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PROFESSIONALISM: COMING OR NOT?

Professionalism in the computer field has been debated for years. Are systems analysts and programmers "professionals" or aren't they? We gather that a good many people adopt the attitude, "Who cares?" However, we feel the subject *is* important to data processing management. Somewhat like privacy legislation, some aspects of professionalism are on the way (although not as rapidly as privacy). Further, they may have an effect on which application systems you may build and/or how you must build them. We have expanded the subject to include system certification and the unionization of analysts and programmers, since all tend to impose types of regulation on computer-using organizations.

Our last previous issue on the subject of professionalism in the computer field was in December 1968. It is interesting to consider what has and what has not happened in the intervening seven years, as it gives some idea of how rapidly the concepts are being accepted.

One's first impression might be that "nothing significant has happened since 1968, as far as computer field professionalism is concerned." We don't agree. Here are the high points of what has happened, as we see it.

United States. The Institute for Certification of Computer Professionals (ICCP) has been formed, with eight computer field societies as charter members—including DPMA, ACM, IEEE CS, and the Canadian Information Processing Society. It has taken over the DPMA CDP and RBP examinations, and will be upgrading them as well as adding new examinations. We will discuss this later in this report. An important AFIPS study, on the definition of the job of programmer, has been completed and another is underway on defining the system analyst's job. Bills proposing the licensing of data processing personnel have been introduced in state legislatures, but they have encountered little support, as far as we can tell. The Privacy Act of 1974 is in force and may well lead to the certification of systems, as far as some security and privacy features are concerned.

Canada. As mentioned, CIPS is a member of ICCP, indicating interest in the certification of analysts and programmers. In addition, the Informatics Institute of Canada (IIC) has been formed; one of its goals is to develop more professional standards for people working in both the public and the private sectors.

United Kingdom. The British Computer Society examination was just barely underway the last time we wrote on this subject. It is now an ongoing part of BCS activities and other computer societies are considering adopting it. BCS has a code of conduct (ethics), along with an enforcement mechanism. It also has developed a code of good practice, which aims to provide voluntary standard practices for the design and operation of computer-based data systems.

Scandinavia. Denmark, Finland, and Sweden have worked on developing standard job titles, for

computer-related jobs, and on developing some standard job definitions.

Netherlands. As we discussed last month, The Netherlands has an extensive government-supported certificate program, including a series of examinations, for analysts and programmers. It is in active use, and is used by employers for hiring, promotions, raises, and so on.

So things *are* happening in the area of professionalism.

Why the subject is important

Surely if anything of any substance materializes in the certification of people, system certification, or the unionization of analysts and programmers, it will be important to data processing management. It can affect the selection of which new systems to build, how they must be built, and which people can work on them. The effects may vary from state to state (within the U.S.) and from country to country. Professionalism might motivate staff members to improve their capabilities, it could bring about more commonality of approaches, it could be used for hiring, promotions and raises, and it could help determine "who is qualified." On the negative side, professionalism might well increase staff mobility and hence turnover, and it probably would lead to higher salaries for the "professionals."

But what leads one to believe that any aspect of professionalism will come to the computer field? As we indicated above, the subject is under study in many countries of the world, and there is no evidence that interest is dying away. Professionalism is in harmony with the times (whether one agrees with it or not). That is, there is a constant increase in the amount of regulation of our personal and business lives, as well as an increase in social consciousness. So the times may encourage the development of professionalism and the regulation it implies. Professionalism may come as a side effect of other legislation; we have mentioned that privacy legislation may lead to a form of system certification. And it is possible that the general public may become sufficiently annoyed with or fearful of computer-based systems that some sort of regulating legislation will be enacted.

Many of the aspects of professionalism that we are discussing can impact a company's data processing function. Further, it is possible (although unlikely) that all of these aspects will come into effect in the next five to ten years. So it is a subject that we believe data processing management should stay abreast of.

Professionalism activities

What is a profession? What is a professional? These are not easily answered questions. In our December 1968 report, we gave some of the "generally accepted" characteristics of a profession: defined body of knowledge of high intellectual content, defined standards of competence, examinations, code of ethical behavior, members have a loyalty to the profession, and the profession has the right to eject someone from membership and practice for incompetence or unethical behavior.

