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Technological Innovation Studies Program

Research Report

ANALYTICAL STUDY OF SIGNIFICANT
TRAITS OBSERVED AMONG A PARTICULAR
GROUP OF INVENTORS IN QUEBEC

by

Jean Robidoux

Faculty of Administration
University of Sherbrooke

August 1974

Rapport de recherche

Programme des études sur les innovations techniques

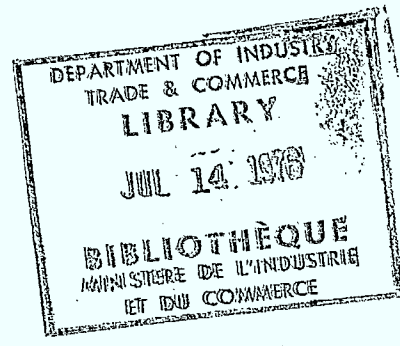


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Direction des sciences
et de la technologie
Ottawa, Canada



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The views and opinions expressed in this report are those of the author and are not necessarily endorsed by the Department of Industry, Trade and Commerce.

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FACULTY OF ADMINISTRATION

UNIVERSITY OF SHERBROOKE

August 1974.

FOREWORD

This detailed study resulted from a close co-operation with the members of the Social Psychology laboratory of Sherbrooke. I would like to stress particularly the continued support extended by Messrs. Jacques Moreau and Louis Côté, both students at the Psychology Department of the University of Sherbrooke. Furthermore, Professor Maurice Payette, of the same Department, provided judicious advice throughout this project. Finally, Mr. Marc Bourret, President of Invention Quebec Inc., co-operated in the speedy launching of the project by giving us access to some basic data allowing us to contact the inventors, who then responded quite willingly to our appeal.

Jean Robidoux
Professor
Faculty of Administration
University of Sherbrooke.

August 1974.

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INTRODUCTION:

1. ORIGIN OF THE STUDY.

During a visit to Expo Profits held at the Windsor Hotel in Montreal in November 1972, the author of this report met Mr. Marcel Ducharme, the prime mover behind that successful initiative and at that time a founding director of Innovation Quebec.

Following that initial meeting, Mr. Ducharme agreed to participate in December 1972 in a committee for evaluating term projects of students registered in the M.B.A. program of the Faculty of Administration, University of Sherbrooke. Since the papers submitted by these students to the evaluation committee were largely oriented towards the conceptualization and implementation of projects having an innovative nature, it seemed subsequently advisable to check whether a significant number of persons who had achieved a very marked success level in the creation of firms possessed particular traits that could somehow account for their success in business.

A first research project was initiated in 1973 in order to take stock of several dominant characteristics of 40 businessmen who had been very successful in Quebec.(1). In May 1973, a project inspired by some of the conclusions of this first report was submitted to the Department of Industry, Trade and Commerce in Ottawa, for approval. It must be specified that this second project deals exclusively with a particular group of inventors in Quebec. This new study does not purport to effect a comparison between successful businessmen and inventors in Quebec, but rather to verify whether there are some particular dispositions that could explain to some extent the urge to innovate and to create which drives these two groups of people acting in separate, but somehow analogous, sectors of activity.

(1) Robidoux, J., Cloutier, A.G. - Profil Sélectif d'Entrepreneurs exploitant des Entreprises à Succès au Québec, May 1973, pp. 184.

2. EVOLUTION OF INNOVATION QUEBEC.

As mentioned earlier, Innovation Quebec was set up in March 1972, based on a large Local Initiatives Program (LIP) subsidy granted by the federal government. According to a press release issued by Innovation Quebec in 1972, that organization was oriented primarily towards "craftsmen, innovators, owners of small industries, in order to help them implement the concepts discovered by their fertile imagination". (1) The cost-free assistance to be given initially was to have comprised the following:

- protecting the priority of the concepts submitted,
- effecting preliminary research,
- outlining the industrial plans,
- manufacturing prototypes, if necessary,
- offering study services and start-up services.

Besides the services already mentioned, Innovation Quebec was to offer practical assistance to inventors, stimulate their latent energies, etc. Eventually, an invention data bank and an inventors' association were to be added to the main auxiliary services mentioned. These two services have now been available for some time to inventors wishing to use them under the aegis of Invention Québec Inc.

