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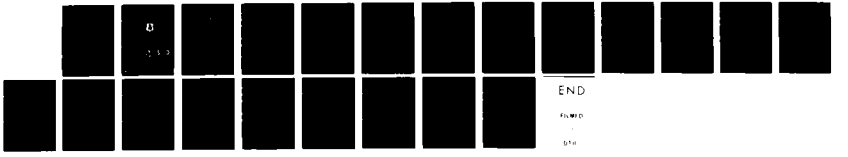

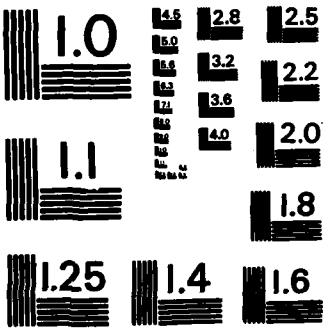

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APPLICATION OF INFORMATION SCIENCE IN POSTAL SERVICES, TELECOMMUNICATIONS, AND MANAGEMENT

by

Czeslaw Syc

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APPLICATION OF INFORMATION SCIENCE IN POSTAL SERVICES, TELECOMMUNICATIONS, AND MANAGEMENT

Czeslaw Syc, Dr. Engr.

The tasks following from the resolutions of the Eighth Congress of our Party, in the sphere of improvement of organization and management, require great discipline in the field of treatment, processing, and transmission of data.

Such discipline combined with dependable information, which is objective and reliable, is indispensable, especially in such fields as statistics, record-keeping, accounting, and planning. Our society must be prepared for such treatment of information.

Information science is preoccupied with data processing technology in "factories" equipped with computers and telecommunications deals with "transmission" and organization of data.

Information constitutes the basis of the close relationship between information science and telecommunications. With the development of the exact sciences and engineering, the concept of information science is defined more comprehensively. Information has two aspects: quantitative and qualitative.

The qualitative interpretation of the information concepts has been well elaborated as formulated by Shannon. The smallest information unit in this

formulation is a bit (binary digit). However, things are not as good when it comes to a qualitative formulation of the information concept. So far, in spite of extensive scientific studies along these lines (including studies conducted in Poland), attempts to define a measure of the value of information, namely, an effective measure of the information content, have been unsuccessful. The latter is so essential that, given the growth of various kinds of information and its deluge, the problem of selection of information from the standpoint of its content is becoming increasingly more important. This need also follows from the point of view of the demand for information as a commodity which is beginning to play an ever-increasing role with the transition from an industrial to a service-oriented society.

In this case, information as a commodity is just as important as modern technologies or ownership of a manufacturing plant. Information as a "commodity", in distinction from other commodities, has many characteristics which are specific to it, namely:

1) it is indestructible;

2) collection of information from a source does not deplete the latter;

3) the total information from the standpoint of its value is greater than the sum of its components;

4) exchange of information is moderately energy-consuming.

Both telecommunications and information science are preoccupied with information. Telecommunications deals with transmission and conversion of information in the quantitative sense and information science deals with the conversion of information in the qualitative sense.

The rapid development of electronics and miniaturization of equipment is accompanied by an interpenetration of these two fields. This is followed by integration of services and techniques, which entails in many countries the creation of a uniform (from the organizational and engineering standpoint) of a remote data transmission industry and research centers subordinated to the Postal Services and Telecommunications Administration.

A new area of services in the field of telecommunications and information science came into being recently. This field is remote data transmission. Remote data transmission is that portion in the field of engineering which is common both to telecommunications and information science; in particular, its range covers:

1) public data transmission networks;
2) selected data transmission networks;
3) commutated and leased data transmission lines;
4) modems, adapters, multiplexers, concentrators, subscriber's stations, terminals;

5) communications processors;
6) telecommunications software;
7) remote access methods, records and telecommunications procedures;
8) servicing, maintenance, and services.