The U.S. Taft-Hartley Act defines a professional as an employee engaged in work requiring an advanced type of knowledge acquired at an institution of higher learning, requiring the consistent exercise of discretion and judgment, which is primarily intellectual and varied in character, and the output of which cannot be standardized. (We have abbreviated, but this is the gist.)

The main components are: defined body of knowledge of high intellectual content, defined standards of competence, examinations, code of ethics, and disciplinary capability.

We contacted all of the computer field societies and organizations that we found reference to, in various countries, that were reported to be concerned with professionalism. The replies we received varied in the amount of detail provided. We will give an overview of the accomplishments that were reported to us.

Definitions of competence

The definition of competence to do a job obviously should begin with a definition of what the job involves. The effort involved in defining a job can vary from one person doing it in a few minutes' time (generally superficial, if the job has any complexity) to a study of a carefully constructed sample of workers, to find out what they actually do on their jobs.

The American Federation of Information Processing Societies, Inc. (AFIPS) has sponsored a study of the latter type to define the programmer's job, conducted by Dr. Raymond Berger. The results have been published in Reference 1. Actually,

nine job categories were covered: junior programmer, programmer, and senior programmer levels for business data processing programming, scientific programming, and system software programming. First, a panel of expert programmers was asked to identify the job functions that they felt make up some of the nine categories. Then a survey was conducted which resulted in 684 programmers indicating the job functions they actually perform. (It was interesting to note the differences between the experts' opinions and the survey results.) A set of functions for each job was then specified.

The next steps in the process are to define the knowledge required for each job function, to define a level of competence (in terms of knowledge) in each function for each job category, and then to develop examinations to test for that level of competence. There is a difference, of course, between true competence to do a job and a measure of the knowledge that a person has about that job. Even so, written examinations are a widely accepted means of determining competence.

As we understand it, ICCP will use the results of this AFIPS study for developing such examinations. More about this later in this report.

AFIPS has continued their support of this project. Dr. Berger is now making much the same type of study for defining the system analyst job. When it is completed, AFIPS will publish the results.

The Association for Computing Machinery (ACM) has developed curriculum recommendations both for "computer science education" and for "computer education for management;" see Reference 2. In both cases, these were developed largely by professors, based on their concepts of a suitable body of knowledge. In neither case was the curriculum based on job definitions such as were developed as in the AFIPS study. So bodies of knowledge and curriculums probably will have to be defined for the programmers and system analyst jobs. (The ACM curriculum committees probably would say that they were aiming at a level of competence above those of "programmer" or "system analyst" and for which job definitions are not likely to be available for many years.)

Other important work has occurred, such as the accreditation of private EDP schools.

Denmark. In a 1972 report prepared for the Organization for Economic Cooperation and Development (OECD), the Danish EDP Council defined job titles and job descriptions for data processing jobs, ranging from EDP manager to keypunch operator. Some 60 activities were identified within the data processing operation, and related to job titles, for both large and small organizations. *Finland,* in 1972, prepared a report on standard job titles.

Sweden. In 1974, a study was completed by Servi-Data AB in which data processing job functions were decomposed into activities. The goal in this case was to develop a better structure for data processing educational programs.

So some progress has been made toward standard job definitions which in turn can be related to the knowledge needed and minimum levels of competence required. It is likely that several types of "programmer" jobs will be defined first, followed by several types of "analyst" jobs.

Examinations for competence

United States. The Certificate in Data Processing (CDP) program was developed by DPMA in the early 1960s. We wrote up the program and the examination in our July 1965 issue. After the formation of ICCP, DPMA turned the CDP program over to ICCP. As far as we have been able to determine, the characteristics of the examination are still quite similar to what we discussed in 1965.

The examination has five sections of 60 multiple choice questions each. ICCP is considering additional sections and is working to improve the content of existing ones.

The examination traditionally is given once a year, on the third Saturday in February. Since its inception, 31,531 candidates have sat for the CDP and 15,115 have been awarded the certificate. In the February 1975 exam, conducted under ICCP, 2,096 sat for the exam and 675 were awarded certificates.

The Registered Business Programmers examination (RBP) was also developed by DPMA. The number of candidates for the RBP fell off markedly after the exam was first given and it has since been suspended. Even so, DPMA turned over the rights to this exam to ICCP and it is being restudied with a view to possible restructuring. ICCP is committed to offering it again in the near future.

ICCP has signed a long-term agreement with the Psychological Corporation, for conducting ICCP's testing program, including the CDP, and

for consultation, services, and administrative support.