Without providing a detailed chronological sequence of the events that occurred between November 1972 and January 1974, when this report was started, we would merely like to stress that during our preliminary contacts in November 1973, the managers of the organization, thereafter called Invention Quebec Inc., provided us with all the support required for carrying out the project. Considering that the subsidy granted to Invention Quebec ran out on January 25, 1974, we thought fit to limit the scope of the present study to cover

(1) Expo Profits, Horizon 4, Innovation Quebec 1972, p. 1.

only the regular members of the Inventors' Club, the files of which are now under constant scrutiny by the managers of Invention Quebec Inc. According to the present director of Invention Quebec Inc., Mr. Marc Bourret, the members of the Inventors' Club are a nucleus made up of the most dynamic inventors who used initially the various free services offered by Innovation Quebec. The members pay an annual membership fee to the Inventors' Club. The purpose of this non-profit organization is to pursue the initial objectives of the LIP project, at a more limited - but no less energetic - pace.

3. SCOPE OF INVENTION IN QUEBEC.

According to the data contained in a document prepared by Innovation Quebec in 1972, there were approximately 9,000 inventions patented in Quebec. This figure does not claim to represent the real number of all inventions conceived in Quebec, but only those that have reached the decisive patent stage. In view of the lack of reliable data concerning the number of inventions of all types now in various stages of development at patent agents' offices or in the hands of other organizations, we have assumed for a fact that there are in Quebec in 1974 approximately 1,000 inventors having at least one creation to their credit (1).

After arriving at this figure, let us note that the Inventors' Club had approximately 350 regular members in January 1974. It is thus perfectly reasonable to believe that these 350 persons represent approximately 1/3 of the inventors recognized in Quebec; we believe this ratio to be sufficiently representative of the total number of inventors in Quebec to permit a sufficiently broad-based study of that particular group.

(1) Expo Profits, Horizon 4, Innovation Quebec 1972, p.2.

It must be stressed that this study covers a very heterogeneous stratum of inventors, some of whom are credited with several significant inventions, while others are just starting out. As a rule, the type of inventor covered in this study is an independent inventor of the occasional variety rather than a person dedicated to full-time research in a laboratory or elsewhere. This is a very important distinction, since the clientele sought by Invention Quebec Inc. is precisely that of the small creators, craftsmen and innovators who do not generally have at their disposal adequate technical, legal and financial resources to bring their inventions to fruition without expert assistance. One must thus think within this framework in order to grasp fully the profile of the inventor this study deals with.

4. DEFINITION OF THE OBJECTIVES SOUGHT.

This study has two distinct objectives:

A) Establishing a profile of inventors in Quebec.

It seems obvious, after some verification, that few detailed studies have been done to describe the average Quebec inventor. Therefore, we deemed useful to stress the accumulation and analysis of the data collected previously in bulk by Innovation Quebec and by its successor, Invention Quebec Inc., in order to attempt to extract certain trends upon which a valid descriptive outline of the Quebec inventor could be based. This first section of the report is thus essentially of an exploratory nature. Its purpose is to show as accurately as possible the dominant traits of the inventors who have used the services offered by Invention Quebec Inc. Thus the stress will be on the distinctive traits, the aspirations and the field of activity of the inventors who responded to our appeal in a questionnaire described in a later section of this report.

B) A survey of the problems and expectations of inventors in Quebec.

After tracing, as accurately as possible, a profile of the inventors covered in this study, we deem useful to state the particular problems independent inventors must tackle in order to develop, protect and market their inventions. We have tried to discover the needs of inventors, their perception of patent agents, of manufacturers, of the Canadian patent system, etc.

We thus believe that we are filling a gap noticed by those who have studied Canadian industries, and invention in Canada particularly. Andrew H. Wilson, in his "Invention in Today's Context" states that: "Before amending the patent regulations, there must be a more detailed study on the problems confronting the independent inventor and the small businesses, both now and in the future" (1).

(1) Wilson, A.H., L'invention dans le contexte actuel, p. 77.
Information Canada, Ottawa 1970, p. 77.

I. METHOD.

I.1 Preparation of the survey.

Before the final launching of the project, it was necessary to reach an agreement with the directors of Invention Quebec Inc., providing a clear definition of our mandate and of the objectives pursued. It was agreed at that time that Invention Quebec would make available to us the data required for a proper development of our study. In view of the necessity for respecting the confidentiality concerning the technical content of the inventions, we had no access to the individual inventor files. However, an information grid was prepared for the use of the personnel of Invention Quebec, so that the latter may collect all the basic data essential to our study.

