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DEPARTMENT OF COMMUNICATIONS

Telecommunications
Regulation Branch

An Approach to Spectrum Management in Canada

BUREAU OF MANAGEMENT CONSULTING SERVICES

Department of Supply and Services
Ottawa-Canada

DEPARTMENT OF COMMUNICATIONS

TELECOMMUNICATIONS REGULATION BRANCH

AN APPROACH TO SPECTRUM MANAGEMENT IN CANADA

April, 1970

ORGANIZATION ANALYSIS DIVISION, BUREAU OF MANAGEMENT CONSULTING,
DEPARTMENT OF SUPPLY AND SERVICES

C O N T E N T S

EXECUTIVE SUMMARY

The radio spectrum may be viewed as a permanent but finite natural resource, the benefits of which should accrue fairly to all Canadians. The allocation of this singular resource is managed by the Telecommunications Regulation Branch through the evaluation, licensing and regulation of all technical aspects of the use of the radio spectrum. The high growth rate of the industry, the increasingly complex technology and sophisticated systems such as microwave, CATV and satellites, and the approaching saturation of certain portions of the spectrum emphasize the need for a management philosophy which maintains the integrity of the spectrum. /

The BMC was commissioned to review the organization of the Telecommunications Regulation Branch, which is the subject of this report. In general, two major organizational structures are feasible for the Branch, functional or divisional. The first is akin to a moderate sized company having production, finance and marketing managers who are jointly responsible for all products. The second is more comparable to a large corporation such as General Motors which has semi-autonomous divisions for each product. The present structure of the Branch is a mixture of these two forms, but tends to have the attributes of the divisional structure.

The U.S. Federal Communications Commission epitomizes a spectrum management organization having a semi-autonomous divisional structure. It is not recommended as a model for organization development for Canada for three reasons. It fails to retain the integrity of the radio spectrum. Further, this lack of integrity complicates spectrum management in highly urbanized countries such as Canada and the U.S. Finally, the total scale of operations in Canada does not warrant the extra levels of management necessary for the coordination of a divisionalized structure.

The report proposes a functional structure for the Branch based upon three market oriented functions, each spanning the entire radio spectrum. The first function is that of service to the user public through licensing operations The second concerns service to the manufacturing industry in facilitating the development and approval of operationally suitable equipment. The third focuses on service to the public at large in assuring sound spectrum planning in the management of our natural resource, the radio spectrum.

R. A. Battram
J. F. Reid
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INTRODUCTION

Prior to 1969, the Department of Transport had responsibility for management of the radio spectrum in Canada. With the creation of the Department of Communications this responsibility moved, and merged with the present related activities of the telecommunications side of DOC. Telecommunications Regulation Branch reports, through the Director General Telecommunications Management Office, to the Assistant Deputy Minister for Operations. There are also three other branches in the Telecommunications Management Office, which are concerned with national telecommunications policy, international telecommunications policy, and non-military government communications. At the time this study was undertaken, the Telecommunications Regulation Branch accounted for about 90% of the personnel establishment of the Operations component of the Department.

The relocation of the Branch to DOC suggested a suitable opportunity for reconsideration of its organizational structure. While the conduct of an organization study is generally hampered, if not rendered impractical, when confined to branch level, the sheer size of this branch compared to its three sisters appeared to contradict this principle. This contradiction was further supported by indications that the operations of Regulation Branch were independent of the other three. Accordingly, the ADM Operations commissioned the Bureau of Management Consulting to:

(a) review the terms of reference of the Telecommunication Regulation Branch,

(b) review the objectives and major activities of the Branch, and

(c) recommend an organization structure compatible with the appropriate objectives and activities of the Branch.

