Chapter 5
NCIC Technology. and Costs

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NCIC Technology and Costs

Chapter Summary

Technology

The computer and communication technologies used by the National Crime Information Center (NCIC) have been the subject of considerable controversy in recent years. Part of the controversy relates to fundamental concerns about the need for and impacts of NCIC, and particularly the computerized criminal history (CCH) file–concerns that have been intertwined with technology issues. Another aspect relates to operational problems experienced with the NCIC system, such as unscheduled downtime and slow response to inquiries, owing in part to the use of old equipment.

The need for updated equipment conflicted with the concern that new computer technology would make it easier for NCIC to engage in unauthorized functions such as message switching (i.e., the transfer or switching of messages from one State to another through the NCIC computer).

Late in 1979, the Federal Bureau of Investigation (FBI) received authority from Congress to upgrade the NCIC communications controller (a device that controls and manages the flow of messages into and out of the computer). While any new controller has the potential to be programed for message switching, the congressional authorization strictly prohibited any message switching applications and required a periodic General Accounting Office (GAO) audit to ensure FBI compliance. Early in 1980, the FBI, with congressional concurrence, took action to upgrade the main computer, subject to the same conditions.

These hardware upgrades, combined with operating system software enhancements that have now been implemented, have improved the quality of NCIC service and reduced downtime. The FBI recognizes that NCIC applications software also needs to be upgraded. While there are no firm plans as yet, the FBI has initiated a review of NCIC system needs for the next 5 years, including the possibility of a major system redesign with further hardware as well as software improvements. In July 1982, the FBI announced a major computer procurement to, among other things, further upgrade the NCIC computers.

costs

The total financial cost to the Nation of operating NCIC is shared by the FBI and the users. The FBI pays for the central computer facilities (including administrative, operational, and programing costs) and the communication links, while the users pay for the terminals and the costs of gathering, inputting, and processing the data. The Federal budget covers the costs to the FBI and to the Federal agencies that use NCIC. State and local budgets cover most of the remaining costs, although in the past these have been partially underwritten by the Federal Government through grants from the Law Enforcement Assistance Administration (LEAA) and others.

Although NCIC cost components can be identified, quantifying them is very difficult. NCIC direct costs have increased from $2.9 million in fiscal year 1972 to an estimated $6.1 million in fiscal year 1981. Because the FBI Identification Division (Ident) is indispensable to the operation of the CCH file, a portion of Ident's costs for criminal file activities should also be allocated as an NCIC cost. The FBI has not estimated what this allocation might be.

Since fiscal year 1970, the Federal Government through LEAA has provided about $207 million in categorical grants to the States for comprehensive data systems and statistical

programs. About $39 million of this total was for CCH-related systems. However, these grants peaked in 1976 and ended in fiscal year 1981. In addition, some portion of LEAA block grants to the States were used for criminal information, telecommunications, and record systems.

Federal grants cover only part of the costs of implementing and operating State CCH systerns. Estimates of the full costs vary widely and have not been independently verified by OTA.

NCIC Technology

Hardware Previously Used by NCIC

Until 1980, the FBI leased two IBM 360/65 computers, first marketed in 1965, from the Itel Corp. for use by NCIC. Each 360/65 had 2 million characters of memory. The second computer was normally used by the FBI to meet internal requirements for batch processing and by NCIC as a backup for the first computer.

NCIC peripheral equipment included a number of tape and disc memory storage devices leased from various vendors and two IBM 2703 nonprogramable communication controllers. These controllers managed the NCIC communication lines. Only one was active at any one time, with the second serving as a backup.

The age of the main computers and the peripheral devices, the technology on which they were based, and the design limitations of this equipment all had implications for the operation of NCIC.

