



DATA PROCESSING IN BOLIVIA

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Corporacion Minera de Bolivia

The largest computer in Bolivia is an IBM 1440 system which by established standards is roughly a medium-size computer. It is also, at the present time, one of three computers in the whole country, all located in La Paz. This computer belongs to the Corporacion Minera de Bolivia.

The Corporacion Minera de Bolivia is the basis of the Bolivian economy and directly employs over 20,000 people; at the same time it is a government-owned and controlled company. Within the corporation the Data Processing Department reports directly to the Finance Manager. It consists of a programming section, machine operations section and document control section.

At this point it appears that this is a standard data processing department within a large corporation. However, this is not quite the case. The purpose of this paper is to present the behind-the-scenes situations, environmental factors, problems and solutions and techniques involved in the attempt to make this particular data processing department, and what it represents to all concerned, a worthwhile approach and a dynamic success.

The introduction of this type of machine into the work environment caused several predictable reactions and problems, these will be classified as personnel and management. Associated with these classifications are what may be called special problems which are unique to the situation.

Before going into the more interesting aspects of the reactions and problems associated with computers in Bolivia and in particular the Corporacion Minera de Bolivia, a brief background and organization of this company is necessary. Also some aspects of the political and social environment will be presented as they relate to the situation.

CORPORACION MINERA DE BOLIVIA

The Corporacion Minera de Bolivia, as the name implies in Spanish, is a mining corporation whose sole industrial output is mineral concentrates, primarily tin. It directly employs over 20,000 people and is a government-owned and controlled company. The president of the Corporacion Minera de Bolivia is, at the same time, a Cabinet member in the government reporting directly to the president of Bolivia.

The corporation consists of 13 mining centers, several cooperative mines, customs agencies and the corporate office located in La Paz; its operations are largely decentralized. The mining centers range in distance to the corporate office from 173 miles to 408 miles and are accessible by dirt roads, some also by rail; communications are by short-wave radio. It is organized as shown on page 4. Each major operating group is headed by its respective manager.

The Data Processing Department reports directly to the Financial Manager and consists of a programming section, machine operations section and document control section.

POLITICAL AND SOCIAL ENVIRONMENT

Some aspects of these factors are of interest because they influenced and are influenced by the introduction of computers into the work environment. Also they bear upon present and future data processing in Bolivia as this is something new and different.

(1) Political environment

This environment is and has been of a stable nature for the past years giving course to a surge in the national economy, particularly in the private sector. Similarly, capital investments are being made in government-controlled and sponsored industries; this in part caused the acquisition of a computer for the Corporación Minera de Bolivia with the rationale of improving operations and finances.

(2) Social environment

As a result of the betterment in the political environment, the social environment has also improved. However, we are interested in some aspects of social improvement as affected by the introduction of computers.

The principal positive aspect of social improvement is opportunity. Computers and Data Processing in the work environment requires knowledgeable and skilled people in this field, however, there are none available. The alternatives to obtain them are: 1) import the skills but at a very high cost and without the needed knowledge of the Bolivian environment, or 2) prepare local personnel to acquire the skills, but this requires a great deal of time in formal training and on-the-job training to reach the level of productive work. In the case of Corporación Minera de Bolivia a combination of the two was chosen. The Data Processing manager was hired abroad, and the remaining required personnel were trained. The result presented opportunities, to those chosen, in expanding their education and knowledge, and prepared them for more satisfying work than that which is generally available, in addition, placing them on the ground floor in the further expansion of data processing in Bolivia.