The development of classical *means of communications* in Poland in the last decade, taking into particular account the requirements that had to be met in the area of installation of telephones, was a correct undertaking from most standpoints. However, underestimating from the investment standpoint, the role played by telecommunications and remote data transmission requirements caused a diversion of funds to the advantage of information science on a country-wide scale, which in turn had an effect on the general insufficient development of remote data transmission. In particular, this began to be felt acutely during the last 3 years.

We attempted to save the situation by developing a concept utilizing the telex network for data transmission requirements, and as part of this concept we elaborated the BIST (Basic Computerized Telex Remote Data Transmission System). All these activities have been undertaken as part of an effort to release available reserves. In the long term, however, activities in the field of more complete utilization of the telecommunications network for information science requirements, taking into account the experience which has already been acquired, are indispensable. From this experience it follows that besides leased lines

made available to the user by the communications sector, it will be necessary to make available on a wider scale for information science requirements a commutated general-purpose telephone network, in particular, a telex network. It will be necessary to consider whether a Datex type network based on the telegraph network should be built, i.e., a generally accessible slow data transmission network (transmission rate up to 200 Baud). Many countries have such networks, including the FRG, Austria, and among socialist countries the Hungarian People's Republic. In my judgment, it is our great opportunity and at the same time a necessity. Using this network and a commutated telephone network as a base, it is possible to build remote data transmission networks oriented to various user requirements, among others, the following requirements:

1) retrieval of data and updating of data sets, creation of data banks and data bases;

2) planning, management of the economy, and statistics;
3) drawing up inventories, keeping records, and materials management;
4) financial, bank, and postal operations, and bookkeeping;
5) reservation of seats, airline, bus, and railroad tickets;
6) engineering and scientific calculations;
7) automated production control and automated control;
8) railway and air traffic control and safety;
9) trade information;
10) management of various fields in the national economy.

When we speak about the application of information science to telecommunications requirements, we have in mind two approaches: the first approach pertains to the application of computer science to the benefit of telecommunications proper. The second approach pertains to computer science systems applications for the purpose of refining or replacing classical telecommunications systems by computerized equipment. In these two categories we will consider concrete examples of computer science applications in telecommunications in Poland.

In principle, the first approach does not differ from computer science applications which are characteristic of other branches and fields. This applies to computer science applications for engineering-scientific calculation purposes, planning, compiling lists of wages, production management, allocation of materials management, etc. Characteristic computerized systems for application in telecommunications are systems the specifics of which differ from those in other branches. In particular, this applies to computerized systems which improve the efficiency of postal and telecommunications services. In the first case, we have been able to develop the POCZTA (POST OFFICE) system, which has improved the efficiency of services provided to clients at cash deposit and withdrawal counters. This system executes automatically calculations involved in the operations of cash deposit and withdrawal counters and post offices. Wherever the POCZTA system is used, all lists are prepared by a minicomputer on the basis of data prepared by the office staff. This frees the cashier from laborious activities and at the same time accelerates servicing of the clients. About 50 such systems are operational in Poland. This definitely does not meet the needs in this field. Taking into consideration the situation, we developed in the Hardware Computer Science Center in Warsaw the integrated POCZTA system, which by using a single minicomputer and taking advantage of the telex network and teleprinters will make it possible to service up to 50 cash deposit and withdrawal windows and the corresponding number of post offices. Dissemination of this type of system will be possible when industry undertakes the production of suitable reliable minicomputer equipment, perhaps the MERA minicomputer. At the present time, its suitability in this area is being studied.

Also, to improve the efficiency of postal operations we have developed in the Hardware Computer Science Center in Warsaw systems providing information about postal-telecommunications services using a telephone coupled with a minicomputer and a television receiver. Such a system was analyzed in UPT (Post and Telecommunications Office, Warsaw 10) and it will be adopted in all larger UPT's, where it will replace the electromechanical drum information system.