THE PRESENT SITUATION

LEGISLATIVE MANDATE

The activities of the Department of Communications are governed by the provisions of several Government of Canada Acts. The Government Organization Act, 1969 and the Radio Act cover the activities that the Department has assigned to the Telecommunications Regulation Branch. Broadly speaking, these give the Branch the mandate of managing the allocation of the radio spectrum in Canada. The responsibilities include the study, development and recommendation to the government of policies and legislation relating to the planning and management of the allocation of the radio spectrum. / The Branch also administers the Radio Act respecting the licensing of radio stations and the technical certification of broadcast stations. / Supporting these responsibilities, the Branch maintains liaison with the manufacturing industry and with associated national and international regulatory agencies. /

PROFILE OF SPECTRUM MANAGEMENT IN CANADA

The Manufacturing Sector

Across the range of its commercial activity, the telecommunications manufacturing industry interfaces with the Department of Communications at several points. Discussions arise over the planning and design of complete systems, and their alternatives to satisfy consumer demand for total communication media. The industry conducts both pure and applied research to find new or improved means of using the radio spectrum to satisfy communication system demands for equipment. It carries out engineering development work to further the concepts and ideas of the research laboratories towards mass manufacture. Type certification of prototype equipment facilitates the sale of the manufactured products to the broadcast and other radio communications sectors of the consumer market. /

The Consumer Sector

The radio spectrum users' equipment needs are satisfied by the design of a suitable communication system and the purchase of that system from the manufacturing industry. Application must then be made to the Branch for what amounts to the leasing of a portion of the radio spectrum, usually within geographic boundaries. When the license is granted, the system will be constructed and installed, placed in service and inspected by the Branch. The Branch's continued inspection and monitoring process ensures conformance with the technical and policy parameters of the system as authorized. The broadcast sector of the consumer market is additionally responsible to the Canadian Radio-Television Commission for programming.

The World Spectrum

The need for worldwide coordination and control of spectrum utilization is satisfied by the international radio regulations that have evolved through the activities of the International Telecommunications Union. The Branch contributes to these activities regarding spectrum planning and registration of frequency allocations. In addition, the Branch liaises with the Canadian Radio-Television Commission in connection with its certification of radio broadcast applications, and with the United States Federal Communications Commission for frequency coordination in the licensing of radio users near the U.S.-Canada border.

The Branch

The profile of activities of the Telecommunications Regulation Branch relates to the interface points with the manufacturing sector, the consumer sector, and the various domestic and international agencies that are involved with regulation of the use of radio spectrum.

The Branch maintains a network of relations regarding its planning activities. From the telecommunications industry comes information on research and development in all areas of radio technique. From the consumers comes information on their operational needs and plans for radio. From other branches of the Department, from the international regulatory agency and from various international agreements come internationally ratified radio regulations and technical recommendations. All of this information is used by the Branch for its planning activities: frequency planning and allocation criteria; standards for equipment, systems operations and the control of spectrum pollution; and recommendations to government on radio policy and regulations.

The evaluation and authorization activities of the Branch flow from this planning. Manufacturers may submit new or improved lines of equipment for type approval, a process that improves the market value of the equipment by facilitating subsequent user licensing procedures. The manufacturers may also have this work done by private laboratories, but the nature of testing devices required renders DOC the only source for certain specialized classes of equipment. On the consumer side, prospective radio users submit applications for radio licenses or broadcast certificates. These are evaluated within the framework of frequency plans, technical criteria, and compatibility with existing stations. Should authorization be granted, the construction of the station can proceed, and the ITU is notified of the frequency allocation.

The final major activity of the Branch concerns inspection and monitoring to ensure initial and continued conformity to the authorized system description, the resolution of radio communications problems, together with the control of radio spectrum pollution and any necessary enforcement action. This follow-up activity also provides feedback of spectrum usage information to the planning activities of the Branch. Frequency plans can be updated, standards can be checked, and information for regulations policy recommendations can be generated through these inspection, monitoring and enforcement proceedings.

PRESENT BRANCH ORGANIZATION

These management activities are conducted at present in an organization structured in part by "product", and in part by "function". The management of the broadcast portion of the radio spectrum is the responsibility of the Broadcasting Engineering and Certification Division, and most activities concerned with the management of this "product" are contained within the division, including planning, technical evaluation and certification of broadcast applications, and the preparation of submissions on national and international policy agreements. Operational inspection and monitoring of the broadcast sector of the consumer market performed by the Branch is unique because of the relatively advanced technical capabilities of these operators. Further, inspection assistance is provided to the CRTC./

The other three divisions represent what is meant to be a functional split of responsibilities. The Radio Authorization and Enforcement Division is responsible for processing applications by non-broadcast users, for evaluating these applications against technical and administrative regulations, for frequency allocation, and for issuing licenses. In addition it has responsibility for the inspection and monitoring procedures that are employed by regional offices for non-broadcast users.