- *Age:* Significant hardware difficulties experienced by NCIC suggested that the central computers were reaching the point where maintaining the units was no longer cost effective. The vendor offered to replace the installed 360/65 equipment at no cost to the FBI because the cost of maintaining these obsolete computers had become excessive.
- *Technology:* The IBM 360/65 used core memory, which is an obsolete technology. Although core memories are still used by computers with useful life remaining, the memories in modern machines are based on solid-state technology and are cheaper, require less power, and are more reliable.
- Design: An IBM 360/65 is not particularly efficient when used for applications that require the data bases to be accessed randomly, as is the case with NCIC. In addition, this computer was not designed to support NCIC teleprocessing needs. Because the communication controller was not programmable, it could not continue operation if the main computer failed. Thus, the match between the NCIC applications and the 360/65 computers was not a good one.

Hardware Upgrade and Message Switching

The computer and communication technologies used by NCIC have been the subject of considerable controversy in recent years. Part of the controversy relates to fundamental concerns about the need for and impacts of NCIC, and particularly the CCH file—concerns that have been intertwined with technology issues.

Operational problems experienced with the NCIC system, such as unscheduled computer downtime and delayed response to inquiries, had been increasing due to the use of relatively old equipment. But the need for updated equipment conflicted with concerns expressed in Congress and elsewhere that new computer technology would make it easier for NCIC to engage in such unauthorized functions as message switching (i.e., the transfer or switching of messages from one State to another through the NCIC computer).

To a significant extent, the message switching controversy has served as a technological focal point for several of the policy issues discussed later in this report. Among these issues are whether an NCIC message switching function would place the FBI in an inappropriate (and perhaps illegal) role with respect to State and local criminal justice activities; and whether NCIC message switching would make it at least technically possible for the FBI to monitor and perhaps control criminal justice communications among the States. Over the last decade, the question of NCIC message switching has involved strong differences of opinion among the FBI, LEAA, the Attorney General's office, the Office of Management and Budget, various congressional committees, a number of States, and other groups such as SEARCH Group, Inc., and the American Civil Liberties Union.[1]

As a result, Congress denied to the FBI the authority for NCIC to perform message switching. A restriction placed in the Department of Justice Appropriation Authorization Act prohibited the use of funds for message switching. In this context, message switching was defined as "the technique of receiving a message, storing it in a computer until the proper outgoing line is available, and then retransmitting, with no direct connection between the incoming and outgoing lines."2 More specifically, the Department of Justice (DOJ), including the FBI, was prohibited, absent approval of the House and Senate Judiciary Committees of Congress, from "utilizing equipment to create a message switching system linking State and local law enforcement data banks through equipment under the control of DOJ or the FBI. "[3]

In mid-1979, the FBI sought approval from Congress for acquisition of a new front-end processor (also known as a communications controller), a device that controls and manages the flow of messages into and out of the computer. In order to evaluate this request, the Senate Judiciary Committee asked both the Office of Technology Assessment (OTA) and the Institute for Law and Social Research (INSLAW) for an outside analysis.[4] OTA and INSLAW agreed that the existing NCIC communications controller was obsolete and that upgraded equipment would improve NCIC performance. However, both OTA and INSLAW noted that the capability for message switching is inherent in a state-of-the-art communications controller and message switching could be implemented at any time through software modification. Therefore, the use of the new controller would need to be governed by management, procedural, and perhaps legal means.[5]

In September 1979, the FBI received authority from the Senate Judiciary Committee to proceed with the acquisition of a new NCIC communications controller. However, the authorization was conditioned on the FBI's commitment: 1) to lease (for a period no longer than 2 years) rather than buy the controller; 2) not to acquire a message switching option with the controller or to message switch data between States; 3) to program the system to assign requests for data from the NCIC/CCH file the very lowest priority; and 4) to permit biannual GAO audits to ensure compliance.[6]

Later in 1979, the FBI requested authority to upgrade the NCIC host computer. An OTA analysis found that "(t)he central processor (host computer) used for NCIC is the IBM 360/65, an early third generation machine that

[1]For a detailed discussion of the message switching controversy, see Donald A. Marchand, et al., *A History and Background Assessment of the National Crime Information Center and Computerized Criminal History Program,* Bureau of Governmental Research and Service, University of South Carolina, June 1979, sec. IV, "The Message-Switching Issue and the Recent Policy Debate Over the CCH Program," pp. 122-167.

[2]See U.S. Congress, House of Representatives, House Report 96-628, 96th Cong., NOV. 16, 1979.