Canada. As mentioned earlier, the Canadian Information Processing Society is active in ICCP, indicating an interest in certification.

Also as mentioned earlier, the Informatics Institute of Canada has been formed. Main areas of interest will be to ensure competent and ethical information processing services by way of professional accreditation programs that use national education and career guidelines.

Netherlands. A "non-regular" education program in informatics has been defined and is supported by the Dutch government; in this instance, "non-regular" means that it is not being conducted by the regular institutions of higher education. The education program is modular, with some modules required and some optional, depending on a student's interests. Examinations are given at the end of each module. Successful completion of modules can lead to programming certificates (in either COBOL or FORTRAN/ALGOL) and/or to the AMBI certificate ("Automation and mechanization of management information processing"). The program is used by Dutch private and public organizations for recruiting and personnel selection, promotion, and remuneration.

South Africa. The Computer Society of South Africa is following a course somewhat similar to that of the British Computer Society. That is, full membership in the society is based upon passing Part 2 of the BCS examination (or equivalent exam), or holding an Honors degree in computing, plus five years of experience in the field. In general, the society considers that competence is attested by means of formal education programs, including examinations, that lead to degrees, diplomas, or certificates of competence.

Spain. A 5-year curriculum has been developed by the Spanish government and is offered at a number of schools and universities. A successful candidate receives an appropriate degree at the end of each year, attesting competence. At the end of the first year, the degree is for applications programmer; second year, systems programmer; third year, applications analyst; fourth year, systems analyst; and fifth year, systems engineer.

United Kingdom. The BCS examination, mentioned earlier, is perhaps the foremost examination of its kind. The examination is given in two parts. The first part is designed for student members and consists of two compulsory papers covering general computing knowledge, of 3 or 4 hours' duration, and two specialist papers (from a list of eight subjects), each of three hours' duration. Exemption from Part 1 may be sought on the basis of bachelor level degrees in business studies, computer studies, or mathematics. In order to take Part 2 of the examination, the candidate must have passed Part 1 or have obtained an exemption from it. Part 2 may be satisfied either by submitting a dissertation on an agreed-upon subject and subsequently discussing this with a panel of examiners, or by submitting three papers on two subjects, selected from a list of subjects. Two papers will be on one of the subjects, with the second paper being at a higher standard than the first, and the third being a first paper on another subject. Subjects include system programming, data processing and information systems, advanced programming theory, and others.

The BCS examination does not claim to be a guarantee of professional competence but rather a certification of a recognized level of professional education. It is used to obtain full membership status in the BCS. We have not heard that it is being widely used by employers for hiring, promotions, and raises, but we suspect that employers do give it considerable weight in such matters.

The National Computing Centre, in Manchester, has developed examinations and certificates for system analyst training. We discussed the NCC basic system analyst training and examination in our August 1970 issue. The training program typically consisted of six weeks of training, at six hours per day.

We have seen no studies on the matter but we gather from comments made to us that the NCC certificates have been used by U.K. employers for hiring, promotions, and raises. In this instance, the training and the examinations address a very specific population—namely, business system analysts.

Once again, progress has been made during the past eight to ten years on examinations for competence in data processing. It is our belief that none of these were based on standard job definitions developed from studies such as the AFIPS study. However, some of the examinations would seem to be measuring knowledge levels required on specific jobs, such as business system analysts.

Should readers desire more information on

these examinations, we have developed a free bibliography (Reference 9) that gives the addresses of where to write for more information.

Code of ethical behavior

United States. Each professional society in the computer field seems to have developed its own code of ethics. In general, however, no enforcement mechanisms have been provided and enforcement of the codes is very much the exception.

ICCP has developed its code of ethics; the enforcement mechanism for it remains to be seen. If and when ICCP certificates become widely used by employers for hiring, promotions, and raises, then the opportunity for an effective enforcement mechanism will exist. Certificate holders could be disciplined by suspending or revoking their certificates, which could have a financial impact on them. Of course, the costs of enforcement, including legal costs, would be non-trivial.

It would be helpful, of course, if a common, field-wide code of ethics were adopted. This *might* come about for societies that are members of AFIPS, and some efforts have been made along this line. But so far it has not occurred.

South Africa. The Computer Society of South Africa has developed a code of professional conduct, applying to its members.

