

# THE VALUE CHAIN AND THE BENEFITS OF ERGONOMICS PROJECTS

Lecturer Emma LÓGÓ

*Budapest University of Technology and Economics*

## *Abstract:*

*Nowadays the most competitive companies are always innovative, renewable and able to be 'the best' in something. But what does one of the most important resources – the human resource – need to achieve a high level of success in his or her workplace? He needs a creative workplace environment where he feels himself in safe, has inspiration and meets challenges. Ergonomics is a human centred science. The ergonomists are focused on the interfaces of the individual person and his or her narrow or wide work environment. Ergonomists typically have not been trained in management or business administration. The business-oriented topics such as cost justification and cost–benefit analysis have not been a part of their curricula. Not surprisingly, instead of presenting the projects to the management in the language of business, they make a great effort to improve engineering design, health and safety, and the quality of work life on. Regardless of the benefits that may be realized from ergonomic improvements, managers are usually willing to provide funds for the intervention unless there is a clear economic benefit to be derived. The ergonomics projects do result in significant economic benefits if they are properly planned and implemented.*

*Keywords: value chain, macroergonomics*

## **Theoretical background**

### ***Value in the marketing***

*Value of a product* within the context of marketing means the relationship between the consumer's expectations of product quality to the actual amount paid for it. It is often expressed as the equation:

Value = Benefits / Price or

Value = Quality received / Expectations

For a firm to deliver value to its customers, they must consider what is known as the "total market offering." This includes the reputation of the organisation, staff representation, product benefits, and technological characteristics as compared to competitors' market offerings and prices. Value can be defined as the relationship of a firm's market offerings to those of its competitors.

Value in marketing can be defined by both qualitative and quantitative measures. On the qualitative side, value is the perceived gain composed of individual's emotional, mental and physical condition plus various social, economic, cultural and environmental factors. On the quantitative side, value is the actual gain measured in terms of financial numbers, percentages, and dollars.

For an individual to deliver value, one has to grow his / her knowledge and skill sets to showcase benefits delivered in a transaction (e.g., getting paid for a job).

For an organization to deliver value, it has to improve its value: cost ratio. When an organization delivers high value at high price, the perceived value may be low. When it delivers high value at low price, the perceived value may be high. The key to deliver high

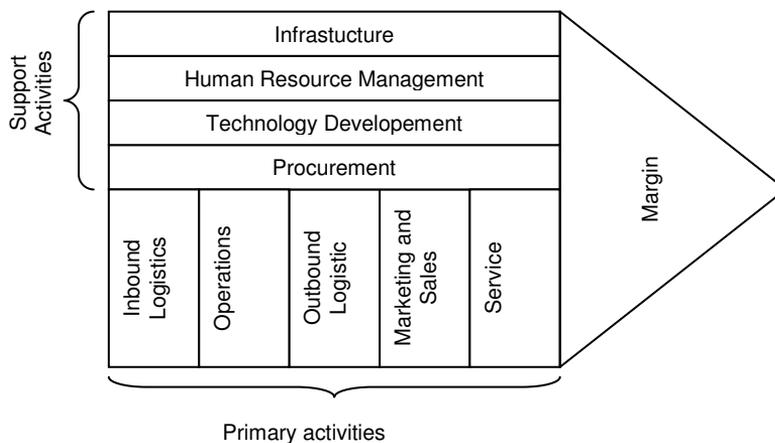
perceived value is attaching value to each of the individuals or organizations helping them to solve a problem, offering a solution, giving results, and making them happy.

Value changes based on time, place and people in relation to changing environmental factors. It is a creative energy exchange between people and organizations in the marketplace.

**The Value Chain**

The term 'Value Chain' was used by Michael Porter in his book "Competitive Advantage: Creating and Sustaining superior Performance" (1985). The value chain analysis describes the activities the organization performs and links them to the organizations competitive position. Value chain analysis describes the activities within and around an organization, and relates them to an analysis of the competitive strength of the organization. Therefore, it evaluates which value each particular activity adds

to the organizations products or services. This idea was built upon the insight that an organization is more than a random compilation of machinery, equipment, people and money. Only if these things are arranged into systems and systematic activates it will become possible to produce something for which customers are willing to pay a price. Porter argues that the ability to perform particular activities and to manage the linkages between these activities is a source of competitive advantage. The idea of the value chain is based on the process view of organisations, the idea of seeing a manufacturing (or service) organisation as a system, made up of subsystems each with inputs, transformation processes and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources - money, labour, materials, equipment, buildings, land, administration and management. How value chain activities are carried out determines costs and affects profits.



**Figure 1. The Value Chain by Porter (1985)**

Most organisations engage in hundreds, even thousands, of activities in the process of converting inputs to outputs. These activities can be classified generally as either primary or support activities that all businesses must undertake in some form.

According to Porter (1985), the primary activities are the following.

*Inbound Logistics* - involve relationships with suppliers and include all the activities required to receive, store, and disseminate inputs.

*Operations* - are all the activities required to transform inputs into outputs (products and services).