Approximately 3,000 invention files have been constituted at Invention Quebec since 1972. The said files have not been classified by inventor, but rather in a chronological order according to the date of receipt. Thus, in some cases, certain technical aspects and the number of inventions per inventor registered were the only data retained. The total number of files on archive covered approximately 1,500 inventors, but in several cases these files were incomplete, and their up-dating for the purposes of this study would have been much too laborious.

For the reasons stated earlier, we opted for studying in-depth the 340 files which constituted the data bank of the Inventors' Club in January 1974. This organization, an appendix of Invention Quebec Inc., comprises - according to its sponsors - the most dynamic among the inventors, who have used the services of Invention Quebec Inc. since its inauguration. Considering the importance that we attributed to the pertinence of the data, we were able to collect the following accurate data relating to each member of the Inventors' Club:

- Name, address, telephone number, etc.
- Number of inventions submitted.
- Invention sectors.
- Type and nature of the services used.
- Expenses incurred.
- Stage reached in protection, development and market study.

All these important data were given to us by the personnel of Invention Quebec on forms established previously by our research team.

Interviews:

After the sifting and initial compilation of the basic data, it was agreed to interview a representative number of candidates registered with the Inventors' Club. The purpose of these interviews was to discover the inventors' perception of invention in general. The research team met eight (8) inventors during semi-structured interviews lasting one hour each. Besides allowing an evaluation of the inventors' reactions to the preliminary grid of questions, these encounters facilitated the verification of the level of pertinence of the following variables:

- inventors' working methods;
- number and sector of inventions;
- leisure;
- motivation;
- sources of satisfaction;
- link between the candidates' inventions and leisure;
- type of work;
- level of schooling;
- problems encountered,
- money invested;
- aid received;
- attitudes towards patent agents and Invention Quebec;

- various suggestions;
- various sociological variables.

Preliminary questionnaire.

While the semi-structured interviews were being carried out, a written questionnaire covering the same aspects was sent to inventors selected at random among the population described earlier. The purpose of this first questionnaire was to verify the comprehension of written questions, as well as to estimate the foreseeable response rate by mail. That rate was found to be 55% after receipt of 11 duly filled-in questionnaires at the end of the period allowed for their return.

1.2 Problem definition.

The data collected during our preliminary survey work allowed us to retain ten determinant dimensions to be used in characterizing independent inventors. These dimensions are the following:

- A) socio-demographic portrait;
- B) attitude towards their profession;
- C) personality traits;
- D) link between inventions, leisure, work and studies;
- E) leisure;
- F) inventors' work methods;
- G) experience in the field of invention;
- H) Invention Quebec services used;
- I) attitude towards the relevant organizations;
- J) problems and aid requirements.

Each dimension is characterized by a certain number of indices or variables. The following is a brief description of the variables studied.

A. Socio-demographic portrait.

In view of the exploratory character of this study and of the lack of sociological data concerning Quebec inventors, it was important to collect information on the following points: age, sex, languages spoken, presence of inventors within the family or the social environment, level of schooling, specialized courses, marital status, spouse's work, present occupation, income and area of residence.

B. Attitude towards their profession.

Four variables determine this dimension: the satisfaction of the inventors with their present job, the possibility of using their creativity on that job, the type of remuneration and the size of the firm where the work is being done. It seems probable that the job satisfaction is proportional to the possibility of the inventors' using their creativity within the framework of their job. Furthermore, it is plausible that job insatisfaction constitutes a motivation to be creative in some other field.

C. Personality traits.

Once a portrait of independent inventors has been established, it is interesting to verify the subjacent motivation of that creative activity. Personality traits thus constitute a fully relevant factor. This dimension comprises the following variables: Motivations, aspirations, perception of the chances for achieving those aspirations, perception of the importance of business sense for becoming a successful inventor and possession of business sense.

D. Link between inventions and leisure, work and studies.

Three variables are used to measure the relative place of inventive activities in the life of an inventor. They are as follows:

the link between inventions and leisure, between inventions and the job, and between inventions and the inventors' studies. The preliminary survey allowed us to assume that "the person who invents within the framework of his or her job is different from the person who invents within an entirely different context.