PERSONNEL FACTORS

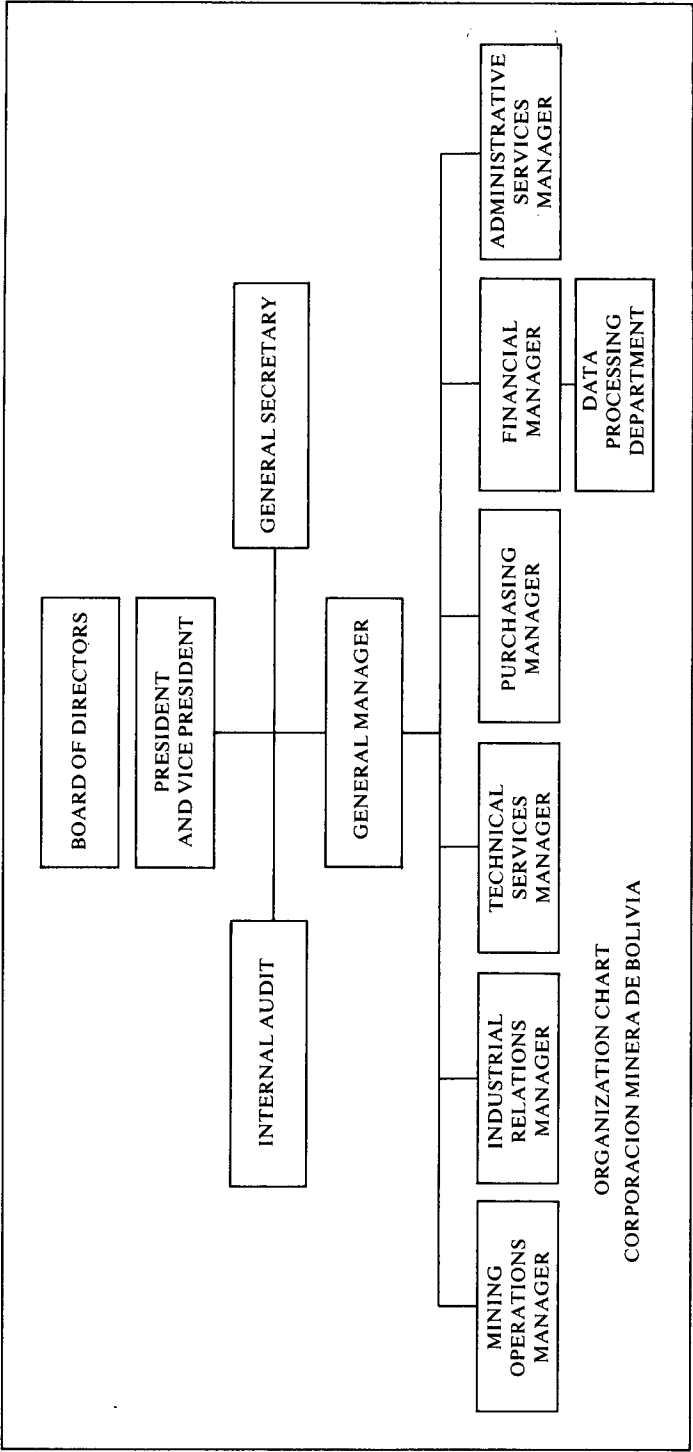
The work environment is the most important as it deals directly with the concepts of data processing and computers and makes them successful or otherwise. One group of factors to be considered in this environment are called personnel.

Personnel factors are almost as diverse as there are people, however, in the local environment we are interested in converting a person with no knowledge on the subject into a programmer, analyst or person that will be able to provide usable work, whatever its form, to the success of the data processing function.

What is the general background of the personnel available like? What is necessary for the conversion? And how was it accomplished?

In the case of the supervisors, programmers and analysts most of these personnel have either completed a university course of study or are in the process of completing one. The remaining personnel have completed a secondary education (high school), and some are completing a university education. The language spoken by all is Spanish; English is a required subject in high school.

Before the arrival of the computer most of the personnel were working in the different mining centers, their jobs consisted of manual accounting or manual statistics, in other words, tedious routines which were primarily dead-end jobs. Their salaries averaged \$b. 600.- (\$us. 50.-) per month.



With the formation of the Data Processing Department which would use the computer, it became apparent that some preparation was required to convert personnel from the previously mentioned background and type of work to a different type of work and operating concepts.

Personnel selection was made by means of the IBM standard aptitude tests for programmers and keypunchers. Of the 500 persons who took the tests, six made passing scores on the programming aptitude test and came into the department. Two of these persons took a Computer Familiarization course in Lima, Peru. Shortly thereafter, all six were given an Autocoder programming course by IBM personnel. All subsequent courses in programming were dictated by the department programming personnel. In the past year and a half, courses in COBOL and FORTRAN IV have been given to the programmers.

The supervisors were selected from the programming group and were chosen on the basis of initiative, programming knowledge, ability to get along with people and systems analysis ability.

The analysts were selected from the programming group on programming knowledge, initiative and education. The analysts were created within the department.

Initial selection of keypunchers, verifiers and computer operators was made from persons who passed the keypunch aptitude test and who made non-passing high scores in the programming aptitude test. They then were trained by IBM personnel and techniques.

From the initiation of the Data Processing Department to date, the number of personnel which started at 10 went up to 42 and has now leveled off to 30. This has been over a 3.5 year period.

One of the difficulties encountered at the onset was the problem of language. All the computer system, programming and application manuals are in English and no one knew enough English to read them adequately, in addition they are written in technical English. To overcome this problem, courses in English language were provided for about a year, after which, technical English and advanced English language courses were given for about half a year.

