

Country Focus

How the Board of Audit of Japan handles EDP Audit in a rapidly changing audit environment

Background

Japan and computerisation

In Japan, 3,600 new computer systems, costing approximately 4,200 million US dollars, were installed in the private sector in each of the five fiscal years (FY) 1989 (April 1989 to March 1990) to 1993. Business automation computers for office use, and factory automation computers, made up about 50% of these systems.

There were a total of 4,930 computer systems costing US\$100,000 or more in central government or government-funded bodies at March 31 1994. Of this total, there were:

- 3,200 systems in 38 government ministries and agencies, including 1,456 systems in National Universities and other National educational or research establishments
- 1,730 systems in 85 other government-funded bodies.

Computer processed jobs have also been expanding, ranging from routine work such as *personnel management, payroll, staff mutual aid and statistics*, to specific departmental work such as *insurance, pensions, loans, inventory and construction*. The management and operational costs of these 4,930 computer systems amounted to US\$5.95 million in FY 1994, and is continually rising.

The major concerns of the Board's audit, including those for EDP work, are whether:

- the statements of account fairly represent the execution of the budget (accuracy);
- accounting conforms with the budget, laws and regulations (regularity);
- projects are executed economically and efficiently (economy and efficiency);
- the purposes of projects are accomplished and effects produced (effectiveness).

Under the Accounts Verification Regulation enacted by the Board of Audit, audited bodies are required to regularly submit monthly/quarterly statements of accounts together with vouchers/evidence and supporting documentation. In FY 1993, audited bodies submitted approximately 238,000 statements of accounts and supporting documents and evidence to the Board. The Board also carried out field audits of 2,130 major accounting units, such as headquarters of Ministries/Agencies and government-funded public corporations and enterprises, out of a total of 4,975 units (42.8%), and 1,179 other accounting units, which excludes post offices and railway stations, out of a total of 10,973 units (10.7%).

Significance of EDP audit in the Board of Audit

In the past, the Board's auditors manually examined vast amounts of computer-produced data. To detect issues and points, they relied on skills accumulated from past audit experience. They found it difficult to get a clear and total picture of an audited body's computer processing, especially where enormous amounts of data was processed by numerous application programs. To overcome these problems, the Board established the EDP Division in April 1984. The EDP Division supports the EDP audit work of the Audit Divisions by analysing the enormous volumes of computerised data submitted by audited bodies, and/or that produced by the Board itself.

Development of EDP audit in the Board

Staffing

Out of a total of 1,246 members of staff of the Board of Audit, 770 Auditors and Assistant Auditors (60%) constantly audit Government Ministries, Agencies and other audited bodies. The EDP Division's EDP audit specifically covers computer audit subjects common to all, or a number, of the Board's 34 Audit Divisions.

The EDP Division has installed a rented, general purpose, main-frame computer, and other equipment. The Division comprises an EDP operations section, a system development section and an EDP audit section.

Of the Division's 19 staff (3% of the total staff of the Board), 7 staff work exclusively on EDP audit, i.e. performance audit of EDP installations/operations and computer-assisted audit, with support from other members of the Division.

EDP training

The Board has established its own training centre - the Annaka Training Centre - in the suburbs of Tokyo, some 120km from the city centre. The Centre provides EDP Audit training to both newly-employed staff and existing Auditors. The EDP training courses also cover use of a personal computer, word processing and database operations.

In addition to training at the Centre, EDP Division staff also attend courses on systems audit, systems engineering, programming, Local Area networks and other subjects, sponsored by the Management and Coordination Agency and private sector computer manufacturers.

Outline of the Board's computer hardware and software

Hardware

The Board of Audit headquarters rents a middle scale general purpose mainframe computer, HITAC M-860-40, monthly rent US\$180,000, and DEC minicomputers, DEC 3600-600S, monthly rent US\$3,600. The Board also has 500 NEC PC-9800 series personal computers, and other PCs. The Board has installed a Local Area Network, connecting the EDP Division mainframe computer to 120 PCs installed in other Divisions, and uses the LAN for information retrieval and data processing.

The mainframe computer is also connected to 26 on-line terminals. The Annaka Training Centre has 21 PCs connected to the headquarters' mainframe. These PCs are also linked to the Management and Coordination Agency database to access Parliamentary information and various statistical data.