Spain. A foundation in Madrid (CITEMA) has developed a code of professional ethics with ten principles, or rules. It addresses, among other things, the handling of personal data.

Sweden. While no explicit code of ethics has been established, the Swedish Privacy Act provides an implicit code, certainly as to the handling of personal data.

United Kingdom. The BCS has a Code of Conduct, together with an enforcement mechanism incorporated in its Articles of Association. The enforcement mechanism consists of an investigative committee, a disciplinary committee, and an appeals committee. Since attaining full membership in the BCS is a difficult matter (for instance, passing the BCS exam), the loss or suspension of membership might be a very effective disciplinary action.

So in this area of codes of ethics, some progress has been made toward establishing such codes and a small amount of progress has been made toward effective enforcement.

Other developments

Developments in the areas of system certification and the unionization of programmers and analysts should be mentioned. These are not "professional" activities, in the accepted sense of the term. But both do represent forms of regulation or constraint on employers.

System certification

Earlier in this report, we mentioned the AFIPS project on system certification. (We have been involved in this project from its inception and so cannot claim a lack of bias about it.) The only progress toward application system certification that we have come across is this AFIPS project.

The AFIPS project began in 1970 and 1971, with two small workshops to consider the question: can computer-based systems be certified? Each workshop was attended by a small group of people selected for their knowledge in this area, plus one or two people representing AFIPS. The first workshop concluded that system certification was not possible at that time but that manuals of preferred (or standard) practices were feasible and needed. The second workshop continued the analysis and concluded that, instead of manuals of preferred practice, system review manuals were needed first.

To illustrate why the workshops felt that system certification is beyond the state of the art now, consider the feasibility of someone signing the following statement: "I certify that this application system performs its defined job, the whole job, and nothing but the job, and cannot surreptitiously be made to do otherwise." The state of the art is such that users do not (cannot?) precisely define the job that an application system is to do; in most cases, the "definition" evolves as the system is developed and maintained. Also, there is no way of assuring that a system cannot be changed undetected a short time after a certification study has been performed.

If that certification statement seems too strong, consider the following: "I certify that this application system was designed and is operated in accordance with generally accepted practices of the computer field." At present, such a statement is essentially meaningless; the practices have not been codified.

If system certification is impractical at this time, should not the next most logical step be to

codify the "generally accepted" practices? Manuals of preferred or standard practices *are* needed. However, they are not easily created. The accounting profession, for instance, now goes through extended discussion, debate, revisions, etc., when developing just one "generally accepted" accounting principle. To come up with good quality manuals of preferred practices for the computer field will take substantial time and effort.

This is why the AFIPS System Certification Committee chose to develop a set of "system review manuals," instead of preferred practice manuals. The first such manual is on security (Reference 3). The manual is really a huge checklist of questions—over 100 pages of them. This checklist can be used by system designers, by managers, and by auditors. Each question asks: Have you thought about, and provided for, this aspect of security? Not all questions pertain to any one installation at any one point in time. But the checklist makes one think. As one reviewer of the manual stated, it tends to give one a feeling of insecurity, there being so many things to consider under the heading of security.

As experience is gained in the use of the checklist, it should be possible to revise and improve it. The checklist could then become the basis of a good quality manual on preferred (or "generally accepted") security practices. Then, at that time, it might be feasible to certify that application systems follow the generally accepted practices.

This same procedure would have to be followed for other aspects of system design, construction, and operation of computer-based systems.

The certification of operating systems is probably more complicated than for application systems. If an operating system is to be certified as to security, then a certification more like the first illustration given above is required. The certification should be of the type: "this operating system is secure and it cannot surreptitiously be made insecure." The state of the art just will not support such certification. A representative of a project that has been studying operating system security, at a recent meeting, made the statement to the effect that his organization does not know how to certify as secure *any* operating system; moreover, they are not able to predict when they will be able to do so. Thus the status on operating system security is essentially the same as we reported in our May 1970 and January 1974 issues.

As we discussed in the November and December 1975 issues, the new privacy legislation may force some form of system certification, before personal data can be transferred from one system to another. It is not yet apparent just how valid such system certification really will be. However, in the December issue, we reported that Dr. Dorothy Denning of Purdue University has developed a computerized method for certifying certain aspects of computer programs. In this method, a certifying program tests a candidate program as far as access to and dissemination of personal data are concerned, and reports any detected violations of privacy regulations. This would seem to be an important step toward the eventual general certification of programs.