Most of the training for the personnel has been in the form of on-the-job training, some specialized personal training was provided for the analysts and supervisors. This was enhanced with the liberal use of publications on data processing practices and standards.

Another difficulty encountered initially was the disparity in salaries among the personnel. They ranged all the way from \$b. 200.- to \$b. 3.600.- (\$us. 17.- 300.-) per month. A salary study was performed which resulted in establishing salary ranges for all job functions in the Department, this included job titles, descriptions and requirements. A programmer's salary is \$b. 2.000.- (\$us. 167.-) per month and a system analyst's salary is \$b. 3.600.- (\$us. 300.-). The current average salary is around \$b. 2.000.- (\$us. 167.-) per month.

MANAGEMENT FACTORS

Another important group of factors to be considered in the work environment are management factors.

Managers, too, are people and subject to most of the problems of personnel. However, there are additional factors which are exclusively managements' in relation to data processing. These factors deal with how they view and use the

data processing tool acquired in providing them with timely and accurate information for use in their decision making process.

To arrive at the above answer it is also necessary to give a general background on managers at Corporacion Minera de Bolivia, and know their opinions, attitudes and expectations.

Top management in the corporation is usually politically appointed and changes in the Bolivian government may affect them. They are generally interested in improving the operation and financial conditions of the corporation. This interest was the moving factor in the acquisition of the computer.

Lower management, however, has not fully responded to the challenge of the computer. Many of these people do not have the necessary managerial skills, knowledge, far-sightedness and interest to implant changes that will improve the situation.

With respect to data processing any real technical knowledge is almost non-existent and the expectation is for the computer to solve long standing problems, that is the interpretation of the propaganda that was presented.

In reality the computer and the Data Processing Department have been more or less accepted, but on the basis that they should not "interfere" and provide immediate results. The results, of course, are not immediate but rather evolve over a long period of time. Also it is, so to speak, "interfering" with long standing practices which it can do better and more accurately; this "interference" is being done more by force than by peaceable or cooperative means. The resulting attitudes are:

- 1) regarding it as the best way to improve operations and finances at the present and the only way for the future;
- 2) assuming it is here to stay, but has got to be fixed or straightened out so that the "interference" will cease and provide the immediate results;
- 3) opposing it directly with the hope of throwing it out;
- 4) ignoring it, hoping it will all fail and disappear.

SPECIAL PROBLEMS

These types of problems deal primarily with procedures, organization and standards which heavily influence data processing functions and success:

- 1) The first organization of the Department reflected a common aspect of U.S.A. data processing organizations, it was soon discovered that this aspect does not function effectively in the local environment. This is the division or separation of labor in highly specialized job functions, such as between programmers and senior programmers. In other words, the incorporation of "as is" work techniques from one country to another does not always function the same. Usually they have to be modified to reflect the different environment and conditions.
- 2) The problem of overall organization as it affects data processing at Corporacion Minera de Bolivia is as follows: The corporation functions as a decentralized organization. The solution to many major problems requires a centralized organization. Data processing has been charged with the automation of many functions which directly affect the major problems. But, due to the lack of centralization, some effort is duplicated and ineffective.

- 3) Another problem is the one of standards and procedures. Employee evaluations were introduced into the Department, and every six months for about two years, after the first half year, were conscientiously performed with good results for the Department. This consisted of placing employees where they could most effectively develop in job knowledge and advancement. For example, all machine operators (computer, keypunch, and unit record equipment) were rotated so that each knew all the equipment and could in emergencies operate any given machine. However, this use of a standard procedure was dropped as the corporation does not have a clear cut salary incentive policy or a personnel evaluation plan.

Standards and procedures are used, almost solely, by the Department.

SUMMARY

What is the result of all the investment of effort, time, and resources by Corporacion Minera de Bolivia into its computer and Data Processing Department?

The results to date are a mixture of improvement and non-improvement for the corporation. It depends on the point of view taken. The Data Processing Department is providing results in some areas and none in others. It is viewed as a desirable method and tool that is beginning to function and, with time, will fulfill expectations, while on the other hand as a very foolish venture and waste of resources. In any case, it is worth remembering that any investment undertaken provides either good or bad returns, whose value depends upon the preparations made beforehand and the willingness of those involved to take advantage of its potential.

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Max O. Mehlis received his BSEE from Oklahoma State University in 1958 and did graduate work at the University of California at Los Angeles. He is a native of Bolivia, and prior to returning to that country to become the manager of the computer center at Corporacion Minera de Bolivia, he held various engineering positions with North American Rockwell Corp., General Dynamics Corp., Bunker-Ramo Corp., and Litton Industries, Inc.