*Outbound Logistics* - include all the activities required to collect, store, and distribute the output.

*Marketing and Sales* - activities inform buyers about products and services, induce buyers to purchase them, and facilitate their purchase.

*Service* - includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

Secondary activities are:

*Procurement* - is the acquisition of inputs, or resources, for the firm.

*Human Resource management* - consists of all activities involved in recruiting, hiring, training, developing, compensating and (if necessary) dismissing or laying off personnel.

*Technological Development* - pertains to the equipment, hardware, software, procedures and technical knowledge brought to bear in the firm's transformation of inputs into outputs.

*Infrastructure* - serves the company's needs and ties its various parts together, it consists of functions or departments such as accounting, legal, finance, planning, public affairs, government relations, quality assurance and general management.

The term 'Margin' implies that organizations realize a profit margin that depends on their ability to manage the linkages between all activities in the value chain. In other words, the organization is able to deliver a product/service for which the customer is willing to pay more than the sum of the costs of all activities in the value chain.

### **Ergonomics**

The International Ergonomics Association defines ergonomics as „integrating knowledge derived from the human sciences to match jobs, systems, products, and environments“. Traditionally, human factors have

focused on the interfaces of the individual operator and his or her work environment. Included has been the design of controls, displays, workspace arrangements, seating, lighting, temperature, noise and vibration limits, protective clothing, operations and maintenance manuals, and job aids such as check lists. These micro-ergonomic applications have significantly improved safety and productivity in a wide range of industries, including transportation, manufacturing, mining, forestry, telecommunications and office work. Since the mid 70's, it also has been applied progressively to improving software design.

By the late 70's, many managers were noting that the application of human factors/ergonomics design technology at the micro-ergonomic level had significantly improved health, safety, productivity, and the usability of their products. Still, their work systems were not achieving the levels of safety and productivity that they intuitively knew should be possible. At the same time, ergonomists began to realize that correcting human factors problems at the operator workstation level did not also correct problems with the design of the over-all work system. As a result, during the 1980's a whole new sub-discipline of human factors evolved that came to be known as macroergonomics.

Through a macroergonomics approach to determining the optimal design of an organization's work system, many of the characteristics of the jobs to be designed into the system, and into related human-machine and human-software interfaces, already have been prescribed.

Put simply, effective macroergonomics design drives much of the micro-ergonomic design of the system; and this insures optimal ergonomic compatibility of the system's components with its work system design.

Macroergonomics has the potential to improve organizations by ensuring that their work system designs harmonize with their critical socio-technical characteristics. A widely accepted view among system scientists is that for all complex systems the whole is more than the simple sum of its parts. Accordingly, when organizations have been effectively designed macroergonomically, and that effort is carried through to the micro-ergonomic design of jobs and related human-machine and human-software interfaces, improvements, such as reducing accidents and injuries by 50% to 90%, or greater, should be possible. (e.g., see Hendrick, 1997, for summaries of case examples)

### **Case study**

A numbers of studies have shown the positive impact of macroergonomics projects. This project shows the actions in the aspect of Support Activities of the Porter Value Chain. The main problem was the number of CTD-related claims of the companies' employees. What does *CTD* mean? Conditions such as *Thoracic Outlet Syndrome* and *Carpal Tunnel Syndrome* are sometimes grouped together under the name *Cumulative Trauma Disorder (CTD)* or *Repetitive Stress Injury (RSI)*. Many different symptoms can arise from the accumulation of small injuries or stresses to the body. CTD is not so much a disease as it is a response to excessive demands that we place on our bodies - without giving them adequate time to recover between. The three words:

*Cumulative*: It just keeps adding up

*Trauma*: Injury to the body that happens secondary to some physical cause.

*Disorder*: A dysfunction of the normal body processes. A group of symptoms - for example pain, tingling or weakness; that describes the manifestations of a certain disorder are usually referred to as a syndrome.

*The causes*: Muscle Tension + Repetitive Motion + Over Use + Incorrect or Static Posture = CTD

The project started in 1991, in Kansas. Blue Cross Blue Shield of Kansas (BCBSKS) reported 103 CTD-related claims costing over \$500,000. In 1991, CTD-related injuries among employees performing data input tasks on computers were rising.

The BCBSKS ergonomics program has continued to change over the years to meet the needs of an ever-changing organization. Measures implemented by the company include the following:

### *The changes in Technology Development*

Purchasing 900 "ergonomically correct" chairs at the end of 1990 in an attempt to ease low back pain and carpal tunnel syndrome. In 1996 a "loaner pool" of new, fully adjustable chairs was established. If an employee needs a different chair and no other available chair will suit their needs (all available chairs are perused), with management approval they consult with the Corporate Nursing department where a new, fully adjustable chair is fitted to the employee by a Corporate Nurse (several styles of chairs to choose from, all cost-effective with solid warranties). The employee is allowed to sit in the chair for one week. If after that period the employee and their management decide to keep the chair, it is then transferred to their cost center. If the employee does not like the fit of the chair, the process begins with another new chair.