E. Leisure.

This heading comprises two variables, namely: the types of leisure and the degree of activity during the inventors' leisure. The assumption is that inventors are more active during their leisure than most of the population.

F. Work methods while inventing.

Four variables are used to indicate inventors' work methods: the regularity, the number of working hours per week, work alone or in a team, and the attitude towards team work. These variables reveal to us the favorable, or even optimum, conditions for inventive work.

G. Experience in the field of invention.

This dimension comprises several variables that provide the basic data relative to the inventors and to their inventions. These variables are as follows: the number of inventions, the sectors of invention, the number of sectors touched, an index of scatter among the various sectors, the number of studies effected at the Patent Office, the result of the studies, the amount of expenses, the number of years of experience as an inventor, the stage reached as regards patent protection, development and marketing, the satisfaction concerning the financial results (outlays and income).

H. Invention Quebec services used.

Since one of the purposes of this study is to evaluate how the inventors judge the effectiveness of Invention Quebec, it was essential to survey the services of Invention Quebec used by the inventors. This dimension depends upon the following aspects: expenditures incurred at Invention Quebec, the number of old and new files, the number and type of services used and seniority with Invention Quebec. These variables will allow us to analyze Invention Quebec and its rôle with respect to some inventors in Quebec.

I. Attitude towards the relevant organizations.

In order to complete the profile of independent inventors, a measurement of the inventors' attitude towards various organizations was deemed necessary. This dimension comprises the following variables: level of confidence towards patent agents, manufacturers and Invention Quebec, satisfaction with Invention Quebec, contacts with patent agents and with some manufacturers, degree of satisfaction with these contacts.

J. Problems and aid requirements.

In order to be able to submit recommendations geared to the real situation of independent inventors, it is essential to include in the study a section dealing with their problems and with the kind of assistance they would like to obtain. This dimension comprises four variables: problems encountered, financial assistance requirements, technical assistance requirements, various suggestions to the federal government concerning inventions.

I.3 Questionnaire structure.

The encouraging response rate to the preliminary questionnaire, as well as the geographic dispersion of the respondents throughout the province of Quebec supported the adoption of a survey questionnaire rather than the use of interviews as a means of contact.

The questionnaire adopted was designed so as to provide data relative to every dimension described in the list of variables. A copy of the final questionnaire retained is attached to this report (Appendix A).

It must be noted that the questionnaire has been pre-tested in order to check whether the questions were clear enough, and how long the response time was.

1.4 Selection and response rate.

After deciding to restrict our survey to the members in good standing of the Inventors' Club, 340 respondents met our selection criteria. The respondents to the preliminary survey and those living outside the province of Quebec were eliminated at this second stage. Two hundred and ninety-one questionnaires were sent out, 173 of which within the Montreal region (60%) and 118 outside Montreal (40%).

TABLE 1
DISTRIBUTION OF THE RESPONDENTS AMONG
THE QUEBEC ADMINISTRATIVE REGIONS

Administrative regions	F	%
Montreal	119	73.0
Quebec	17	10.5
Three-Rivers	13	8.0
Other areas	14	8.5
TOTAL	163	100.0 %

Exactly 163 replies were returned, i.e. 56% of the sample. As shown in Table 1, the respondents are distributed as follows: 119 from Montreal (73%) and 44 from outside (27%). There is thus a strong representation of respondents from the Montreal area. This is easy to explain, since it was possible to call the inventors within the Montreal region to secure their co-operation and to check their address, with a view to their possible moves during May. Unfortunately, a lack of time and funds prevented the same procedure being done with respondents outside Montreal.

II - DESCRIPTIVE ANALYSIS OF THE DATA.

The purpose of this section is to present the profile of the independent inventor based on the data collected by means of the survey questionnaire and of the files of Invention Quebec.

These data will be analyzed in the same order as the main dimensions described in the list of variables (section I-2), except for the variables connected with the "Invention Quebec services used" and "problems and aid requirements", which shall be studied in greater detail at the end of the report.

This first section of the report concludes with a synthesis of the salient points observed among the inventors within the sample.

1. Socio-demographic portrait.

This dimension comprises the basic sociological data relative to the independent inventors covered in this study.

A. Age.

A first compilation shows the age of the inventors. Table 2 reveals a concentration of inventors in the middle, and mainly in the mature, age categories.