It is characteristic that during the two-year-long period in which this system was used (accessible to the public in the hall of UPT, Warsaw 10) that no one damaged it or tried to do so. Basically this system elicits admiration and respect thanks to its simple servicing, intelligence, and reliable

operations. Because queries are made by dialing the proper number on a telephone dial, the repertoire of queries and responses can be very wide and extended arbitrarily. Responses are displayed on a screen of a television receiver, thanks to which they are transparent and readable. The PACZKI (PARCELS) and SKRYTKA (POST OFFICE BOX) and INFORMA (INFORMATION) systems have also been elaborated to meet post office requirements.

The PACZKI system makes it possible to obtain from a telex on the basis of suitably formatted data information about the postage which should be charged for shipment abroad (parcels or letters). The SKRYTKA system improves efficiency in the area of registration of shipments delivered using post office boxes.

The INFORMA system makes it possible, using simple keyboard terminals, constituting part of the equipment of cash deposit and withdrawal counters, to verify the numbers of savings books, ID cards, or checks to make sure that the latter are proper or not forged. The check is conducted discretely by entering the number in the memory of the computer using the terminal keyboard to verify whether the given number is correct. The response is properly encoded and displayed in the terminal display. On this basis, the cashier can make a decision about withdrawal of cash from the savings book or checking account or sound an alarm in order to detain a client with an improper document. Thanks to the INFORMA system, verification of the document is almost instantaneous, while in the traditional method it requires a search over a large volume of data entered in suitable form in a book. The traditional method annoys and irritates the client. All systems that have been mentioned above are currently integrated into a single system which will be able to service the main office to which many post offices are subordinated. Also here reliable minicomputer equipment is needed. Keeping in mind the future of our postal services, the Central Postal Research and Development Center in Warsaw is working on a country-wide system known as POSTBANK (POSTAL BANK).

In the field of telecommunications, many DOPiT (Postal and Telegraph Services) use electronic computer techniques in billing payments for telecommunications services. This applies, in particular, to preparation of telephone

bills. "This computer operation" is best known to the authorities from the letters of readers to various editors about high telephone bills. However, it should be mentioned here that erroneous bills are not the fault of the computer but of the data read into the computer. Mistakes usually arise as a result of erroneous reading at the counter and transfer of this error to the punched card or as a result of an error made by the operator punching the card.

Generally, this takes place in the data preparation stage for the computer. A lack of suitable programming mechanisms for controlling margins, for example, by comparing the amount of the last bill with the previous bill, is the cause of a senseless result, which is not the fault of the computer, but of the programmer who did not foresee such a case or some other possibility. The SART system, which is presently used on the ODRA computers, does not have the capability for such a check.

The TELSART system for JS (Unified System) RIAD computers, which is being developed, will have such a capability. Thanks to the elimination of card punches by using MERA 9150 recorders for data preparation, the number of complaints about high bills will sharply decrease. The TELSART system, which has been developed in the Computer Science Engineering Center in Warsaw, was already scheduled for installation in 1981 in DOPiT in Warsaw. As a result of the application of computers in telecommunications to meet all DPiT requirements in Warsaw, we were able to considerably increase the efficiency of the process of publishing telephone directories.

In 1976 we published, using the offset technique with the aid of an IBM 360 computer and a linotype, a directory of subscribers who reside in the capital, Warsaw. In this year we are preparing for publication, also by the offset technique, using an IBM computer and a linotype, a directory of institutional subscribers in the capital, Warsaw. This directory, unlike those published by the traditional method, will be more updated and, thanks to the introduction of abbreviations of the names of institutions, will allow all persons familiar with these abbreviations to find almost immediately the required information about a subscriber. The greatest difficulty in this system of

publishing directories is the creation of data banks (computer files) about subscribers. Next, thanks to systematic updating of these banks (computer files), a directory is ready to be published at any instant. The degree to which the directory is updated depends, in this case, on the time required to print the directory.