The company has issued new, larger, 21-inch monitors for the majority of employees.

BCBSKS has designed and builds equipment necessary for workstation comfort when specific equipment cannot be found. For example, the pro-vu spacemizer podium was developed in 1996. It has since been modified and is utilized by most employees. The podium, which sets in front of the PC,

behind or above the keyboard, is utilized for holding papers, books, and literature viewed for pc input or analysis; thus, neck, back and eye strain are reduced. The company has also designed and fabricated workstation extension bars, chair arm writing support mechanisms, terminal risers and more. Using accessories such as glare screens, articulating and split keyboards, document holders, mouse rests, and different mouse varieties.

Since 1993, providing ergonomically designed workstations and indirect lighting in the company's new buildings. Remodelled older buildings with ergonomically correct office equipment. Increased from one part-time to two full-time corporate registered nurses. In 1993, the nurses helped create an on-site electronic job-site questionnaire that educates and requests information on employee workstation comfort.

#### *Changes in Human Resource Management*

Initiating and maintaining educational ergonomic programs and training for all BCBSKS employees.

New employees are educated during their first day of employment with BCBSKS in their orientation session regarding ergonomics and proper alignment techniques with their workstations.

All new employees receive a job site evaluation typically within 10 business days of employment with the company. The employee and their management receive copies of the job site form for future reference. The company follows up with all employees who receive job site evaluations within 30 days of their evaluation.

A company-wide stretch program have began in 1999. A member of the Corporate Nursing department staff travels to individual units approximately 2 times/month to lead and facilitate various stretching exercises. Focus leaders from within the units keep the

stretches going twice per day throughout the rest of the month. Incentives such as handouts, music, bright colours and fun encourage participation in the stretch program.

They work closely with the workers compensation TPA. (Third Party Administrator) They also work closely with the workers compensation medical provider.

Together with the TPA and workers compensation medical provider, they have been developed and utilize a preferred provider network for the employee work-related medical care.

The company also holds an annual employee health fair celebrating National Employee Health and Fitness month in May. In 2002, the health fair featured an employee on-site Olympics and also an employee Health Risk Factor game (similar to the Fear Factor TV program).

#### *Changes in Infrastructure*

Nurse availability for employees experiencing work-related (or non-work-related) pain or illness. The nurses follow their workers compensation physician's standing orders for assessment, evaluation and implementation of conservative measures during initial exam. Since 1998, body composition analysis (body fat %) via Tanita machine has been available for employees. A Corporate Nursing staff member assists with the analysis and the printed results are immediately available for the employee.

In 2000, BCBSKS installed three Health Stations for use by the company's employees. The machines are available for use "24/7." They monitor blood pressure, pulse and weight.

Since 2000, free flu shots are available to all interested employees, provided by the Corporate Nurses.

Cholesterol testing has been offered free to employees. In 2002, the Cholestech finger stick cholesterol

testing was provided by the Corporate Nursing department staff. With the Cholestech testing, immediate printout results are available for the tested employee.

Each year they also invite local dermatologists (skin specialist physicians) to come on-site for free employee skin checks. This has been a life-saving program.

In 2001, five Li'l Medic machines were installed at BCBSKS. The machines offer employees various over-the-counter medications for only \$.25 each.

The Corporate Nursing department continually researches ergonomic information/literature/equipment and implements additional measures as needed.

The company strives to accommodate any return to work status, including alternative duty.

Club Blue exercise facility was established in 1995. All employees are able to utilize the exercise facility (open "24/7") upon completion of a brief equipment orientation. The facility features cardio machines, stationary exercise equipment, and exercise floor area for the daily exercise classes offered to employees. A TV, VCR, and exercise tape library is available for employee use as well.

#### *The Impact*

Since 1991, the company's focus has shifted from "managing RSI claims" to "facilitating work safety and overall employee health," this means educating and accommodating employees to be as comfortable and pain-free as possible both at work and at home. CTD-related repetitive strain injury claims and costs have fallen from 103 to

52 and from \$526,000 to \$137,000 in 10 years time.

### **Summary**

In this macroergonomics case study, workers who had changed chairs and attended ergonomics training growth of pain and discomfort were reduced over the work day. The project has had influence on the support activities (in the Value Chain): Infrastructure, Human Resource Management and Technology Development. These results were extended to the employees' efficiency and hereby the job satisfaction and loyalty. The BCBSKS management wanted everyone to have a good time at the workplace. And the working environment (physical, psychical, social level) played an important part in this goal.

Day-to-day a number of corporate decisions are being made. These decisions have one common touch: they are all budgeted. The lack of health and safety is indicates extra costs. The value of the labour-force is determined of three parts:

- knowledge
- abilities and skills
- state of health

In this case study the project was planned for 10 years' time; the management was committed to macroergonomics changes. At the end of the period the CTD-related injuries decreased to the half and the unnecessary costs are decreased to the quarter. The management raised the knowledge of employees, developed their abilities and improved the state of their health.

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