[3]Ibid.

[4]June 26, 1979, letter from the Chairman of the Senate Committee on the Judiciary to the OTA Director.

[5]See Aug. 10, 1979, letter and attachment from the OTA Director to the Chairman of the Senate Committee on the Judiciary; and July 30, 1979, letter and enclosure from the INSLAW President to the Chairman of the Senate Committee on the Judiciary.

[6]Sept. 12, 1979, letter from the Chairman of the Senate Committee on the Judiciary to the Director of the FBI.

was first marketed in 1965 and is now obsolete . . . Operating statistics indicate that the processor is approaching the end of its useful life and may soon have to be replaced, even if no change is permitted in the character of its applications. Early in 1980, based in part on the OTA findings and with congressional concurrence, the FBI took action to upgrade the host computer, subject to the same conditions stipulated for the communications controller.[8]

Status of Hardware and Software Upgrade

In May 1980, the two obsolete computers were replaced with two National Advanced Systems (NAS)[9] AS/5000 computers. Each of the new computers has 4 million characters of memory, double that of the 360/65. Also, the disc drives have been upgraded and now provide more cost-effective storage of online data. In May 1981, new operating system software (multiple virtual storage) was installed. Finally, in October 1981, the two obsolete communication controllers were replaced with two CC I Model CC80 controllers.

The upgrading of the host computers, disc drives, operating system, and the communication controllers substantially increased the computer power available to NCIC. These changes have improved the quality of service and minimized downtime. Unscheduled monthly downtime averaged about 1.6 percent for the 12-month period ending October 1981.[10]

With respect to applications software, the FBI recognizes that NCIC application programs will also need to be upgraded at some future time. The use of a higher level programing language would enhance the maintainability of NCIC application programs and make it easier to recruit the necessary programing personnel. In addition, upgraded applications software would help reduce the substantial programing backlog that presently exists. As of December 1981, the NCIC staff listed 14 non-CCH and 11 CCH programing priorities, many of which are not scheduled for implementation until 1983 and beyond.[11] While there are no firm plans as yet to reprogram the NCIC applications software, the FBI has initiated a review of NCIC system needs for the next 5 years, including the possibility of a major system redesign with further hardware as well as software improvements.[12]

By comparison, the Ident Automated Identification Division System (AIDS) uses hardware similar to that used by NCIC. However, the AIDS host computer (an NAS AS/5-3) is accessible only within the FBI headquarters building through 10 minicomputers (IV-Phase Model 4-70), whereas the NCIC host computer is accessible via 137 communication lines to Federal, State, and local criminal justice agencies. NCIC and AIDS peripheral equipment is generally comparable, except for equipment associated with the AIDS automated fingerprint reader systems. An AIDS operating system software upgrade to multiple virtual storage (already implemented by NCIC) is scheduled to be completed in the near future.[13] In July 1982, the FBI announced a major computer procurement. The two AS/5000 computers used by NCIC will be replaced with two IBM 3033S computers, and the AS/5-3 used by AIDS will be replaced with an IBM 3033N. In addition, the operating system will be upgraded to MVS/SPl.3.[14]

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[7]U.S. Congress, Office of Technology Assessment, draft paper on NCIC Technology, Sec. 1.2.1.1, "Description of the System: Central Processor and Memory," January 1980.

[8]Jan. 11, 1980, letter from the FBI Director to the Senate Judiciary Committee Chairman.

[9]National Advanced Systems (NAS) acquired Itel, the previous vendor.

[10]For the months of November 1980 through October 1981, unscheduled downtime (in percent of hours in the month) was 1.1, 1.0, 0.5, 3.0, 1.1, 1.5, 1.5, 2.0, 2,4, 1.2, 1.6, and 1.7 percent. Data from *NCIC Newsletters.*

[11]NCIC staff paper prepared for the Dec. 9-10, 1981, meeting of the NCIC Advisory Policy Board, Topic #8, pp. 1-3.

[12]"NCIC System Report" presented by Kier Boyd of the FBI at the June 17-18, 1981, meeting of the NCIC Advisory Policy Board.

