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STRENGTHENING THE TECHNOLOGICAL BASE OF MONGOLIAN PEOPLE'S REPUBLIC (MPR) STATE COMMITTEE FOR SCIENCE AND TECHNOLOGY FOR DESIGNING, PRODUCTION AND TESTING OF PROTOTYPES BASED ON SCIENTIFIC RESEARCH

ST/MON/82/T01

MONGOLIA

Technical report: Utilization of the microprocessor techniques*

Prepared for the Government of Mongolia
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of S. S. Yurov, expert in microprocessor application

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Vienna

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CONTENTS

1. Immediate objectives of the project and the mission

Initial stage of implementation of the immediate objective of the project "Creation of an information system (information collection and retrieval) linking all activities related to the design, construction and testing of prototypes with Centre of Scientific and Technological Information" has been initiated in the Centre of Scientific and Technological Information. The information system Centre consists of following subsystems:

- Information unit for industrial catalogues;
- information unit for patents;
- information unit for catalogues of periodical issues.

Since the above-mentioned subsystems do not support technical information requirements, the immediate objective had to be reformualted into "Strategic planning of a structure of the information system for management scientific-technical progress to support all activities connected with design, production, testing and adaptation of pilot prototypes". A new job description for the respective expert had been prepared accordingly.

2.1 Strategic planning of the information architecture

The management of process of designing, production, testing and adaptation of achievements of science and technology is being the main area of SCST's activities. All departments of SCST are doing their best to realize this objective. Information system is established as integrated system, which supports the activities of all departments of SCST.

The elaboration of the information architecture has been carried outby local staff under scientific guidance of an expatriate expert based on the method of strategic planning "top-down". In accordance with this method a functional-administrative model of SCST should be first created.

2.1.1. Fields of activities of the State Committee for Science and Technology

Activites of SCST were examined. The following areas of SCST's activities were defined:

1. Planning of research works;
2. Financing of research works;
3. Co-ordination of research works;
4. Analysis of the results of research and desgin works;
5. Management of experiemental production of pilot prototypes;
6. Application of pilot prototypes and analysis to the manufacturing process.

2.1.2. Functional structure of the field of activities

The following functions of SCST were determined:

1.1. Receiving Government's orders for long range research works;
1.2. Preparing plans of research works;
1.3. Planning of resources for realization of research works;
1.4. Assign research works to research organizations under SCST.
2.1. Management of research organizations' cash flow.
3.1. Techno-economiv analysis of research results obtained from outside Mongolia.
3.2. Analysing scientific technical literature.
3.3. Training national staff in the country and abroad.
3.4. Verifying scientific technical results for patent and license clearance.
3.5. Preparing technical documents.
4.1. Technical evaluation of elaborated prototypes.
4.2. Testing prototypes.
4.3. Processing test data.
5.1. Management of stocks.
5.2. Management of experimental production.
5.3. Controlling production line.
5.4. Controlling quality of production.
6.1. Application of results of research works.
6.2. Collection and analysis of data from utilization of applied results.

2.1.3. Reflection of the function into administrative structure of the State Committee for Science and Technology

This reflection is made with a purpose to determine the information requirements of all SCST's personnel and other research staff. The connection between functional and organizational structures is shown in the table 1. The zona of data processing is shown on the pic.1.