TABLE 2
AGE DISTRIBUTION OF THE INVENTORS

Age categories	F	%
20 - 24 years	7	4.3
25 - 34 years	40	25.2
35 - 44 years	37	23.4
45 - 54 years	48	30.5
55 years and over	26	16.6
TOTAL	158	100.0 %

Forty-eight inventors, i.e. 30.5% were between 45 and 54 years of age. The two previous categories do not differ by much: i.e. 37 inventors (23.4%) between 35 and 44 years of age; and 40 inventors (25.2%) between 25 and 34 years of age. The group mean is between 40 and 45 years of age.

It is interesting to compare the above distribution with the age curve of Quebecers in general. Figure 1 shows a comparison between the age of this group of inventors and the age of the population of Quebec in general.

The population of Quebec comprises a higher proportion of individuals in the extreme categories of 20 to 24 years and 55 years of age and over. Table 2 shows that this trend is reversed among the inventors covered in this study. It is easily noted that there is a high proportion of inventors in the 25-to-54-years categories relative to the Quebec population. Furthermore, a concentration of inventors is noted in the 45-to-54 age bracket.

B. Sex.

The inventors in this sample are mainly male. Out of 163 respondents, 149 were male (91.5%) and 14 female (8.5%). It would be out of the question to conclude that invention is a trait of the male sex; many uncontrolled variables could be at play in this distribution, and it proved impossible to check their scope within a study of this type.

C. Languages spoken.

In order to check whether the ability to express oneself in two languages has any influence on being an inventor, the respondents had to indicate the languages in which they are fluent. After a detailed preliminary verification of the files, it became obvious

FIGURE 1.

Comparative curve: Age of Quebecers⁽¹⁾ vs. Age of inventors.

percentage

_____ : Quebecers' age curve

____ : inventors' age curve

age (years)

(1) Quebec Yearbook 1973, p. 187.

that there were very few English-speaking members of the Inventors' Club (less than 10%). Therefore, a single French version of the questionnaire was used. It is credible that all the inventors contacted had a sufficient level of comprehension of French to reply appropriately to the questionnaire. The group of respondents comprised 86 persons (54.9%) who spoke both French and English, whereas 73 persons (44.8%) spoke French only; three other persons spoke a language other than English, besides French. The inventors questioned are thus divided almost evenly between bilingual persons and persons speaking French only.

D. Schooling.

The distribution of inventors according to the level of schooling reveals a quite significant point. The most numerous group, 43.2% of respondents, completed their secondary schooling. Incidentally, 26.6% of respondents did not advance beyond the level of elementary school. Finally, 16.2% passed the college level, and 14% were University graduates.

TABLE 3

DISTRIBUTION OF INVENTORS BY LEVEL OF SCHOOLING

<u>Level of schooling</u>	<u>F</u>	<u>%</u>
Primary	43	26.6%
Secondary	70	43.2
College	26	16.2
University	23	14.0
<u>TOTAL</u>	<u>162</u>	<u>100.0 %</u>

E. Refresher (training) courses.

This is another interesting factor complementing the previous one. It involves the training or refresher courses taken by the inventors. The 157 replies to this question are distributed as follows: 64 respondents (40.7%) have taken such courses, whereas 93 (i.e. 59.3%) have not.

Table 4 contains a list of the types of course taken by the various respondents.

TABLE 4

DETAILS OF THE TRAINING (REFRESHER) COURSES TAKEN BY THE INVENTORS.

Training course	F	%
Trades and Techniques	29	50.0
Human Sciences	9	15.6
Business	8	13.7
Arts	6	10.4
Languages	5	8.5
Pure Sciences	1	1.8
TOTAL	58	100.0 %

Let us note that only 58 of the 64 who replied to this question specified the type of course in which they registered. This analysis shows that 29 inventors, i.e. 50% of those who specified the type of course they had taken, trained within the trades and techniques category. This category includes: electricity, construction, carpentry, body-work, welding, mechanics (Diesel, automobiles, aircraft), refrigeration, industrial design, etc.

Nine persons (15.6 %) took so-called "Human Sciences" courses: psychology, character study, leadership, human relations, personality, etc.; while only eight learned business practice or management.

F. Marital status.

A very large proportion of the inventors interviewed was married: 72.9% (118 persons), 19.8% (32 persons) being single, and 7.3% (12 persons) having some other marital status.