The Radio Regulations Engineering Division is responsible for equipment standards and approvals, spectrum pollution standards and for spectrum allocation standards. In addition it is responsible for the Radio Regulations Engineering Laboratory, which conducts type approvals and constructs special equipment for Department use. Because of the increasing technical sophistication of radio applications, this engineering division is called upon to assist in the evaluation of many of the applications processed by the authorization division.

The Radio Regulations Services Division serves as a central management centre for the various support activities within the Branch. These services include drafting, for frequency allocation charts and utilization maps, and for preparation of electrical drawings; accounting, for the handling of license fees and office accounts; and a transcription unit, for processing of the volume of correspondence associated with Branch operations.

THE ENVIRONMENT OF BRANCH OPERATIONS

Not unlike other businesses with extensive technological involvement, the Branch operates in an environment characterized by explosive change. Further, there is not much likelihood that the pace of change will alter in the foreseeable future. Indeed, one of the major criteria for future success in this business may well be the ability to cope with environmental changes. The following areas of change are indicative of this situation.

To start with, the Branch is required to handle an ever increasing volume of business. Growth rates vary with different categories of spectrum users, but rates of 10 to 20 percent per year are typical for presently established categories. Added to this growth is the increasing introduction of new kinds of equipment, placing new demands on the Branch. The growing popularity of community antenna television (CATV) systems and radio paging systems are but two examples.

Concurrent with this increase in volume of Branch business, is an increasing sophistication in several aspects of spectrum management. The customers themselves are becoming more sophisticated, eager to employ the latest in electronic marvels. Their applications are becoming more complex, with highly engineered systems to be analysed as the telecommunications equipment increases in sophistication, and as more efficient coaxial cable, microwave, and satellite systems are starting to enter user plans for the future. Finally, the criteria by which applications are judged are becoming more sophisticated. The sheer volume of spectrum usage tends to create crowding in some areas of the spectrum, and computer-assisted analysis is necessary to speed the analysis and processing of applications. As communications takes on an ever increasing importance in our national life, mere technical considerations alone are not sufficient for granting licenses. The users of microwave relay systems must now demonstrate economic viability and social value in addition to technical adequacy in order to obtain licenses, a situation present for a long time in the broadcast sector of spectrum use. The future will undoubtedly see increasing emphasis placed on non-technical considerations in other consumer categories as well.

As mentioned previously, the communications industry is expanding rapidly. New uses for the radio spectrum are being found constantly, particularly as the need for transmission and manipulation of data increases. The computer has become firmly entrenched in business use, and the "computer utility" is close upon us, increasing the pressure for microwave systems. The medical and legal professions are just two of the many future large-scale users of this kind of information system on a wide regional or even national basis.

The rapid growth of radio, electrical and electronic equipment is resulting in increasing radio spectrum pollution which adversely affects all uses of radio and will require increasing attention.

THE EMERGING ROLES OF THE BRANCH

In the light of these various aspects of the present situation, what roles emerge that must be played by the Branch? How can the mandate be fulfilled, given the functions that emerge from the industry/market interaction, given the resources of the present organization, and given the scope of the changes taking place in the environment?

The mandate is clear. It is the management of a constant but finite national resource, the radio spectrum. With Canadian philosophy encouraging the use of the resource to foster the growth and development of the country, three major roles emerge which together fulfil the management mandate.

The first role is that of planning the allocation of the limited resource. This involves activities in the area of marketing, analysing and forecasting consumer trends in present system demands for the spectrum and anticipating additional system demands in the future. Forecasts must also be made of technological advances arising out of research activities that may provide communications systems to satisfy anticipated consumer demand. The planning role must coordinate these expectations with the licensing process, combining the newer economic and social criteria with the present technical criteria. Finally, this role includes maintenance and development of the internal management resources and capabilities in the areas of budgetary planning, manpower planning, staff development and training, and general management systems of the branch. In short, the planning role enables the Branch to effectively cope with today's problems while anticipating situations that might otherwise become tomorrow's problems.

The second role is that of allocating the constant but limited resource, guided by the planning of the Branch. This is the role of actually issuing the leases for portions of the spectrum. It calls for competence and efficiency, the same attributes that apply to the operational role in any business. Technical expertise in the light of consumer and product sophistication, and management systems efficiency in the processing of applications and the effective monitoring of performance are implied requirements for this role.