[13]For a more detailed technical description of AIDS and NCIC, see FBI, *Interstate Identification Index: Background and Findings for July-September 1981 Phase I Pilot Project,* Dec. 4, 1981, pp. 18-25.

[14]Telephone conversations with Kier Boyd and Gordon Zacrep of the FBI, July 30, 1982.

NCIC Costs

The total cost to the Nation of operating NCIC is shared by the FBI and the users. The FBI pays for the central computer facilities (including administrative, operational, and programing costs) and the communication links, while the users pay for the terminals and the costs of gathering, inputting, and processing the data at the Federal, State, and local levels. The Federal budget covers the costs to the FBI and to the Federal agencies that use NCIC. State and local budgets cover most of the remaining costs, although in the past the Federal Government has partially underwritten the costs to States and localities through grants from LEAA and others. The total cost of NCIC includes the indirect costs incurred by supporting activities and systems, as well as those costs directly chargeable. For example, the CCH file is heavily dependent on support from various State, local, and Federal agencies for its operation. Records can be entered into the CCH file only after an FBI number has been obtained, and only Ident can assign that number. Records can be entered solely by authorized criminal justice agencies, and State and local criminal history systems are major sources of entries.

The costs of operating NCIC that are common to both the hot files and CCH file include:

- an allocated portion of the costs of the FBI computer facility and communication lines, including both hardware (on a lease or purchase basis) and operating personnel;
- the FBI's cost of developing and maintaining the NCIC software;
- the cost to State and local governments and Federal user agencies for terminal equipment and operators; and
- the cost of personnel in user agencies who record and format the data for NCIC input and processing.

The following additional costs are incurred by the CCH file:

- A portion of the FBI's cost of operating I dent.
- A portion of the costs incurred by State and local governments for operating their own criminal history record systems. Many of these systems are automated and include costs that are similar to those of the FBI computer center.
- A portion of the cost of the activities of the courts, correctional authorities, and other criminal justice agencies to support criminal history record systems on which NCIC depends.

Although the components of NCIC costs can be identified, it is very difficult to quantify them. For example, the costs to the FBI of operating computer and communication facilities are broken down by organizational unit, not by function or programmatic activity. Thus, while OTA has been able to identify the direct costs of NCIC (i.e., the costs of the NCIC section and related technical support within the FBI Technical Services Division), indirect costs such as those incurred by Ident to support the CCH file are not readily identifiable. Similarly, at the State level the funding for operating criminal justice information systems comes from a variety of sources and is not broken down by function. While OTA has documented the level of Federal funding to the States through LEAA categorical grants for CCH and related activities, the portion of State revenues and Federal block grants devoted to hot files or CCH files is not known. OTA has not attempted to quantify costs at either State or local levels.

Costs to the FBI

The costs of the NCIC section and related automated data processing (ADP) and telecommunications support are shown in table 7. Over the 10-year period from fiscal year 1972 through fiscal year 1981, NCIC costs have increased about 110 percent at an aver-

Table 7.—NCIC Direct Costs, Fiscal Years 1972.81 (thousands of dollars)

	FY '72	FY '73	FY '74	FY '75	FY '76	FY '77	FY '78	FY '79	FY '80	FY '81
Personnel (manpower):										
NCIC section										
Agent work years[a]	6	10	11	14	15	12	9	9	8	8
Support work years	24	42	39	106	102	111	96	99	99	99
Total work years	30	52	50	120	117	123	105	108	107	107
ADP and telecommunications support										
Operations work years	N/A	N/A	N/A	17	17	19	19	19	20	20
System maintenance work years	N/A	N/A	N/A	5	5	6	6	7	8	8
System development work years	N/A	N/A	N/A	–	–	—	—	7	8	8
Total work years				22	22	25	25	33	36	36
Personnel (costs):										
NCIC section	$360	$684	$735	$1,476	$1,556	$1,713	$1,624	$1,757	$1,644	$1,800
ADP and telecommunications support	N/A	N/A	N/A	396	418	475	500	660	800	900
Nonpersonnel costs:										
NCIC section	N/A	N/A	N/A	155	143	165	163	169	170	180
ADP and telecommunications Support[b]										
NCIC telecommunications network services	900	900	940	1,000	1,000	1,000	1,000	1,000	1,000	1,000
FBI NCIC terminals	130	130	130	140	140	140	110	100	100	100
Computer center space	N/A	N/A	N/A	140	180	180	200	200	225	200
ADPE rental and maintenance	1,100	1,100	1,200	1,300	1,400	1,500	1,610	1,610	1,543	1,960
Equipment purchase	—	—	—	—	—	—	—	750	[c] —	—
Estimated costs[d]	439	479	530	—	—	—	—	—	—	–
Total NCIC costs	$2,929	$3,193	$3,535	$4,607	$4,837	$5,173	$5,207	6,246	$5,482	6,140

