, in order for them to easily see and hold/grab the things they need conveniently and rapidly.

Anthropometric access

This concerns the proper cold-protective clothings. Workers in the cold environment need appropriate clothings when in operation, but the quality of the clothes and shoes should be also considered. This means lighter clothings and that the sense of touch is important to be considered.

Design features for physical access

Machines and equipment should be properly placed in the right places, allowing the workers easy to move around the working area considering ample place for them to rest and regain body heat.

Task simplification

The best way to make high level of performance is to make the people work and do the tasks as easy as possible, most especially to the workplace where extreme climatic conditions are.

These guidelines are essential to the designing the machines considering human factors, and planning a performance system to also have proper procedures of working under the Arctic conditions. To deal with the barrier industries facing in the Arctic regions, it is crucial to present the human factors as early as the designing level. So then stress, accidents, sickness and breakdown will be eliminated. Hence, proper integration of human factors to designing and planning will increase human performance as well as the organizational performance.

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