The third role is that of encouraging technological development and standards that will allow the fullest utilization of the limited resource while avoiding its misuse and pollution, and facilitating the planning and allocation roles. This role demands involvement with the manufacturing industry, to encourage research and industrial development of equipment to meet user needs, and the refinement of that equipment to optimize spectrum use. This role also includes the development of standards and equipment for monitoring user conformance to the authorized system description and for generating data fundamental to the planning process.

The mandate to manage the spectrum is fulfilled when all three roles are performed in consonance. None is independent of any other, indeed each is entirely dependent on the other two for its own effective performance. These three roles are being performed by the Branch at present. They must be performed by the branch no matter what its organization, but there are optional structures to meet these role requirements, and some structures may be more effective than others. The next chapter examines these options.

OPTIONS FOR THE FUTURE

STAGES OF CORPORATE DEVELOPMENT*

Whether very small or very large, whether domestic or international, whether profit motivated or altruistic, most business organizations can be classified according to their stage of corporate development. Such classification is based on the way in which the business is structured, i.e. on the division of tasks to be performed.

A stage I organization structure epitomizes the autocratic concentration of management control. It is most commonly seen in small business, although there are some giant corporation which, through close family ownership, demonstrate all the characteristics of stage I development. At this stage all of the major decisions of the business are made by the owner/manager. Typically, he makes all decisions on the nature of the products or services of the business, makes all the marketing decisions, acts as his own chief accountant, supervises production or operational staff, and is the sole recipient of the rewards of the business. There may be a few or many employees, but he holds all the strings. This form of organization is very flexible, and can meet changes in its environment with ease. However, it is extremely vulnerable, requiring the constant attention of the top manager to avert the constantly threatening catastrophes of business life, and often fails with the loss of the owner-manager.

A stage II structure is characterized by the functional delegation of authority. If a stage I manager is able to make the philosophical leap, he can develop a stage II organization by delegating functional authority to subordinate managers. This is the first stage that exhibits "professional" management, and the majority of medium and large businesses fall into this category. The top manager may retain ultimate control, but he has delegated the routine management of each functional area of the business to his managers. He no longer retains a detailed knowledge of all the activities of his business. The particular functions that are delegated depend largely on the nature of the business, but typically there may be a marketing manager, a production manager, and a finance manager. The business may have a number of products, plants, or service centres but all marketing activities will be handled by the marketing manager and his staff. Likewise, all production activities and all financial activities for all the products, plants, or service centres would be handled by the production and finance managers respectively. A stage II corporation has more stability than stage I, but at the cost of some flexibility. The organization is self-sustaining, however, and its success does not hinge so critically on the top man.

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* Much of the concept described in this section is attributable to Prof. D. H. Thain, School of Business Administration, University of Western Ontario. A paper of the same name was published in the Winter 1969 edition of The Business Quarterly.

A stage III organization is epitomized by a fully divisionalized corporation such as General Motors. Given infinite (or economically sufficient) resources, each of the product line "mini-businesses" of a stage II corporation can be established as a semi-autonomous organization of its own. Thus, the product "A" organization will be headed by a general manager, to whom report marketing, production and finance managers. The top man in stage III corporation has no direct concern in the day-to-day activities of each of the product divisions. He is concerned more with returns on investment, mergers and acquisitions, corporate research, and long range corporate planning and is usually aided by competent headquarters staff. To coordinate and set standards for the marketing activities in each of the divisions, the corporate headquarters may have a marketing vice-president. Similarly other headquarters posts will coordinate activities in production, finance, etc., in the various divisions. The stage III development is characterized by this extra level of management at the corporate level, as well as the management at the divisional level, which inhibits response to environmental changes. With this rigidity, however, comes management strength, and a corporation that succeeds in developing to a stage III structure is almost impervious to failure.

CORPORATE DEVELOPMENT AND SPECTRUM MANAGEMENT

In practice, many businesses at a given time will not be "pure" stage I, II or III, but may be at some point between I and II, or between II and III, or have attributes of all three. While a mixed structure is not necessarily wrong, there should be strong justification for any discrepancy from the stage of corporate development between segments of an organization. A mixture of stage II and III structures will likely resemble the latter but suffer the dissonance of its divisions without the benefit of its stability. The appropriate choice of structure is generally dependent upon the scale of operations, but may also be influenced by management custom in the industry, or by some peculiar factor of a particular industry.