As a result of the application of computer techniques and a linotype, it became possible to automate the publication of telephone directories, while considerably simplifying such processes as preparation of the data bank, all types of corrections, selection of printing type, arrangement of material in the directory and standardization of the latter, introduction of all kinds of innovations in the directory system, etc. In addition, thanks to the application of a linotype, it was possible to avoid manual compilation of the directory, as a result of which publication of the directory was considerably reduced (from 18 months to 3 months).

The Institute of Communcations designed a system for an ODRA 1300 computer for fast retrieval of scientific-engineering information. Subsequently this system was made available to many other institutions, among others, the Chief Statistical Office. Many systems for JS RIAD (Unified System of Computers) computers have also been developed, which are currently in the implementation phase. These systems include TELSART, a system which like the SART system automates telecommunications accounting, with the difference that it uses an R-32 computer; TELSPIS, which automates servicing in the telephone number office, i.e., using an R-32 computer and CRT monitors in information sites in the telephone number offices for service to subscribers by providing answers to their questions pertaining to such data as the number of the subscriber when other information about the subscriber is known, the name and other information when his telephone number is given, etc. Many other systems have been developed or are being developed for example, the ZASTERZWUT system for controlling the license production of PENTACONTA telephone exchanges in ZWUT, the POSTBANK system for postal service calculations and accounting, a system for telecommunications line management, the SABAT system for automated calling of subscribers, the MINISIK system, which makes it possible to inform

DOPiT management about the situation in the district with the aid of telephones, television receivers, and a minicomputer.

Other subscribers can also use the MINISIK system with consent of the person to whom the system was made available. The MINISIK system was realized on a MERA 305 minicomputer base and suitable telecommunications equipment and has been utilized in DOPiT in Warsaw since 1978.

The TELEGRAM system has been designed to improve the efficiency of telegram communications. This system operates on the principle of an information concentrator, which allows full automation of the reception and relay of telegrams to telex subscribers.

This system is based on a minicomputer and it allows for direct interaction with the telegram network in a multiaccess mode and in real time. The system replaces the traditional main teleprinter station equipped with 12 teleprinters by printing telegrams for delivery on a minicomputer printer. The telegrams which are printed automatically are furnished with a heading containing the date and time of reception, the number of the telegram, etc. In addition, errors are automatically eliminated from the message in the telegrams. Telegrams directed to institutions owning their own telex systems are automatically relayed to these institutions.

At the present time, the TELEGRAM system has been installed in DOPiT in Warsaw, Gdansk, and Katowice. The opinions of users are very favorable. However, because of the fear that the equipment may be damaged, the traditional system has also been retained as a backup system. Until now it has been used very rarely.

It bears emphasis that thanks to specifics, centralization and standardization and common mandatory regulations in postal services and telecommunications, the computerized systems that have been designed to meet postal and telecommunications requirements are multiple systems. Most of these minicomputer systems, like the POCZTA, TELEGRAM system, are also systems coupled with

specific objects. This facilitates considerably the installation of computerized systems in postal services and telecommunications.

However, because of the great number of postal and telecommunications offices, the demand for computer equipment is so great that it forces us to seek solutions which, while using the telecommunications network, will allow us to limit the number of installed minicomputers and computers. For this purpose, we are working on the design of various kinds of terminals and remote multiaccess to minicomputers and computers. We have developed the UPTI (Universal Portable Intelligent Terminal), which coupled with a telephone and a television receiver can realize all functions of a CRT monitors. The advantage of UPTI is its low cost and the possibility of carrying it from place to place (small dimensions and low weight). The terminal allows one to establish a connection with the aid of a telephone (connected to a telephone network) with any minicomputer or computer (connected to the telephone network), for example, for the purpose of using a data bank, obtaining necessary information, transmitting data, etc.

We are working on a system known in the West under the designation VIEWDATA. This system has first been disseminated in Great Britain under the designation PRESTEL. The idea of the system is based on taking advantage of a television receiver as a CRT monitor and when coupled with a telephone as an intelligent terminal. Such use of a television receiver and a telephone is made possible by a special electronic attachment, which, thanks to the application of large-scale integrated circuits and microprocessor structures, has dimensions which will fit in the casing of a telephone or a television receiver constituting standard equipment.