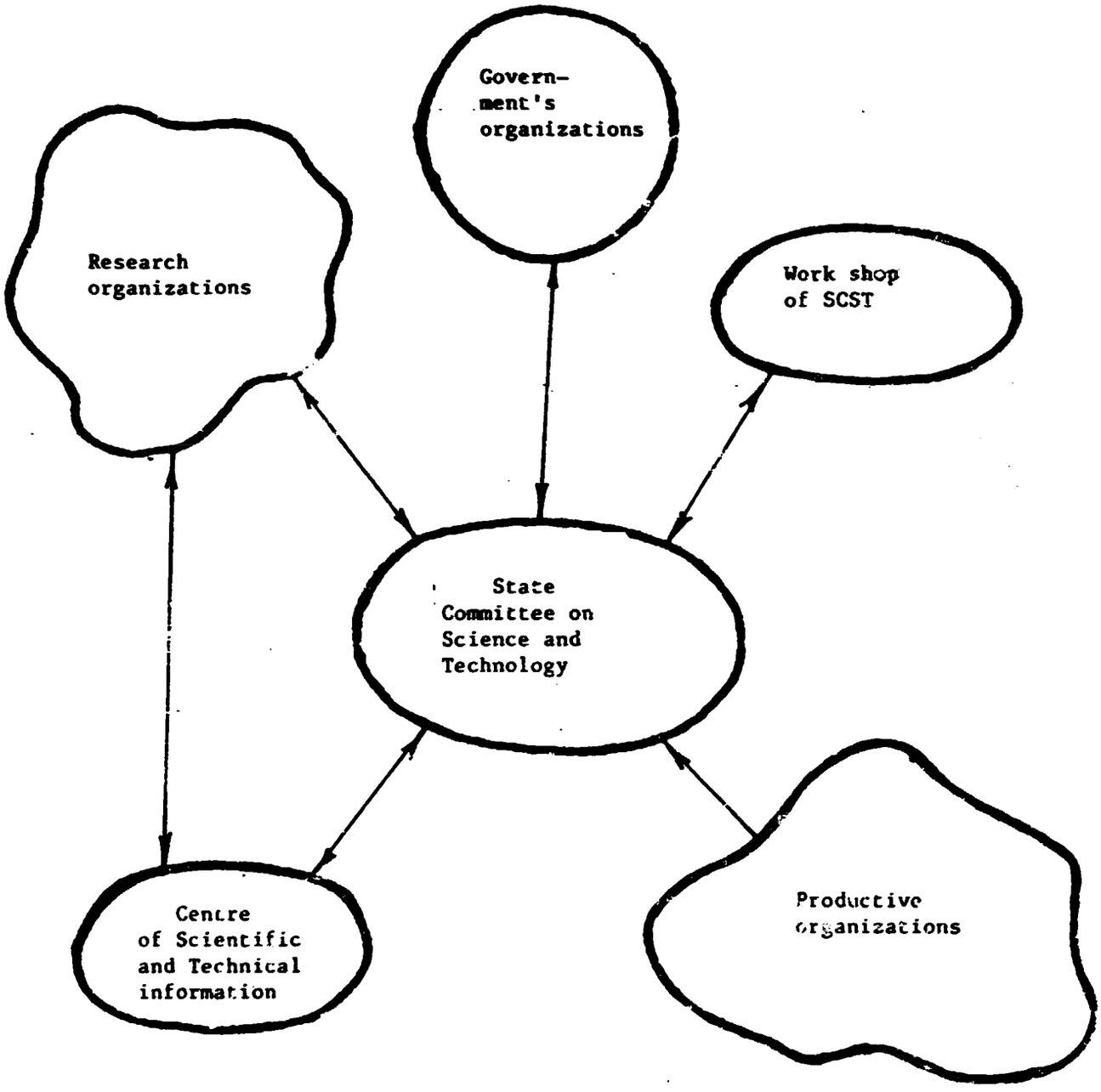
2.1.4. Determination of required data bases

The analysis of data which are being used by administrative and research personnel was done. Classes of data, which is classified as required data bases was determinated. The list of required data bases is shown in the table 2.

TABLE 1. Connection between the administrative division and the activities of SCST.