For instance, the Telecommunications Regulation Branch, which manages spectrum allocation in Canada, is partly stage II (functional) and partly stage III (product division). In the United States, the Federal Communications Commission is an almost pure stage III organization. The FCC has its Common Carrier Bureau, Broadcast Bureau, Safety and Special Radio Services Bureau and Field Engineering Bureau. To coordinate activities in these somewhat autonomous bureaux, a central engineering office, as well as other staff offices, has been created. The FCC has chosen to divide responsibility for managing the radio spectrum among its bureaux. To accommodate new "products" such as CATV, it adds new bureaux, the common mechanism for growth of large stage III corporations.

How should Canada organize to manage its finite radio resources? The volume and complexity of the business, and the public nature of government enterprise preclude the "one-man show" approach of a stage I organization,

so the choice narrows between stage II and stage III. Canada at the moment has a bit of each, as has the UK. Does the stage III concept, à la FCC, serve as a good model for Canada's development? The answer appears to be no, and for reasons that are founded in the nature of resource, the nature of the market, and the nature of the country.

There is but a single and finite radio spectrum. Viability of the stage III concept rests with an assumption of relatively unlimited resources, so that each division can grow to almost unlimited proportions without seriously threatening the existence of the other divisions. This is not true in the management of the radio spectrum. A serious limitation of the FCC organization in spectrum management is the inflexible division of the spectrum that follows. Each FCC bureau requires the prior assignment of a portion or portions of the spectrum that it can manage itself. There is nothing basically wrong with this, provided that the initial division can be wisely made so that problems of expansion do not arise in future. This appears to be difficult if not impossible in a business with such a volatile technology. The FCC is now faced with the problem of handling some areas of the spectrum that are desperately crowded, while other areas lie relatively idle in another bureau's jurisdiction. The only way out of their dilemma, short of a total reorganization, seems to be increasing the central planning responsibility. This may alleviate the situation, but at the rather large cost of creating a more massive bureaucratic organization. To avoid this, the integrity of the spectrum must be preserved because of its constant but finite nature, and reorganization along the functional lines of a stage II development structure would accomplish this.

While Canada is less populous in total than the United States, the nature of its consumer market for the radio spectrum is very similar. Canada's population is relatively concentrated along the southern border, and is particularly concentrated in a relatively few large cities. In its projections for the future, the Economic Council of Canada indicates that this trend to urbanization will increase even further, to the point that 80% of Canada's population will be city-dwellers by the year 1980 (70% were in that category in the 1961 DBS census). The implication of this is that spectrum usage density will increase correspondingly, further emphasizing the need for integrated management of the radio spectrum. The choice again narrows to a stage III structure with a strong corporate staff to provide the integration and unification of divisional bureaux or a smaller but functionally integrated stage II structure.

The final argument should effectively settle the dilemma between the large stage III bureaucratic structure and the functional stage II structure. In toto, Canada does not have the scale of operation which necessitates the stage III structure of the FCC in the United States. For example, the city of New York alone has more radio stations than Canada in its entirety. Quite simply, Canada does not need, nor can it afford, a stage III structure like the FCC for the management of its radio spectrum.

The conclusion from these assessments is that the finite nature of the resource, the concentration of the consumer market, and the general scale of operations prevail against the development of a stage III structure. For Canada, spectrum management through a functional stage II organization seems most appropriate. The following section offers a specific proposal for a functional approach to spectrum management in Canada. It describes the roles relevant to this business, the relationships between those roles and an organization structure to facilitate their portrayal.

A PROPOSED COURSE OF ACTION

There is a logical sequence in the development of a corporate organization, just as there is in other human endeavours. "Form follows function" is the creed of the architect. And in the language of the corporation architect, structure follows strategy. Strategy is the description of the functions and activities through which the organization proposes to achieve its corporate objective.

OBJECTIVE

The objective of the Branch follows clearly from the legislative mandate, and can be stated as: The effective and efficient management of the allocation of the radio spectrum in Canada, for the benefit of the national public.