Unionization of programmers

At a meeting in San Diego a little over one year ago, the subject was the possible unionization of data processing personnel, particularly system analysts and programmers. Computer operators are already unionized at a number of organizations, but to date relatively few analysts and programmers have joined unions. The purpose of the meeting was to discuss the pros and cons of their doing so.

The subject was approached indirectly, via representatives of three other types of unions: aeronautical engineers, office employees, and university professors. Each representative discussed what the benefits of union membership are. The main points that were advanced were:

Avoid exploitation. Many groups are being exploited by employers, it was stated. By banding together in a union, with a common cause, the employees gain strength to combat the exploitation.

Provide job security. This aspect is particularly important to employees during recessionary times, by making it more difficult for employers to lay off union members.

Improve job benefits. Such benefits can include pension plans, paid health insurance, guaranteed working conditions and hours, vacations, overtime and shift differential pay.

Provide more control over one's working life. For instance, the professor said he wanted to be able to give his students grades of all As or all Fs,

if he desired, as an example of the working life freedom that he sought.

In the discussion following the presentations, the union representatives said that they felt professional societies could not fill the same needs as could unions. Professional societies are useful for the exchange of technical information, but unions are more effective for job protection and influence on employers.

EDPACS (Reference 4) has discussed briefly the unionization of data processing personnel, mostly from the standpoint of the disadvantages to the employer. A strike by a relatively small number of people (in data processing) might possibly shut down the whole organization. This is particularly true if computer operators strike and supervisors are unable to take over and run the equipment. Moreover, with unions involved, it is harder to keep supervisory people capable of running the equipment so as to be able to step in, in case of a strike. And with unions, it is harder to enforce good discipline because it is harder to take disciplinary action against union members.

The unionization of analysts and programmers as yet is not widespread. It can occur in parallel with developments in professionalism. And it can come a lot faster than professionalism, as far as any particular organization is concerned, when the conditions are "right."

What seems likely to happen?

As the above discussion implies, we do not believe that any of these developments—professionalism, system certification, unionization—will have a major impact on the computer field in the next five years or so. On the other hand, there *are* active pressures for all of them. Any one of them could be important to data processing management. And as far as any particular organization is concerned, any or all of them could occur within the next five to ten years.

What is likely to happen? Following are our opinions on this matter. Recognize that, as with anything that has strong pro and con arguments associated with it, there is a lot of conjecture in forecasting what will happen in these three areas. Moreover, we are confining our remarks to what seems most likely to happen in the United States, rather than in other countries.

An overview of "professionalism"

Just who are the prospective professionals? All analysts and programmers? Or only "senior analysts" and "senior programmers"? What about computer operators; will they qualify as professionals?

To get a better perspective on such questions, we reproduce a table from the report on a workshop sponsored by the U.S. National Bureau of Standards and the Association for Computing Machinery, Reference 5. This table gives a broad summary of the makeup of the system development staff of one large business organization. In addition to job categories, it gives the approximate percent of total development staff in each category, as of about three years ago.

STAFF OF ONE ORGANIZATION

Category	*Job*	*% of staff*
A	Large system architects	1
B	Large system project managers	1
C	Computer scientists (Ph.D.s)	1
D	Business system analysts with little knowledge of programming	10
E	Professional programmers, experienced, interested in keeping up with the technology, have initiative to do self-training, capable of recognizing that others have already solved a particular problem.	22
F	Craftsmen programmers, less experienced, have less initiative, are less likely to recognize that a problem has been solved by others; willing to use guidelines, etc., if directed.	44
G	Dull programmers, with little or no interest or initiative; just doing a job.	22

Moreover, said the participatnt offering this information, the "center of gravity" seems to be shifting from the F category down toward the G category. The G category might well become the largest in terms of percent of staff.

Using this one organization as perhaps a first approximation of the total population of analysts, programmers, etc., what can one say about "professionalism"? From a technical standpoint, the large system architects (A) and the computer scientists (C) might well be in one category of professionals. Large system project managers may or may not qualify technically as professionals, depending on their technical backgrounds.

If "business system analysts with little knowledge of programming" are to be classified as pro-

fessionals, it seems clear that the requirements cannot demand a deep knowledge of the computer. Are these people to be certified mainly on their ability to study existing systems and to develop sets of requirements for new systems? Or must they have a demonstrated ability to design new computer-based systems? If this will not be a "professional" category, will it be feasible for them to have higher salary levels than professional programmers and (often) to be directing the work of professional programmers?