	Secretariat	Planning department	Finance department	Patent department	Department of international liaison	Department of applications of the science ach ievements to pr.	Centre of scientific and technical information	Workshop of SCST	Research and Design organizations
1.1	m								
1.2	a	m	a			a			a
1.3		m	a						a
1.4		m	a						a
2.1			m						a
2.2			m						a
3.1							a		m
3.2							a		m
3.3					m				a
3.4				m			a		m
3.5							a		m
4.1				m		m	a		a
4.2						a			m
4.3						a			m
5.1								m	
5.2								m	
5.3								m	
5.4						a		m	
6.1						m			a
6.2						m			a
6.3						m			a

m - main activity; a - auxiliary activity



Pict.1 Areas of information processing

TABLE 2. List of required data bases

No.	Item	Size (Kbyte)
1.	Government and Ministeries	20
2.	Research staff	10
3.	Research and design organizations	10
4.	Finance	20
5.	Scientific and technical research	10
6.	Training and upgrading qualification of national research staff	5
7.	International consultants	10
8.	Techno-economic analysis of the research results outside Mongolia	20
9.	Techno-economic analysis of local prototypes	10
10.	Production line of prototypes	*
11.	Stocks	*
12.	Preparation of production	*
13.	Technological process	*
14.	Industrial catalogues	20
15.	Patents and licences	20
16.	Catalogues of scientific and technological literature	20

* - estimate of size of required data base will be determined later.

2.1.5. Relation of the required data bases and the function structure.

Reflection of the function structure into required data bases gives possibility to determine the function of the endusers utilizing data bases and the retrieved data.

The results of research are shown in Table 3.

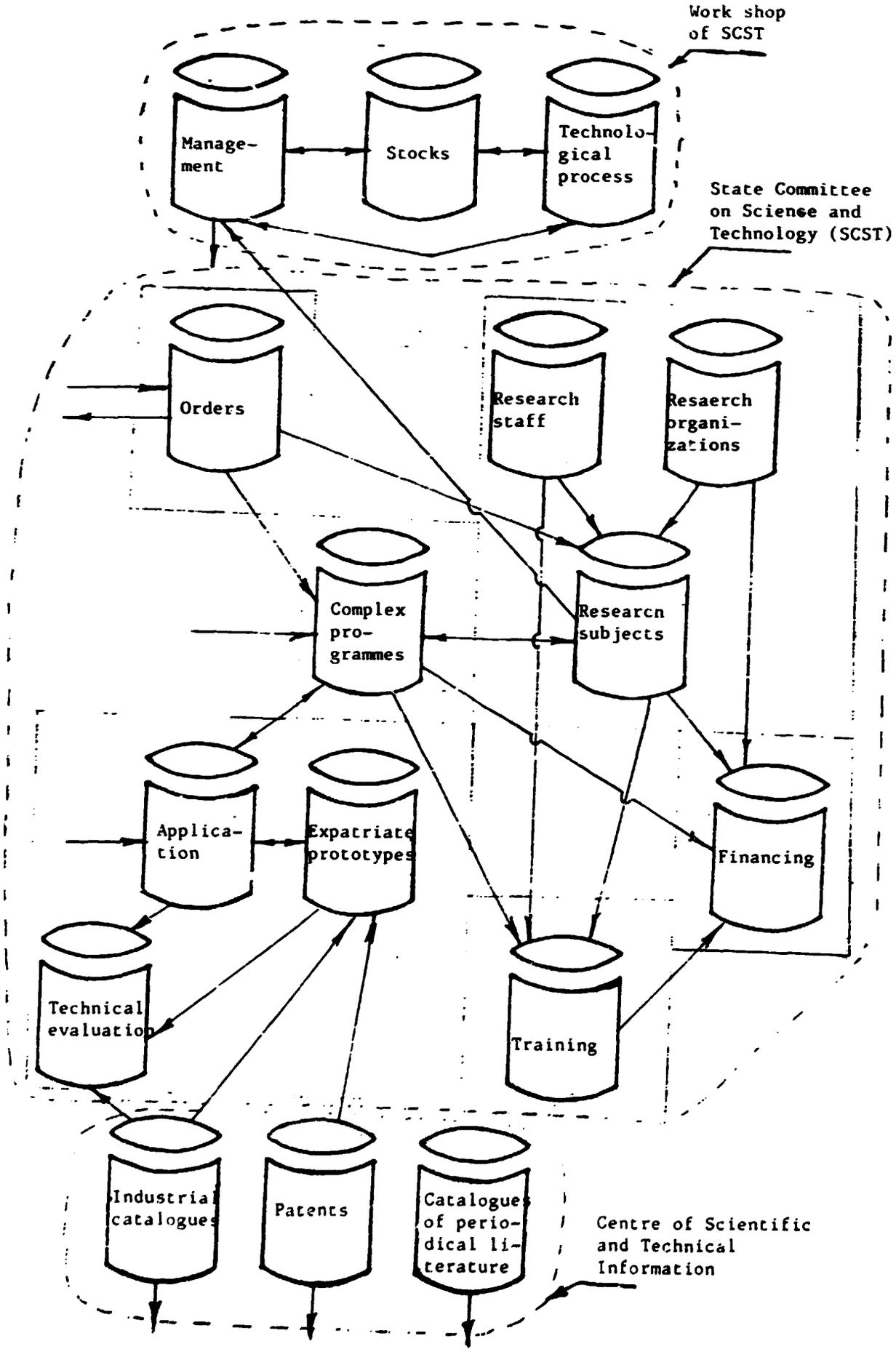
2.1.6. Mapping of the required data bases