This objective reflects the present philosophy of using the resource rather than hoarding it. Efficient management is necessary in this process of allocating the resource for the betterment of Canada, so that it may be accomplished with the least expenditure of men, money and time consistent with public demand. Finally, but no less important, the allocation of the spectrum must be effectively managed to adequately cope with current problems and environmental changes, as well as to correctly anticipate and influence those of the future.

STRATEGY

As mentioned previously, corporate strategy describes the way a business plans to accomplish its objective. The following is a description of the strategy that derives from the objective of the Branch and underlies the organizational structure that this report is proposing. A basic premise is that effectiveness will follow most readily by maintaining a unified approach to the radio spectrum throughout each corporate role that the organization is performing. This, as we have seen, follows from the fact of the limited nature of the radio spectrum resource.

Corporate strategy must be market-oriented before any other consideration. The strategy calls for three market-oriented service roles, each one serving a natural division of public or private interest in the radio spectrum. One role is oriented to the user market, serving those who seek licenses to utilize the radio spectrum. Optimal utilization of the radio spectrum can be achieved primarily (but with certain technical reservations) in two ways. For a given frequency or frequency band, either the transmission power or geographic dispersion must be varied to prevent interference. For a given transmission power or geographic dispersion, other frequencies or frequency bands must be allocated to the consumer. Another role is oriented to the supplier market,

serving those who provide the equipment and technology that permits the radio spectrum to be employed by the users. Optimal utilization of the spectrum can be sought through such things as the development of better antennae with improved propagation patterns, or of transmitters with minimal frequency width and drift, or by reduction of interference from electronic equipment and electric generation and transmission equipment. The third role, oriented to the needs of the national public at large, is one of planning and coordinating the activities of the other two roles. Effective planning will assist in the preservation of unused portions of the spectrum for the future members of the consumer market, and for the national public who will utilize various communication media. These are the same three roles that were seen to emerge from an analysis of the present situation in the Branch and of the environment in which the Branch operates. A more detailed description of these roles is to be found in that earlier discussion.

ORGANIZATION STRUCTURE

The proposed organization for the Branch parallels these roles and their relationships. Figure 1 illustrates the proposal.

Telecommunications Operations Division

The Telecommunications Operations Division serves the consumer market. It is responsible for authorizing the use of a portion of the radio spectrum, now and in future, to those who can satisfy the criteria for a license. Those criteria are essentially technical as far as the authority of the Branch is concerned. However, there is presently an increasing emphasis on other criteria for certain spectrum uses, and the Branch cannot execute its responsibilities effectively without working in close liaison with those who are responsible for the other license criteria, i.e. the National Policy Branch. An integrated approach is to be commended in the discharge of this responsibility.

Licensing involves the initial processing and evaluation of applications, and the allocation of frequencies, together with the repeat issuing of radio licenses and broadcast certificates. As these activities encompass both highly sophisticated as well as certain more routine elements, a blend of engineering, technical and clerical skills is required. A proper merging of these resource elements will permit an efficient discharge of the duties.

There are very valid pressures to decentralize the licensing activities to the regional operations. In terms of numbers of applicants, the regions are more suited to this role. They are, as they should be, close to the consumer. Thus they can be more aware of his specific needs, of peculiar local conditions, and hence can provide more satisfying client service. However certain applications require evaluation resources not yet available to the regions, and so