We also see the possibility of a fast application of such a system in Poland, as well as the necessity of replacing the imported minicomputer in the E-10 system by a minicomputer manufactured in the country. We are working on the design of electronic telegraph exchanges based on minicomputer control and management.

The District Postal and Telecommunications Laboratory in Lublin has developed the PIAST (Transmission of Management Information over Telex Network) system, which was described in Number 1/79 of Wiadomosci Telekomunikacyjne, and the Computer Hardware Science Center of Postal and Telecommunications Services in Warsaw has developed the BIST (Basic Computerized Telex System). The PIAST system creates organizational conditions and regulations for management of community and town offices by provincial offices using the telex system, i.e., by utilizing teleprinters in community and town offices and utilizing a telex station, circulation equipment, and properly elaborated formats for reports and suitable regulations for their transmission in the provincial office.

The BIST system is also a system based on the telex network and its main task is to enable users to take advantage of a public slow-data transmission system (from 50 Baud to 200 Baud) based on the telex network.

A family of telegraph adapters and multiplexers allowing one to connect directly to the telex network such minicomputers as those in the MERA 300 series, MERA 400, MERA 9150, and DP 5500 minicomputers have been elaborated as part of the BIST system. Different types of minicomputers, for example, MERA 60, can also be connected in a relatively simple fashion. With suitable software, these minicomputers perform in the BIST system the function of information concentrators, multiple terminal stations, information systems, and communications processors.

The former Minister of Communications, professor dr. Edward Kowalcyzk, wrote the following on the subject of the BIST system in an article entitled "The Role of Communications in Setting in Motion Available Resources for the Development of the Country," which was published in the journal Nowe Drogi, No. 9.

The BIST system is an abbreviation of the designation "Basic Computerized Telex System." This system creates technical conditions which enable various types of minicomputers and computers to interact directly with the telex network.

Thanks to the development in the communications sector of a family of telegraph adapters and multiplexers and earlier developed multiplex telegraphy devices, the BIST system makes it possible to use the public telex network more cost-efficiently. Instead of forming inflexible networks to satisfy the needs of individual users, they can be formed flexibly and relatively cheaply using the existing telex network as a base only for the duration of the transmission. The BIST system is based on computer equipment manufactured in the country. The technical shortcomings of this equipment are forcing scientific research and engineering establishments in the communications sector to undertake design studies, the objective of which is the improvement of reliability of systems that are used.

Communications with many users is experiencing an acutely felt lack of suitable types of minicomputers, in particular, that of a general-purpose telecommunications minicomputer. This gap must be filled using our own resources. The approach to utilizing the telex network to satisfy the needs of computerized handling of information developed by the scientific research staff in the communications sector, is neither utopia nor an impractical concept. It is a concrete step, the aim of which is to reduce the distance which separates us in the discussed field from economically and technically more advanced countries.

Investments in telecommunications are very costly. They must be carried out with long-term objectives in mind and their effects are not felt for a long time. Taking into consideration the current economic situation of the country, the communications sector is seeking solutions requiring the smallest possible investments, in particular, it is undertaking actions which integrate users of remote data transmission networks by way of using the public telegraph and telephone network. In view of the heterogeneity of computer equipment and lack of clarity in regard to the prospects for the production of minicomputers, the BIST system creates the possibility of using both already-existing and recently-produced computer equipment for interaction with the telex network. The concepts for integrating various systems and computer techniques interacting with public networks (telegraph and telephone network) are being developed. We

are proposing modern designs not requiring great investments, which would be needed to build from scratch remote data transmission networks or branch networks based on leased exchange lines.