Most advocates of professionalism, we suspect, would agree that category E is the programming group most entitled to professional certification. They have both a good level of job knowledge and a motivation to improve that level of knowledge.

The question is, though: will some people in categories F and G force themselves to become certified as professionals and then drop back into their unmotivated ways? If the certification examinations are difficult enough to eliminate just about all of the F and G categories, then (according to this model) only about one-fourth of all programmers are likely to be certified as professionals. These people may already be recognized by their employers as talented, so these people may be reluctant to take the examinations where (they might believe) they stand a chance of failing. Hence the number of candidates for the programmer certificate might be quite small.

There are several other factors involved in trying to identify who the professionals might be. For one thing, the concepts of team programming are catching on in popularity; we discussed team programming in our April 1974 issue. In team programming, each team member may specialize in only those aspects of programming in which he or she is particularly proficient. In such an environment, would a team member qualify as a professional?

Another factor, which we discussed in our August 1972 report, is career paths for data processing staff members. At what point in one's career would one be eligible to be a professional? For the medical profession, eligibility comes after graduation from medical school and one year's internship at a hospital. Would the apprenticeship be longer for a data processing professional? If so, on what justification?

Still another factor is the breadth of knowledge that will be demanded of a professional. Finerman, in Reference 6, discusses an interesting point that some people at the Massachusetts Institute of Technology have developed. In the opinion of these people, the educational program for computing should provide not only the needed professional skills but also the breadth of understanding needed to become responsible professionals. This includes an awareness of social and cultural problems that arise from the fragmentation of knowledge, the social consequences of science and technology, and the need for more contemplation on the part of the professionals. The computer science curriculum, Curriculum 68, developed by an ACM committee, falls short of this objective because it concentrates only on the professional skills, say these people. Finerman says that engineers and scientists are being held increasingly accountable for the effects of their work on society—and the same will be true of computer field professionals.

We could go on but perhaps this discussion makes the point. As we see it, the true professional status for system analysts and/or programmers—similar to that of doctors and lawyers—seems no closer today than it was ten years ago. It is not clear just what body of practitioners should rightly classify as professionals. When in their careers should they become eligible to be professionals? What body of knowledge should they be expected to know—and should it include the social aspects of computing as well as the technical? There are no clear answers to these questions as yet. We do not see true professionalism coming to the computer field until there are much better answers.

At the same time, *some* aspects of professionalism do seem close. These include the certification of analysts and/or programmers and possibly the adoption and enforcement of a field-wide code of ethics.

Certification

With the formation of the Institute for Certification of Computer Professionals in 1973, a major step was made toward certification of analysts and programmmers in North America. ICCP is made up of eight charter member societies: Association for Computing Machinery (ACM), Association of Computer Programmers and Analysts (ACPA), Association for Educational Data Systems (AEDS), Automation One Association (A1A), Cana-

dian Information Processing Society (CIPS), Data Processing Management Association (DPMA), IEEE Computer Society (IEEE CS), and the Society of Certified Data Processors (SCDP).

We have already mentioned that DPMA has released to ICCP the CDP and RBP examinations. The RBP examination has been suspended, pending further study, and ICCP at the moment is offering only the CDP.

But the 1974 ICCP Annual Report makes some interesting points about how the Institute sees the future. Here are the main points.

Certification. The first priority for ICCP resources goes to the certification activities. At the top of the list is a project to review and improve the CDP, as well as to identify its proper role in an overall certification program. Almost equally important, however, is the development of a structure for future certification exams. ICCP believes that this structure will be modular, with some modules required and others optional. It is possible that some modules will be quite specific, such as the design of data communications networks. Further, the structure may well tie the examinations to the standard job definitions developed under the AFIPS study; this point was not made in the report but has been mentioned verbally.

The decisions on the structure of the certification program also must consider the question of re-certification or dated certification. The point here is that rapid technical changes are being made in the computer field. Many of the benefits of certification will be lost if certificate holders become technically obsolete but are allowed to retain their certificates.