At this stage the reflection of the list of data bases into

an organization structure was prepared, based on the data given in the Table 1, 2, 3. As a result the data bases location and the access to the corresponded data bases were defined. The results are shown in the Table 4.

2.1.7. The information architecture

The scheme of information architecture is shown in the pic.2. The dotted lines show the boundaries of organization; the rectangle lines show different departments within the organization. The arrows show the directions of data circulating among data bases.



Pict. 2 Information architecture of the computer system for management of scientific and technical progress in MPR

2.2 Strategiec planning of technical configuration of the information system.

The main purpose of this stage is a creation of discentralized and integrated computer system, based on local computer network of SCST.

2.2.1. Selection of computer

The following criteria should be used in the selection of computer:

- size of the data bases and data processing time;
- computers already in use in Mongolia;
- the main objectives of the MPR technical policy in the field of computer;
- supplier price and cost of delivery;
- service simplicity;
- expansion possibility of the computer system.

The analysis of information architecture has shown that a size of all data bases is less than 20 mbytes.

It is also necessary to pay attention that in the MPR the overall tendency is to use computer from socialist countries.

It is known that almost all personel computers from the socialist countries are compatible to IBM personal computer. So it is worth while to use the available personal computer for creating the first stage of proposed computer system for the SCST.

The selection of personal computer as technical tool of information system will enable SCST to simply render technical service to other institutions. In addition to that personal computer does not need a special room; it is handy and moveable.

TABLE 3. **Relation of the required data bases and activities of SCST**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.1	c							r	r							
1.2	r	c	c	c				r	r							
1.3		r	r	r				r	r							
1.4		r	r	r				r	r							
2.1		r	r	r	c											
2.2		r	r	r	c											
3.1														r	r	r
3.2														r	r	r
3.3					r	c										
3.4																r
3.5														r	r	r
4.1							c	c	c							
4.2							r	r	r							
4.3																
5.1										c	r	r				
5.2										r	c	r	r			
5.3										r	r	c	c			
5.4												r	r			
6.1								r	r							
6.2							r	c	c							
6.3							r	r	r							

c - create and update data in the data base
r - retrieve data from the data base

TABLE 4. Mapping of the required data bases

Items of the data bases are shown at the TABLE 2	Secretariat	Planning Department	Finance Department	Patent Department	Department of international relations	Dept. of applic. of the research of scientific production.	Centre of scientific and technic. information	Workshop of SCST	Research and design organizations
1	l	r	r						
2		l	r		r				
3		l	r			r			
4		l	r						
5		r	l		r				
6			r		l				
7						l			
8						l			
9						l			
10								l	
11								l	
12								l	
13								l	
14						l			r
15						l			r
16						l			r
17						l			r

l - location of the data base

r - remote access to the data base

2.2.2. Interaction of computer in the information system.

Integration of computers in the system is to be realized in two levels: inside of the areas and interlink between the different areas. This system should then have a link to the national computer network in accordance with "The conception of creating a National Computer Management System".