Essentially, the proposal is to set up frameworks of remote data transmission systems based on teleprinters which are already operational in the telegraph network and a wider and more complex utilization of the telephone network. In this case the telephone with a special attachment and a television set will let us take advantage of data banks on a wider scale. Some examples of an application of the BIST system are: the IT-306 systems meeting the requirements of the INTERWAG system, which has been installed in a Branch of the Central Transportation Information Center in Lodz, used to collect information from stations on the border about international railway car movements; the IT-305 system, which has been installed in the Central Roadbuilding Center, used for collection of data from regional departments in the entire country; the IT-306 system, which has been installed in the Provincial Office in Piotrkow Trybunalsky used for administering community and city offices which provides information services about various kinds of conferences (recently the system was used to service the Provincial Party Conference and election to the Diet of the Polish People's Republic and the Provincial National Council); the IT-5500 information system, on a DP-5500 minicomputer base, which has been installed in the Institute of Basic Problems of Marxism-Leninism of the Central Committee of the Polish United Workers' Party in Warsaw provides information services to satisfy the needs of that institute; the IT-306 system, installed at the Warsaw Institute of Technology for research purposes in the field of management of objects and power engineering processes. In addition, IT-306 stations for special purposes have been developed and installed. Moreover, the following systems are being put into operation: for the CENPLAN Regional Information Center of the Planning Commission, for the purpose of data collection from provincial planning commissions; for the Central Association of Food Product Cooperatives in collaboration with the Central Research and Development Center for Computer Technology and Measurements of the MERA association; for the requirements of the UNITECH Association; for the requirements of the Central Association of Agricultural Cooperatives "Samopomoc Chlopska" (Farmers' Self-Help); for the requirements of power engineering, communications, and transportation, etc.

The above-mentioned PIAST, BIST, VIEWDATA, and E-10 systems are examples pertaining to computerized systems applications. These types of systems are widely used in all branches and fields of our economy.

It has already been mentioned that telecommunications deals mainly with the transmission of information; however, it has been taking over increasingly the function of organizing information for the needs of management.

Modern telecommunications integrates all kinds of services connected with the transmission and processing of data and techniques associated with the latter. In this connection, a natural close relationship emerges between telecommunications and computer science, both in the sphere of services and techniques. In looking forward to the 21st century when in many advanced industrialized countries a transition will take place from an industrial civilization to an information service civilization, in which the part played by information will be dominant, it will be difficult to fully meet the requirements for computerized remote data transmission services, which will occur in the nearest future without joint organization of undertakings in the sphere of computer and telecommunications services and without an integrated computer and tele-engineering industry.

With regard to computer science applications in Poland, implemented so far, it should be stated that despite the progress that has been made in the application of computers to production control and their utilization in management, despite the advances that were made in the development of many computerized systems in industrial branches and branches of the economy as well as government systems, central planning, and accounting systems, computers have not been exploited to release the tremendous resources which continue to be available in our economy. The latter requires a new engineering approach, followed by an application of new management methods and techniques. Building of a computerized management system without considering telecommunications is, as I once said, like building a prosthesis without taking into consideration the living organism representing a telecommunications network. Only a telecommunications network expanded by intelligent terminal devices can connect the central management

system to local and object data bases scattered over the territory of the entire country (in the natural manner in which the common production process is scattered). The lack of such technology and organizational possibilities of coupling telecommunications and computer science, led, on the one hand, to an overestimation of the part played by computer science in relation to telecommunications which was reflected in a reallocation of funds to the benefit of computer science and, on the other, contributed to the dualism prevailing at the present time in management, since wherever a computerized system has been installed, a traditional system is operating informally side by side with it. Among other things, this is due to the fact that in many cases systems functioning well in a capitalist economy which are not suitable in our socioeconomic conditions have been purchased and adapted in mechanical fashion.

With regard to the matter of production of computer engineering equipment, the producer of this equipment must revise his relationship with the user. The producer must be familiar with the real needs of the user and consider the profitability of export in relation to domestic requirements. For example, minicomputers for multipurpose applications must meet international standards and requirements and from the standpoint of quality and reliability, must be suitable for use under real conditions, not only for training, experimental, or possibly research purposes. This equipment must be priced relative to production costs, since prices related that are already too high during investment in the equipment are not amortized in the envisioned period, which is often interpreted as proof of their uneconomical application and use. Matters concerning spare parts and services must be solved in accordance with user requirements and mandatory requirements in this field.