Finally, as a part of the structure, entry level examinations must be defined. It is possible that the present CDP is such an exam. The knowledge requirements for the CDP are fairly broad and fairly shallow, as we discussed in our July 1965 report. For instance, the math questions mainly are at the level of first year algebra. Candidates often have little difficulty in answering the questions that pertain to their specialties; the difficulties come with the other sections of the exam. We have observed, for example, that programmers often answer the computer-related questions easily but have all sorts of difficulties with the accounting questions. In any case, one or more entry level examinations must be identified—and it may turn out that the CDP is one such exam.

Self-assessment. In addition to certification examinations, ICCP is quite interested in the idea of self-assessment examinations. These are self-administered exams that a person can take and grade at home. The purpose is to tell the person, not someone else, how his or her knowledge of a subject compares with peers. To be most useful, such exams should be related to job definitions and to defined curricula. The person thus finds out if his or her knowledge is not sufficient to perform a type of job and, if this is the case, where to get the needed knowledge.

Self-assessment might also be tied into a re-certification program. It could point out to a certificate holder, well before a re-certification date is at hand, just what the state of his knowledge is.

Other activities. There are other areas in which ICCP is interested, but in which the Institute probably will not do much until more resources are available. These include the development of codes of conduct and good practice, educational standards and guidelines, accreditation guidelines, salary surveys, and perhaps even the licensing of people for certain data processing jobs.

ICCP conducted a planning workshop in December 1975 to consider the future structure of certification examinations. A long-range (ten year) structure is being developed, covering both certification and self-assessment exams. The CDP and RBP programs will then be evaluated with respect to this suggested structure, after which changes may be recommended.

For more information on ICCP and its activities, see Reference 7.

Licensing

We have hardly mentioned the idea of licensing data processing people in this report. This is not because the idea has not received much attention but rather because it appears that the issue has been settled for the present.

What is the difference between certification and licensing? Certification is the granting of a privilege, generally be a peer group. Thus, a professional society, or a group of societies in a field, can develop the certificate and the rules under which it is granted. A person generally can practice in the field without a certificate—but of course cannot hold himself to be a certificate holder unless he actually is one.

Licensing, on the other hand, is controlled by government agencies. It is the removal of a restriction. The law says that no one may practice a specified job or occupation unless he or she has a license, which is granted by a specified government agency. So licensing implies a much greater degree of control over the practicing of an occupation than does certification.

The Society of Certified Data Processors (SCDP) decided to advocate the licensing of data processing personnel. In 1974, SCDP developed a model bill and submitted it to a number of state legislatures. Under this model bill, no person in a state which passes the bill could "practice, continue to practice, offer or attempt to practice data processing or any branch or part thereof, unless specifically exempted by this Act." A grace period of 24 months would be allowed in which practitioners could obtain the necessary academic qualifications, etc., required under the Act.

Why did SCDP a advocate this action? In the words of K. W. Lord, SCDP's president, "It came into being because we at SCDP felt that the proliferation of privacy legislation being considered around the nation omitted the most critical part of the privacy question—the people involved. Privacy efforts, however, are but a small part of the question. Accountability, responsibility, ethics, and leverages are all a part of the effort. We reason that one does not truly have a profession until one has the ability, legally, to challenge a practitioner and when proven guilty, to see that he is separated from the practice . . . There are several sets of codes of ethics in existence, all reasonably well thought out . . . and all missing one key element—teeth. Or more specifically, leverage. Proved violation can lead to the removal of a certificate or the slapping of hands, but beyond that, nothing. This is one problem the SCDP licensing bill will solve." For more information on the SCDP views, see Reference 8.

Readers of the trade press in the U.S. will know what a furor this proposal stirred up. Letters to the Editor of *Computerworld,* for instance, argued the pros and cons for many weeks. The bulk of the letters argued against the proposal, as we remember, by a factor of 4 or 5 to 1.

But legislators have not been unwilling to enter the model bill and submit it to the legislative process. The public has been annoyed, and at times hurt, by poorly designed computer-based systems. The troubles are generally not irreversible. They might well be due to the newness of the technology. No strong case has yet been made, that we know of, that the troubles are generally due to incompetency.

But even if such a model bill were introduced into any given state legislature, this does not indicate that it would be favorably considered by the committee to which it was assigned. We have a copy of two letters from a committee chairman of the California Assembly, regarding the refusal of his committee to look favorably on a proposed "Industrial Engineers Practice Act." He said that he had been active on licensing committees for 13 years—and had received licensing bills from astrologers, massage therapists, hypnotists, corrosion engineers, forestry practice engineers, chemical engineers, etc. All who seek licensing describe their license as a public benefit, he says. But, in general, no case is made that the public will benefit. No case is made proving incompetency among those practicing. And no case is made that the products or services offered by manufacturers or others would be improved by the licensing act. So here is one legislator, at least, who subjects licensing bills to a very critical analysis.