DEPARTMENT OF COMMUNICATIONS - PROPOSED BTR ORGANIZATION

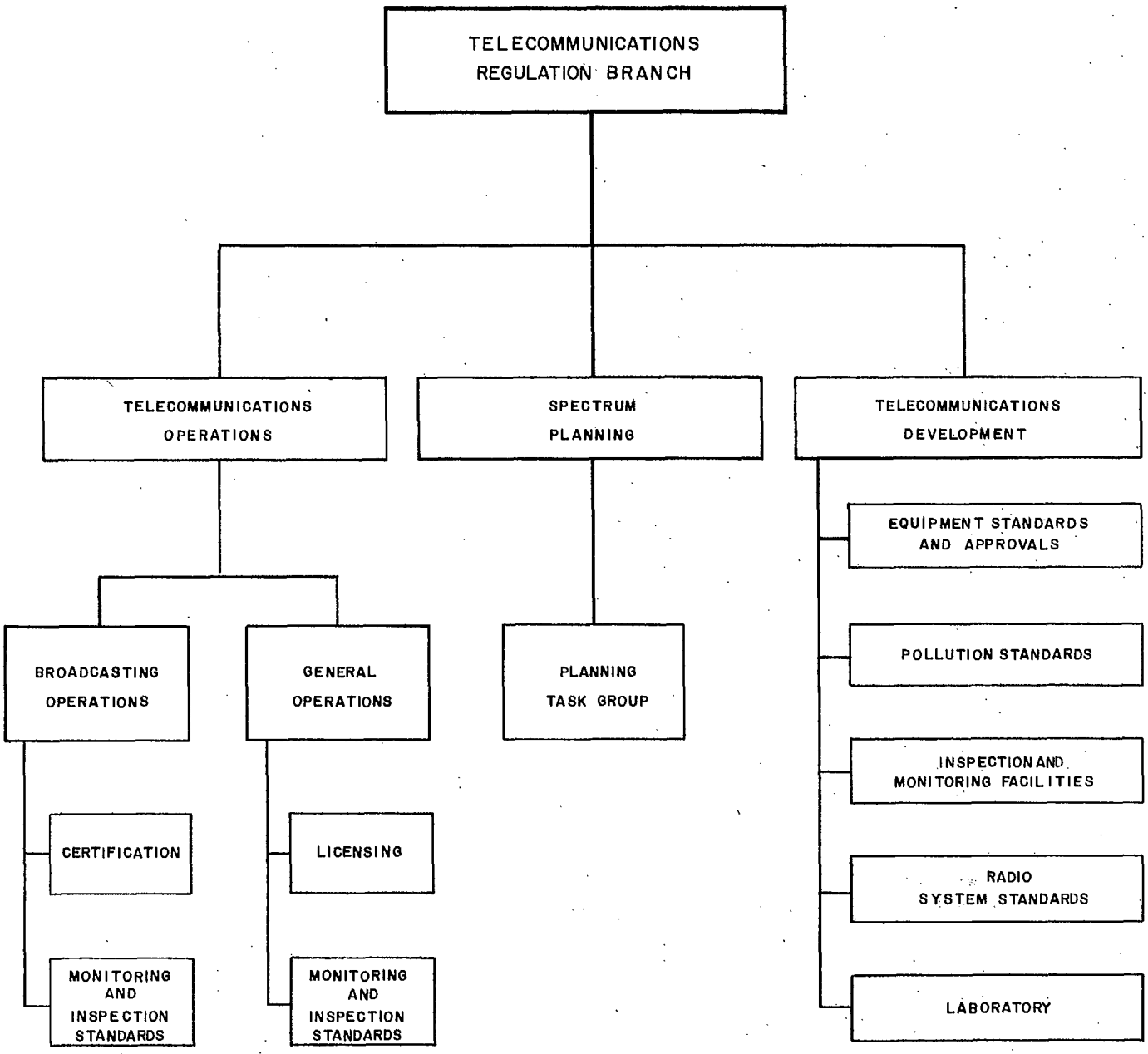

Figure 1

this headquarters group must be maintained. As regional volume of business grows, additional resources in the field can be justified. Further, the development of more sophisticated computer-assisted evaluation programs will allow more decentralization in future. Thus the future licensing aspects of the role of this division will become standards coordination. This is not to imply that all licenses should be judged on the same basis no matter what the circumstances. Rather, it is meant to imply that similar situations should receive similar treatment.

A further responsibility of the Operations Division is the development of standards for the inspection and monitoring by regional offices of radio spectrum users' operations. Leasing of a portion of the spectrum carries with it a responsibility for proper use of the resource, according to the terms of the lease. Ensuring that this is done requires that standards and procedures be worked out, so that the regional and field units of the Department can effectively and uniformly carry out the necessary monitoring, and if necessary, the enforcement of the provisions of the license.

Until the deliberations of the Telecommission are concluded, the responsibility for broadcasting licensing in Canada, which is presently shared by the Department of Communications and the Canadian Radio-Television Commission, may not be firmly established. Therefore, in depicting the Operations division two operational groups are shown, one for Broadcast Operations, and the other for General Operations (covering all non-broadcast users of the radio spectrum). The Broadcast Operations group is that portion of the present Broadcast Engineering and Certification division that relates to the processing and evaluation of broadcast certificate applications.