Besides supporting the audit work of the Audit Divisions, the mainframe also provides the Board's administrative applications such as payroll, personnel recording and document retrieval. The PCs are also used for routine day-to-day work such as document preparation, maintenance and preservation and spreadsheet work.

In supporting audit work, the mainframe computer and the PCs, among other things, match different data files, and extract from large numbers of accounting units those records to be field audited. The amount of data processed has increased each year, and computer data processing is increasingly contributing to the Board's audit work.

Software

The Board established an Audit Information System (AIS) to promote efficiency and improve the quality of its audit. The AIS, through the Board's mainframe computer and LAN, provides Audit and Administrative Divisions with information for audit and other activities. As of June 1995 the AIS comprised 12 sub-systems as shown in the table overleaf.

Computer assisted audit

The General Audit Sub-system

The General Audit Sub-system (GAS) contains audit software for individual audit subjects and includes instructions for applying these computer programs. The GAS supports the audit activities of individual Audit Divisions (ADs). ADs provide the EDP Division with details of the purpose of the individual audit, the data to be audited, and how it is to be analysed. The EDP Division then formulates the required computer audit programs and processes the data.

Individual audit program development

In cooperation with ADs, the EDP Division formulates and executes computer audit programs in the following way:

- EDP Division auditors discuss and agree with AD auditors the goal(s) of the audit, the approach, and computer data processing details such as the required data and the data output format etc.;
- EDP and AD auditors see the auditee agency officers and study outlines of the body's computer processing, files and data etc.;
- EDP and AD auditors ask the auditee agency to submit copies of required data files, or files of extracted data, and to fill-in prescribed paper forms;
- EDP auditors convert the submitted data files into a form suitable for processing on the Board's computer system, and/or convert information on paper into magnetic data;

The components of the Audit Information System

Sub-system	Purpose
<i>General Audit</i>	processes data for individual audit subjects, for example, statistical samples of data, extracted data meeting specific conditions, simulations, and statistics on specific audit subjects
<i>Auditee Information</i>	contains regularly updated information on 16,000 of the Board's major audited bodies, such as budgets, settlements of accounts, number of staff, past audit records etc. Note - the Board of Audit is responsible for the mandatory or discretionary audit of a total of 38,840 auditees. This sub-system also processes the Secretary General's travel orders to Auditors, travel expense claims, settlement of claims etc.
<i>Audit Implementation Record</i>	accumulates audit implementation records such as audit man-days to date etc.
<i>Audit Report Retrieval</i>	contains audit findings of the Board's Annual Audit Reports for the past 30 years, and enables retrieval by key items such as type of finding, name of body, monetary amount etc.
<i>Accounts Verification</i>	verifies monthly/quarterly/yearly statements of account submitted by audited bodies, and also produces specific statistics. There are 3 sub-systems, for Revenue Expenditure, State-owned Commodities and State Credits
<i>Payroll</i>	calculates the Board staff members salaries, Government-owned staff dormitories/house rents and other charges. This sub-system also processes staff members mutual aid system data
<i>Personnel</i>	holds Board staff members professional records
<i>Audit Document Reference</i>	holds records of the in-house location (Division, Section etc.) of documents useful for audit. The sub-system also maintains an outline of each document
<i>Library</i>	holds records of books and magazines in the Board's library. This sub-system is connected to the Diet Library and records can be retrieved of books and magazines held there
<i>EDP Information</i>	hold information on EDP systems installed in Government Ministries/Agencies and other Government Institutions

- EDP auditors write computer program(s) in PL/1, COBOL or other computer languages, and test the completed program(s);
- EDP auditors process the prepared data using the developed computer programs and produce paper or magnetic tape output;
- EDP auditors provide AD auditors with the paper output, or convert the magnetic data into a form which can be processed on the AD auditors' PCs.

Issues to be solved

Audit programs

The EDP Division responds to each ADs' request for computer-assisted audit by developing audit programs for individual audit subjects, and in most cases does not use package programs. The Division currently has problems in responding to ADs' requests because:

- as an ADs' audit subject selection takes a considerable part of the one-year Board audit cycle, the EDP Division is normally given less than two months for audit program development and data processing;
- the EDP Division has to satisfy very varied program requests from ADs, it is always developing new programs.

To cope with these problems, the Division may have to develop audit programs with common applicability to various Board audit subjects.