aA work year is defined as an equivalent full-year employee.
bADP and telecommunication .support resources are estimated as **a** prorated portion of FBI Computer Center resources. Except for the $750,000 for purchase of replacement telecommunications control equipment In FY 1979, all ADP/telecommunication funding for NCIC is implicitly included in the FBI's centralized ADP/telecommunt. cation budget.
cFunds allocated for the replacement of telecommunication control equipment, but never spent
d Estimates of costs for Which data were not available. Computed by dividing the sum of the costs for which data were available for each of the Years estimated by 0.85, a factor derived from the data that were available for fiscal years 1975 through 1979.

SOURCE" Office of Technology Assessment and Federal Bureau of Investigation

age rate of about 9 percent annually. However, personnel costs for the NCIC section have increased almost 400 percent. There has also been a sizable, although not as large, increase in personnel costs for ADP and telecommunications support. Other costs have increased at or below the rate of inflation.

Since Ident is indispensable to the operation of the CCH file, a portion of Ident's costs for criminal justice activities (which totaled about $58.7 million in fiscal year 1980) should be allocated as an NCIC cost. The FBI has not estimated what this allocation might be.

Costs to the States

Some portion of the expenditures of State agencies for hot files and CCH use should be included in the overall costs of NCIC. However, there is really no sound basis on which to identify this portion. First, as noted in chapter 4, there is wide variation in the levels of State participation in NCIC. While all States can contribute to the hot files, only eight are currently permitted to contribute records to the CCH file. Some States make relatively heavy use of NCIC, while others use it only minimally. Thus, the exact basis for allocating costs to NCIC—even if known —would be difficult to determine. Second, the level of automation of State criminal justice information systems also varies widely. Therefore, the costs to the States are also likely to be highly variable, depending on the type of system. Third, some portion of State funding has been provided by the Federal Government, primarily through LEAA.

Since fiscal year 1970, LEAA has provided about $207 million in categorical grants to the States for comprehensive data systems and statistical programs, as shown in table 8.

Table 8.—LEAA Grants to States for Comprehensive Data Systems and Statistical Programs, Total by Fiscal Year

Fiscal year	Total amount
1969	$ 0
1970	1,000,000
1971	4,000,000
1972	9,700,000
1973	21,200,000
1974	24,000,000
1975	26,000,000
1976	31,622,000[a]
1977	21,152,000
1978	16,000,000
1979	21,290,000
1980	15,000,000
1981	16,275,000
Total	$207,239,000

[a]Includes transition quarter grants totaling $6 million

SOURCE Office of Justice Assistance Research and Statistics, U S Department of Justice

Table 9. —LEAA Grants to States for CCH-Related Systems, [a]Total by Fiscal Year and by State

Fiscal year	Number of grants	Total amount
1969	0	$ 0
1970	2	123,975
1971	0	0
1972	10	2,714,105
1973	5	1,379,531
1974	21	5,875,968
1975	17	7,068,913
1976	36	9,931,835
1977	24	4,545,147
1978	15	4,726,194
1979	12	2,650,308
1980	3	274,756
1981	0	0
Total	145	$39,290,732

[a]Including offender-based transaction statistics and computerized criminal history systems

SOURCE Office of Justice Assistance, Research, and Statistics, US Department of Justice

About $39 million of this amount has been for CCH-related systems, including offender-based transaction systems (OBTS) to record key events about individuals as they pass through the criminal justice process. As indicated in table 9, CCH grants peaked in 1976 and ended in 1981. From 1970 to 1980, 145 CCH-related grants were awarded to 35 different States. However, 10 States receiving 57 grants accounted for about two-thirds of the total funds awarded to all States.