Should the reports of the Telecommission recommend that the responsibilities for broadcast licensing remain essentially as at present, then consideration should be given to a gradual merging of broadcast certification activities with those of non-broadcast licensing. Although the technologies differ, these activities are now virtually identical in the two groups, and it follows from the unified spectrum management principle that the most effective discharge of the responsibilities of the Operations division will be accomplished by this merger.

Telecommunications Development Division

The Telecommunications Development Division, (Equipment and Systems), performs the role that is oriented towards the supplier market of the manufacturing industry. It is responsible for encouraging development, in close liaison with the industry and research organizations, of equipment and system standards that will allow the fullest utilization of the limited resource while preventing undue wastage. It is also responsible for developing equipment standards that will assist the Operations division in preparing procedures for inspection and monitoring. Finally, it can generate data fundamental to the Planning Division.

The clear identification of a supplier market-oriented organizational unit will permit the generation of a close liaison with Canada's telecommunications industry and research establishments, so that leadership can be exercised in developing the fruits of research to benefit the nation. This role will involve user market information developed through activities of the Operations Division and Planning Division and the communication of this information to the manufacturing industry.

Another important aspect of the development role of this division relates to the internal activities of the Branch. To be effective in its operational role with the user market, the Operations division must be able to specify equipment adequate to the work of inspecting and monitoring communication installations. Standards for inspecting equipment and monitoring systems are part of the Development Division's role. In addition this Division must be able to provide data useful to the Branch's planning role, so that the current situation can be accurately gauged to carry on reliable forecasting of inspection and monitoring needs and problems.

The Branch's engineering laboratory is retained as part of the Development division. It's role, like all other elements of the Branch, is market-oriented. Because it is physically isolated from the rest of headquarters operations, it will be doubly important to stress the marketing role in the management of the laboratory. A principal activity will be the development of liaisons with personnel in the headquarters staff of the operations, planning and development divisions, as well as with the industry and with the regional offices of the Department.

Spectrum Planning Division

The Spectrum Planning Division serves the public at large through planning the allocation of the limited resource of the radio spectrum. One aspect of this work is the collection and analysis of data relating to the market use of the resource, both present and future. This division is required to keep abreast of activities in the manufacturing industry and in research and of consumers' needs and problems, to permit the most effective allocation of the spectrum.

Economic and social considerations are growing in importance with technical criteria for the licensing of spectrum users. Hence, another aspect of this division's work is that of coordinating the evaluation responsibilities that lie outside the branch with those that are within the Branch, so that all criteria can be adequately considered in the planning process.

The business of radio spectrum management is characterized by change, not the least of which is obsolescence of the technical manpower associated with it. A further aspect of the planning role then is the planning for the development and training needs of the Branch personnel, so that careers may be fruitful and the scarce human resources may be effectively employed.

Another way of looking at the role of this planning division is that it permits close and unhampered attention to be given to major problems of the Branch, while at the same time it permits anticipating and influencing the trends that will evolve into tomorrow's situations.

It should not be construed that the role of the planning division is to control the activities of the other two divisions. On the contrary, each division's role requires the support of both the others, so that no one division controls Branch activities. To ensure that planning does not become pre-eminent, the planning division should be a small task group. It is the responsibility of this group to work closely with the Operations and Development groups, and to liaise with outside establishments as necessary. As problems arise that require specialized assistance such as management consulting, the services of the Department's Management Services Branch could be employed.

While individuals comprising the planning group will bring to it specific skills, it is not proposed that they be assigned particular specialized responsibilities within the planning role. Responsibilities should remain with the group as a whole, with each individual making contributions as he is able. For this reason, a broad cross-section of skills are required, drawn from all facets of engineering and technical backgrounds that comprise the spectrum management business. However, since this is a task group, more is required than specific experience and skills related to the technology. Each member of the Planning division, even more so than for the other divisions, must be able to effectively work in the group situation. Since anticipation and reaction to change are so important in the discharge of this division's responsibilities, the ability to contribute effectively in a sometimes unstructured group environment is an essential requirement.

Branch Support Services

Unlike the present organization, a separate services division is not included. Rather, the necessary drafting, accounting, stenographic and clerical services that each of the three divisions requires for their activities are to be made part of each particular division and responsible to that division. For the inevitable overload situations, it is expected that the Branch will call upon the central pool of support personnel available through the Department's Finance and Administration organization.