Data acquisition

In 1988, the Japanese Government enacted a 'Privacy Protection Law', which obliges Government Ministries and Agencies to protect the computerised data they hold on individuals. To carry out computer-assisted audit work, the Board seeks the voluntary submission of computerised data from audited bodies. Since the law imposes strict conditions on the protection of such information, it sometimes takes several months for the Board to obtain the computerised data it requires.

Examples of computer assisted audit results

Case 1

Audit finding

Public Corporation A provides low-interest, long-term loans to house purchasers. Public Corporation B builds houses for sale or rent. In both cases the loan borrowers or house purchasers/tenants receive houses strictly on condition that they use the home as their own residence. However the Board found 82 cases, with a value of US\$1.25 million, where the same person had acquired two houses, one via a Corporation A loan, and the other from a Corporation B housing sale or rental. They then sublet one of the houses to a third party.

Audit procedures

The Board borrowed 14 magnetic tapes, (4,360,000 data items) from Corporation A, and one magnetic tape (800,000 data items) from Corporation B. The Board processed the data using its own audit program (21 sub-programs; 6,000 steps). The Board spent 40 man-days on program development and 20 man-days processing the data.

The borrowed magnetic tapes were converted into a uniform format. The two sets of data records were matched by key items, i.e. name and date of birth. This process identified 21,000 identical matches. Of these matches, 14,549 irregular cases were highlighted. The Corporations had already taken remedial measures in 14,467 cases, leaving 82 cases of duplicated payment.

Case 2

Audit finding

The Ministry of International Trade and Industry subsidises Prefectures with resource funds for providing no-interest long-term small enterprise Equipment Modernisation Loans (EMLs). Using their own funds and the subsidies, Prefectures provide EMLs which cover 50% of small/medium enterprises' equipment purchase costs. The Board examined the EMLs and found cases where Prefectures had:

- given EMLs based on over-claimed purchasing costs;
- given duplicate loans, by giving EMLs to those who had also borrowed funds for the same equipment from a Government-funded financial Corporation that gives loans to small businesses.

Audit procedures

The Board converted the EMLs and the Corporation's magnetic tapes into a common format, and made a single master file. The Board then selected details of those who had borrowed from both the Prefectures and the Corporation. For this audit the Board processed 49,000 items of data on seven volumes of magnetic tape, and spent 20 man-days.

Audit of computer systems - economy, efficiency and effectiveness

Audits of computer-related costs

It is more than 30 years since audited bodies first introduced computer systems. Since then computer technology has rapidly advanced, and computer-processed business has widened and diversified. The EDP Division has been carrying out Government-wide audits of computer-related costs since 1985. In FY 1993 230 man-days were spent on such work.

The EDP Division examines and evaluates computer systems for economy, efficiency, effectiveness, security and reliability, and especially looks to see whether the systems:

- could have produced the same output for less cost, and/or could have produced more output for the same cost (economy and efficiency);
- have achieved planned system goals and produced planned effects (effectiveness);

- include sufficient measures to prevent system breakdown, minimise the effects of breakdowns, and ensure quick recovery (reliability);

- include sufficient measures to prevent fraud, data manipulation and errors, and maintain computer centre security.

In 1986 the EDP Division produced an annual plan for this type of audit work for the first time, and has produced and executed such a plan each year since. These annual plans cover the principal audit concerns, i.e. hardware procurement costs and computer-related service (labour) costs. The Board selected these major concerns because:

- due to the rapid development of computer hardware technology, audited bodies should select the very best hardware configuration from the wide range of equipment, including high performance Central Processing Units, and peripherals available, thus achieving the best cost performance;

- a Board survey showed that computer-related service costs amounted to ¥155.2 billion in FY 1992. Rapidly increasing computerisation also increased software development, data input and other computer service costs every year.

EDP economy and efficiency audit approach

The Board's audit approach at each stage of the systems development life-cycle is:

System planning stage

Audit at this stage examines the appropriateness of the system development plan and the system analysis. This stage seeks to examine such questions as:

Planning

- Were development plans established for both the short and long term?
- Was the systems planning and design appropriate for the planned system goals?
- Were sub-development plans appropriately prioritised?
- Was the development plan periodically reviewed and re-evaluated based on established standards?

Research and analysis

- Was the user-needs research sufficient in terms of coverage, methods and scope?
- Did the analysis sufficiently reflect reality?
- Was the technical analysis sufficient? Specifically, did it include analysis of future hardware/software technology developments both at home and overseas?