In addition, some portion of LEAA block grants to the States was used for criminal justice systems. While OTA did not attempt to estimate this amount, an independent analysis provided to OTA suggests that an additional $200 million to $400 million of block grants funds were spent on law enforcement telecommunications systems, criminal justice agency record systems, and criminal justice information systems.[15]

Federal grants account for only part of the cost of implementing and operating a State's CCH files. Estimates of the full costs vary widely and have not been independently verified by OTA.A 1975 study by lNSLAWestimated the total cost of a fully developed CCH (in which all States were full participants) to be $361 million in current dollars (adjusted for inflation over the 10-year development period 1975-84). Of this total, the State share was estimated at $274 million ($44 million for development and $230 million for operation) and the Federal share at $87 million (for FBI/Ident and NCIC/CCH).[16]

A 1979 study by the National Center for State Courts (NCSC) attempted to determine development and operational costs for State CCH systems. The results were fragmentary, but provided a basis for concluding that the 1975 estimates were probably low. For example, INSLAW projected that 15 States would be full CCH participants in 1978, with a combined CCH/OBTS operational cost in that year of $17.7 million in 1978 dollars.[17] By comparison, NCSC found that the actual 1978 CCH/OBTS operational costs for the 15 States listed in table 10 were reported to total about $42 million,[18] more than double the INSLAW projection. Some of the difference may be attributable to assumptions about the rate of inflation (assumed by INSLAW to be 26 percent over the 3-year period 1975 to 1978).[19] However, the comparison does suggest that operating costs in 1978 were significantly higher than projected by INSLAW.

[15]"Data and analysis provided to OTA by Sept. 9, 1981, letter and enclosures from Tom Dalton of Seattle University,

[16]"Institute for Law and Social Research, *Costs and Benefits of the Comprehensive Data System Program,* prepared for LEAA, June 1975, vol. 1: Summary, pp. 12.26.

[17]"Ibid., pp. 12, 25, 26,

[18]National Center for State Courts, *A Review of OBTS and CCH Program Requirements in the Judiciary,* Williamsburg, Va., 1979, pp. 86, 131.

[19]Institute for Law and Social Research, *Costs and Benefits of the Comprehensive Data System Program,* prepared for I. I? AA, June 1975, vol. I: Summary.

Table 10.—CCH/OBTS Operational Costs[a] for 1978 by State (in 1978 dollars)

State	Operating cost
Alabama	$ 480,000
Arizona	5,000,000
California	14,826,000
Delaware	1,241,000
District of Columbia	1,500,000
Hawaii	1,000,000
Maryland	2,000,000
Michigan	1,731,000
Minnesota	1,250,000
Missouri	600,000
New York	8,000,000
North Carolina	2,500,000
Oklahoma	200,000
Texas	1,097,000
Virginia	195,000
15-State total	$41,620,000

[a]Includes combined costs for Computerized Criminal History Systems and Offender-Based Transaction Systems (OBTS)

SOURCE National Center for State Courts, *A Review of OBTS and CCH Prograrn Requirements in the Judiciary, 1979,* pp 06, 131

In general, NCSC encountered great difficulty in obtaining reliable cost data for the study. State operating personnel were frequently unable to reconstruct the requested data from available records. The operation of CCH and OBTS systems was often so intertwined with that of other criminal justice systems that the proper allocation of costs was almost impossible. In addition, some portion of State identification bureau costs (estimated at $60 million for fiscal year 1980[20]) should be allocated as an NCIC cost. Finally, no systematic data were available on the costs to the various localities of preparing and submitting CCH/OBTS information for use by State systems.

[20]International Association for Identification, *Functional Requirements and Systems Development Plan for State Identification Bureaus: Executive Summary of Findings and Recommendations,* Utica, N.Y., October 1980, p. 1.