SCDP, by advocating licensing of data processing personnel and by submitting their model bill to a number of state legislatures, has sought a crystallization of thought on the matter. We believe that the crystallization has occurred—and mainly in opposition to the idea, at least for the present. It seems very unlikely to us that licensing of data processing personnel will occur in the U.S. within the next five years. Some special cases might arise, perhaps as a byproduct of other legislation, which will lead to the licensing of people for specific data processing jobs. But, as yet, there is no evidence that this will occur.

Other aspects

Code of ethics. Some efforts have been made toward getting all AFIPS member societies to adopt a uniform code of ethics. Since many of the societies already have adopted their own codes of ethics, it has been difficult to muster arguments as to why they should replace their current codes with the new one.

One step toward this, of course, would be if both AFIPS and ICCP adopted the same code of

ethics. We can visualize this happening within five years.

Enforcement of a code of ethics. Enforcement requires one or more types of disciplinary action, and the disciplinary action must be "painful" enough that offenders will try to avoid it. Currently, most computer field societies in the U.S. have nothing stronger than suspension or termination of membership. The associated economic penalties are probably trivial.

The suspension or revoking of a certificate, which has value as far as raises and promotions are concerned, would be a different matter. (Suspending or revoking a *license* would be even more severe.) This is why we believe that when ICCP develops job-related certificates, it will be in a position to begin enforcing its code of ethics.

System certification. As we said earlier, true system certification seems to be beyond today's state of the art. Until researchers can see how to do it, there is no use trying to predict when it will arrive.

But, as we have mentioned, privacy legislation probably will force the need for "certification of security and privacy features" at installations and in application systems. We suspect that the first such certifications, when they occur, will be worded along the lines of "generally accepted security principles, plus the specific privacy principles specified in the _____ Act, have been followed." An ad hoc codification of these principles may be referenced. Such certifications will probably be very specific and quite limited as to what is certified.

Unionization of analysts and programmers. We cannot say that such unionization will not happen on a wide scale in the next five years, but it does seem unlikely. It may occur in some locations, such as at a distressed organization where the analysts and programmers want job protection. Moreover, it could occur rapidly, and in a widespread fashion, if a recession severely affected the computer field.

In brief, then, here is our opinion of what will happen and not happen in the next five years or so, as far as professionalism is concerned:

Not happening. We do not see true professionalism for system analysts and programmers coming about in anything like the next five years. We do not see true system certification as being achieved in that time. Nor do we see widespread unionization of analysts and programmers.

Happening. We do foresee substantial progress in defining the jobs of analysts and programmers and in defining minimum knowledge levels for those jobs. We foresee job-related examinations being developed, for at least some of the levels of some of the jobs; successful passing of the exams would be evidenced by certificates being issued. It is possible that curricula will be developed (and perhaps even accepted by the educational community), related to these job definitions and minimum knowledge levels. If such certificates are created, then we can see the emergence of an enforcement mechanism for a code of ethical behavior. And finally, we do think that some limited form of system certification will occur, in support of privacy legislation.

In one sense, five years is not a very long time and maybe not all of these things can occur in that period of time. But there has already been substantial progress toward them, so we believe that the chances of their coming to fruition are reasonably good.

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7. For more information on the activities of the Institute for Certification of Computer Professionals, write to the Institute at P.O. Box 1442, Chicago, Illinois 60690.
8. For more information on their position on licensing, write to the Society of Certified Data Processors, 38 Main Street, Hudson, Massachusetts 01749.
9. We have prepared a bibliography on professionalism. For a free copy, write EDP ANALYZER.

Some rather simple words in existing and proposed privacy legislation—words such as "accuracy," "integrity" and "security"—will pose a problem to many data processing executives. The challenge already exists for U.S. federal agencies. It will probably confront the remaining public and private sectors in the U.S. as well as in some other countries in the next few years. The problem is, these words cannot be put into practice as easily as might first be imagined. But if they are not *put into practice, the threat of both civil and criminal penalties arises. Next month, we will discuss what the privacy legislation says on these points and what the consequent implementation problems appear to be.*

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