Interaction of computer inside the areas is to be realized by their integration to local computer network. Interlink between different areas and to national network is to be realized by utilization of hardware-software interfaces.

2.2.3. Selection of local computer network.

The criteria and condition for selection of local computer network for the SCST information system are the following:

1. Low cost.
2. Low traffice (less than 125 kbit/s).
3. Possibility to use office telephone cable.
4. Possibility to connect different kinds of personal computers.
5. Simple service.

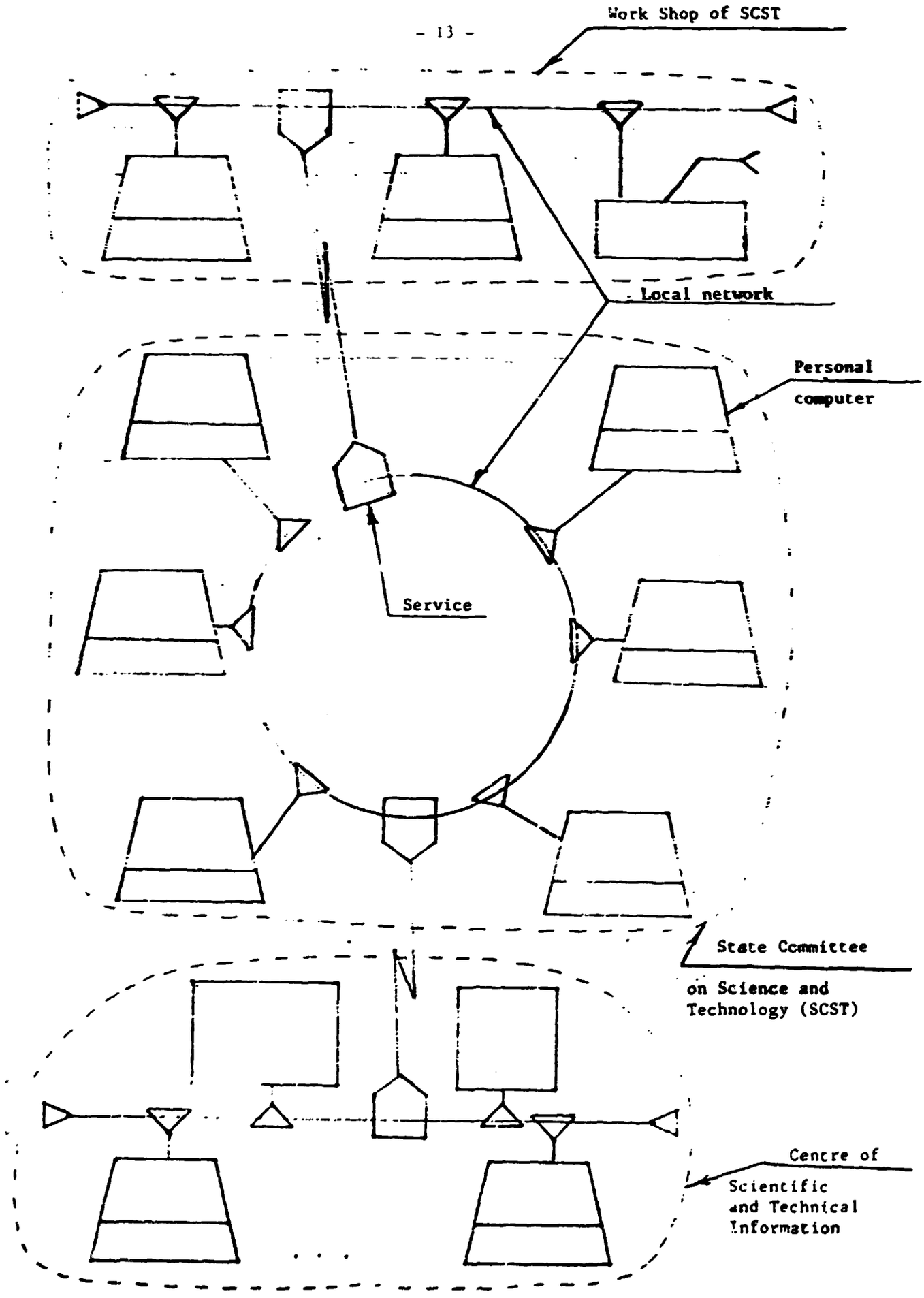
In accordance with the above-listed criterias and conditions the following low cost local computer network is recommended:

- Cross-Talk;
- Multilink;
- Infaplag.

Above-mentioned networks can use an office telephone cable. Connection of computer to network is realized through interface RS232/v. 24. The quantity of such interface is limited to 250. Cost of one connection is 100-300 pounds.

2.2.4. Technical configuration.

The topology of the computer network for SCST and location of personal computer is shown in the pict. 3.



Pict.3 Technical configuration of the computer system for management of scientific and technical progress in MPR.

2.3 Recommendation for selection of software.

The software of the information system for the SCST should include the following systems:

- network interaction;
- database management;
- end-user's tools (word processing, speadsheet, professional irawing etc.);
- compilers for high level languages.

For network interaction system PC/NOS (Personal Computer Network Operation System) is recommended. The system is able to integrate personal computer with different operation systems into network. In addition to that PC/NOS is planned as software system which is independent from any type of hardware.

The end-user's tools could be purchased in USSR, because the above-mentioned end user's system will operate with cyrylic characters.

The compilers of Pascal and Turbopascal should mainly be used for creating large applied software systems for the information system of the SCST .

3. Realization of the information system.

The National Staff of the Research Centre of Computer Management System has under the expert's guidance elaborated the first structure of proposed information system for the SCST. This work has been carried out by using personal computer "Multitech" (compatible with PC/XT). The main menus of the elaborated system and her scheme was demonstrated.

At present the following data bases have been created (conceptual, logical and physical projects of the data bases have been made):

- Government and Ministries
- Research subjects
- Research staff
- Research and Design organizations
- Training Plan of local staff abroad.

4. Recommendations for the development of the information system in the SCST.

4.1. To elaborate information system compatible to local data bases, to support the processing of information inquiries.

4.2. To create technical base of the SCST information system based on 5 personal computers.

4.3. To create a distributive computer system through a link of 5 personal computer to a local computer network.

4.4. To train the SCST's administrative staff in the utilization of the SCST information system.

4.5. To elaborate suggestions for the realization of 2 stages SCST information system.

4.6. In cooperation with UNIDO to prepare new project as a follow-up of the phased out one.

5. Training of national staff

The training of national staff in the utilization of microprocessor techniques was carried out. It covered the following subjects:

5.1. Designing of data base structures; utilization of the software "IBASE", which was prepared by the expert.

5.2. Operation of personal computer.

5.3. Utilization of data base system dBASE III.

5.4. Interaction of personal computers by using office telephone cable.

ANNEX 2

LIST OF PERSONS BEING CONTACTED

M. Dash	-	Chairman of SCST MPR
D. Tsedendamba	-	Vice-Chairman of SCST MPR
Sh. Bat-Ercene	-	Chief of division of SCST, National Manager of the project ST/MON/82/T01
Ts. Miagmar	-	Chief of division of SCST
T. Sukhbatar	-	Chief of division of SCST
D. Erdenchimeg	-	Chief of division of SCST
D. Miegombo	-	Senior Office of SCST
D. Biambasuren	-	Director of the Project-Research Centre of Computer Management System of SCST (PRCCMS)
T. Dorjbal	-	Director of the Centre of Scientific Technical Information
R. Baldan-Ish	-	Director of the Workshop of the Ministry of Water Supply
A. Altan-Och	-	Chief of Laboratory of PRCCMS
D. Tosonkhuu	-	Chief of Laboratory of PRCCMS
D. Nachin	-	Researcher of IFT.