At the present time, the entire world is facing a new situation in which extensive forms of management pertaining to the quest for new raw materials and energy sources, and an unlimited increase in productivity by automating production processes no longer yield anticipated effects and information appears on the arena as a commodity. What is involved is a new view of telecommunications, the possibility of using it for purposes concerned with the organization of information, for improving the efficiency of management, above all, in those fields of

the national economy which have been given priority, such as transportation, power engineering, commerce, and agriculture.

To satisfy the requirements in this field, research and design studies such as those listed below must be undertaken on a wider scale than up to now:

1. Development of new types of data terminals;

2. Integration of various kinds of services in the field of digital transmission and commutation;

3. Development of public teledata network (data transmission and commutation). Apart from the rapid growth of the demand for leased exchange lines, an attempt must be made to satisfy even faster the demand for transmission of data by planning and installing public teledate networks, from slow transmission (telex network) to very fast transmission (communication between computers). In view of the fact that the concept of public flexible teledata networks is a matter of fundamental importance, important problems emerge requiring additional research, especially the need to ensure very fast establishment of connections in all traffic flow conditions that occur in practice, since for many new services any delays can be equivalent to a catastrophe.

Requirements on wideband commutation and problems dealing with the possibility and degree of integration of the existing large telephone network, covering videotelephony and the new teledata network, indicate the need for additional research along these lines.

4. Man-computer, man-data bank, man-telecommunications data bank (distributed) connections. Because of the role and signficance of the human factor on the development of telecommunications, its languages, efficiency, and structure, deeper research in this field is indispensable, with particular emphasis on the role played by artificial intelligence of a computer.

5. Determination of certain aspects of biological relations and the relations between the human brain and terminals, networks, machines, and computers.

In particular, this pertains to focusing attention on man-machine interaction, with special attention to the functioning of the human brain, its emotional and logical functions, and analyzing information from the standpoint of its value;

6. Studies in the fields of voice encoding and decoding, using simple and inexpensive encoders and decoders, connected to digital transmission systems;

7. Research in the field of alphanumerical and graphics terminals used in homes;

8. Research on the utilization of teledata networks in school instruction;

9. Research on application of computers in public teledata networks to meet the needs of commerce and banking;

10. Research on access to libraries;

11. Research on voice inquiries;

12. Research on integrated telephone-teledata subscribers' centers;

13. Research on access to computers by dial and pushbutton telephones;

14. Research on electronic postal services;

15. Research on telephone equipment in motor vehicles and moving objects and portable remote data transmission terminals;

16. Research on personal radio-telephones for use in traffic and calling and their use as a supplement to radio-telephones of portable remote data transmission terminals;

17. Research on development of the Telekst and Viewdata systems and their integration.

A close relationship exists between the economy and telecommunications. The effect of progress in the field of telecommunications on economic activity is overwhelming. Telecommunications is an indispensable complement to transport and a vehicle for economic progress.

From the point of view of socioeconomic development of a modern state, a new measure of the latter, besides the tonnage of steel and the amount of energy produced per capita, is also the number of telephones per 100 inhabitants and the number of kilometers of telecommunications lines per square kilometer of territory of the country, and the number of terminals per 1000 inhabitants.

The dynamic development of communications is a reflection of human needs in the field of communications. It is the obligation of a state to satisfy these needs.

A direct telephone conversation between two people serves basically better mutual understanding. Clearly, telecommunications, like human speech, can be used for good or evil purposes. The responsibility for progress in mutual understanding depends on man and his leaders. The chances are small that conflicts will arise between people and nations maintaining close communications. Conversely, conflicts may arise among peoples and nations with little or no mutual exchange of information.