System development plan and manpower management

- Was the analysis of the cost, manpower, facilities and system development duration appropriate?
- Was the system management/operational cost analysis appropriate?
- Were the quantitative and qualitative system effectiveness evaluations appropriate?

Systems development stage

Based on the system development plan, the audited body designs and tests the system. The Board's EDP auditors examine whether this work was done efficiently and economically. This stage asks:

Establishment of the development processes

- Was the system design implemented and supervised in accordance with the development manual showing the development procedures agreed between the system developer and the end-user?
- Did the development agreement take into consideration the scale of the development and the newest hardware/software technologies available?

Manpower allocation

- Were the position and duties of the team members clearly defined?
- Were the duties segregated to prevent irregularities, fraud or crime?
- Was the team members' working time accurately recorded?

System/program design

- Were economy and efficiency sufficiently considered in system and program design?
- Were the systems and the programs sufficiently reviewed after initial design work?
- Was data integrity secured?
- Were the output forms standardised?

Coding

- Were the programs coded strictly in compliance with the system and program design sheets?
- Was the coding work efficiently shared between team members and their working hours recorded?

System testing

- Was the system sufficiently tested in accordance with the test plan?
- Were test results analysed and the system reliability and security thereby verified?

In many cases, the Board's audited bodies contract-out systems development. In such cases, the Board's auditors normally give priority to the audit of systems development contracts let in the previous fiscal year. However audited bodies often let contracts covering a number of years, especially for large-scale systems development. They may also divide the system development into several parts and let a number of contracts with the same

contractor. In such cases, it is difficult to get a clear picture of the total systems development. While the Board seeks to show results in terms of the amount of yen wasted, or which could have been saved, it is often difficult to establish quantitative measures or evaluation standards. These are major problems for the Board's systems development audit.

Operation and maintenance audit

In this audit, the Board's auditors examine whether the computer systems is operated and maintained properly after development. Normally many applications programs are run on a single computer system. Therefore it is important to examine whether processing is controlled effectively. It is also important to examine whether the system is well maintained after modification of control programs. Auditors might examine:

Operational scheduling

- Is computer resource allocation and data processing properly planned?
- Are computer operations constantly monitored?
- Are scheduled and actual computer operations compared, and the cause of differences analysed?

Human resource management

- Does the scale of manpower match the scale of the system and expected workload?
- Are computer team members' positions and duties clearly defined in organisational charts, working regulations etc.?
- Are sufficient fraud prevention measures taken?

Data file management

- Is the position and responsibilities of data file management staff clearly defined?
- Are the methods and procedures for data file protection appropriate?
- Are data files securely preserved by inventory and user records?

Operations review

- Is the computer room periodically monitored?
- Does the computer room comply with EDP facility standards?

- Is the computer room operated in accordance with the operations manual?
- Are computer operations recorded?

System maintenance

- Have system modification procedures been established?
- Have post-system modification procedures been established and is a testing record maintained?

The Board's auditors particularly consider the following aspects of computer operations and maintenance:

- Has the EDP section clearly stipulated staff duties and responsibilities to ensure appropriate 'checks and balances'?
- Is data protection and management appropriate?
- Are the specifications for data input, programming and output forms appropriate?
- Does internal audit periodically review the EDP section?
- Are there sufficient personnel and facility security measures, particularly access control?
- Was contracted-out work, e.g. system operation, maintenance and input data preparation, implemented properly and economically?

Issues concerning the economy, efficiency and effectiveness of computer systems

Evaluation of software development productivity

In many cases audited bodies contract-out software development. In such cases the Board examines the economy and efficiency of the contracted-out software. However the Board does not have total effective evaluation procedures.

In Japan, software development productivity is, in many cases, evaluated on the basis of the number of monthly or daily programming steps actioned by a programmer. However, the auditor must also consider:

- the complexity of the programming task;

- the complexity of the system being developed, e.g. whether it is a simple system printing-out tables, or a complicated one using a database;
- whether the developer is implementing a new system or modifying/scaling-up an existing system;
- the system development environment (the availability of Fourth Generation Languages, case tools etc.);
- the program language being used (COBOL, ASSEMBLER etc.).

Since these elements are inter-related, the Board's auditors find it difficult to draw up comprehensive standards for evaluating computer software development productivity quantitatively.

Example of economy audit results

A Public Housing Corporation builds houses which it sells or rents to the general public. The Corporation contracts-out data input for the preparation of statistical reports. The Corporation paid outside contractors US\$640,000 in FY 1992, and US\$944,000 in FY 1993 for this data input work.

Inputted data is converted into magnetic tape. The magnetic tape data is of two types - Fixed Length Records such as Group Residence and Compartment Number, and Variable Length Records such as tenants name and monthly rent.

The contractors input data either at the Corporation's headquarters or at their own offices. Where work is done at the contractor's offices. Payment is on the basis of the number of alphabetic or character keyboard punches made.

The Board examined the contract let by the Corporation and found that:

- for fixed length records, keypunchers could create a 'space' after a record without touching the space key;
- the Corporation should not have counted a 'space' as a character.

The Board concluded that the Corporation could have reduced costs by US\$139,000 had it excluded 'spaces' from recorded characters. As a result of the Board's findings, the Corporation revised the data input contracts.

How to evaluate system scale adequacy

The adequacy of the scale of computer hardware for a system is closely related to system operational efficiency. Because of rising hardware costs, and rapidly advancing technology such as CPU capability, expanding CPU/disc memory size and increasing disc data transfer speed, organisations must consider the hardware configuration carefully, and design the most economic and efficient overall system. Therefore, the Board conducts comparative reviews of hardware configurations.

For newly established systems, auditors examine:

- whether the choice of hardware, and the timing of the installation of the new system, is appropriate;
- whether the hardware configuration is appropriate.

In evaluating existing systems, auditors examine:

- whether the system would be more economic if the hardware configuration was changed;
- whether the hardware configuration is appropriate for the day-to-day workload;
- whether the capabilities of individual devices suit the total system requirement;
- whether the memory capacity of discs and other devices is periodically re-examined as the workload changes.

The Board need to study further techniques and standards for evaluating the adequacy of the scale of computer hardware.

System security/reliability evaluation

One of the major objectives of systems audit is to verify the security of computer systems. In Japan, the Ministry of International Trade and Industry has established "EDP System Security Standards" and "Computer Virus Prevention Standards". To overcome inherent weaknesses and fragile information security, the former gives necessary security measures, and specifically shows the detailed goals to be achieved in EDP system facilities, technologies and operation.

To respond urgently to the rapidly spreading computer virus threat, the latter document stipulates the actions to be taken by EDP system users, managers and software developers.

In these areas, the Board is currently trying to standardise its system security evaluation methodology. The Board also plans to consider standards, methods and techniques which could be applied to evaluating the security and reliability standards adopted by audited bodies.

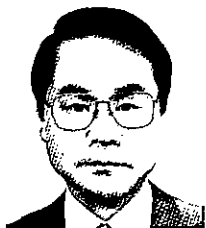
Future strategy

With advancing computerisation, computer-related costs in bodies audited by the Board totalled US\$5.9 billion in FY 1993, including hardware procurement costs of US\$3.5 billion (58.3%), and labour costs of US\$1.6 billion (26.2%).

Computerisation work in audited bodies is expected to continue to expand. To respond promptly to requests from Audit Divisions, the EDP Division must gain computer expertise, train staff and hire highly experienced experts to provide for better computer-assisted audit.

Computer-related labour costs are also expected to grow significantly. The Board plans to audit such costs, focusing on the costs of contracted-out software development, input data preparation, hardware/software maintenance etc.

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Since audited bodies are expected to place greater reliance on increasingly inter-dependent computer systems, breakdowns will cause significant damage to Government activities as a whole. The Board will therefore continue to examine and evaluate audited bodies system security measures.

Conclusion

The changing data processing environment in Japan, including advances and changes in computer hardware, Local Area Networks and Electronic Data Interchange, has had, and will continue to have, a significant influence on public finance, accounting and other administrative activities. To respond to this changing environment, the Board of Audit will continue to make efforts to develop new techniques for both computer-assisted audit and economy and efficiency audits of Government computer installations and their management and operation.

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Yasuhiko Ueta joined the Board of Audit of Japan in 1965. After being involved in EDP audit in several Audit Divisions, he became Director of EDP Division in 1993. He is currently responsible for supervising performance audits of Government EDP systems and computer-assisted audit. He also supervises the Division's EDP system management, operations and development.

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