G. Spouse's work.

Questioned on this point, 37 persons (30.3%) replied that their spouse had a regular job, while 85 persons (69.7%) stated the opposite. Altogether, 122 persons replied to this question.

H. Present occupation.

According to the 160 complete replies to this item, 129 persons (80.6%) work full-time; they constitute the so-called working segment of the inventors. The other 31 respondents include students, housewives, pensioners, disabled and unemployed persons. The 7.5% (12 persons) unemployment rate, calculated on the total number of respondents, is much the same as the current rate of unemployment in the province of Quebec.

The working segment of the inventors is distributed among the following nine job categories.


FIGURE 2


Comparative curve: Quebecers' vs. inventors' job categories.

percentages

_____ : Quebecers' (1) curve

===== : inventors' curve

 : overrepresentation of inventors

 : underrepresentation of inventors

tradesmen
 office employees
 professionals and technicians
 employees in the services
 managers
 salespeople
 farmers and primary sector
 transportation and communications
 laborers and unskilled

job categories

(1) Quebec Yearbook, 1973, p. 432.

TABLE 5

INVENTOR DISTRIBUTION BY CURRENT OCCUPATION

Job categories	Employed inventors	
	F	%
Trades and allied jobs	44	34.1
Professionals and technicians	38	29.4
Managers	16	12.4
Salesmen	10	8.0
Unskilled labourers	8	6.1
Office clerks	7	5.5
Farmers, primary sector	3	2.3
Transportation and communications	2	1.5
Services	1	0.7
TOTAL	129	100.0%

Almost all respondents have jobs in three of the nine categories shown in Table 5.

Indeed, 44 persons (34.1%) are tradesmen, 38 persons (29.4%) are professionals or technicians, and 16 persons (12.4%) are managers.

It is worthwhile stressing that there appears to be a link between the training courses taken (trades, techniques, human sciences, business) and the main jobs held by the respondents. These two variables foreshadow the importance of technical competence in the field of invention.

Furthermore, the comparison of the jobs held by the inventors with those held by Quebecers in general proved just as interesting.

In this sample, the inventors were over-represented with respect to the Quebecers in the following job categories: tradesmen, professionals and technicians, managers, salesmen, unskilled labourers. The over-representation of inventors among tradesmen, among professionals and technicians, and among managers - relative to the population of Quebec - was demonstrated by the chi-square test, with a significant difference at the .001 level, with three degrees of freedom (99.9% certainty). This relationship is clearly shown in Figure 2. The inventors covered in our study thus constitute a particular group of the population of Quebec so far as their present occupation is concerned.

On the other hand, the inventors questioned comprise proportionately fewer office clerks, transportation and communications employees, fewer people in the primary sector and much fewer employees in services than is the case in the population of Quebec in general. This underrepresentation obviously completes the overrepresentation described above.

I. Annual income.

As regards annual income, the inventors are fairly evenly distributed among the following three categories: 47 persons (30.2%) earn \$0.00 to \$6,000.0 per annum, 55 persons (35.4%) earn between \$6,001.0 and \$11,000.0, 54 persons (34.4%) earn more than \$11,000.0 per annum.

TABLE 6
DISTRIBUTION OF INVENTORS BY ANNUAL INCOME

Annual income	F	%
\$0 to \$6,000	47	30.2
\$6,000 to \$11,000	55	35.4
\$11,000 and over	54	34.4
TOTAL	156	100.0 %

These results tend to demonstrate that the inventors questioned have rather high incomes, higher than that of the Quebec population (1). However, one must take into account the fact financial questions can easily elicit misleading answers. It must be noted, furthermore, that some of the respondents have included their spouse's income in their own annual income. Moreover, the small proportion of women in the sample has undoubtedly an effect on the distribution of income.

However, even taking into account the above factors, the annual income of the inventors remains nevertheless above the current average if results are interpreted in accordance with official government statistics. This conclusion may also be explained by the overrepresentation of the better-paying job categories among the inventors of our sample.

J. Presence of inventors among one's family and friends.

Under this heading, the respondents were asked to indicate the presence of inventors in their family, among their relatives as well as within their immediate environment. This last variable was required in order to discover and compare, if applicable, the influence of the family environment and of the close social milieu on the propensity to create.

TABLE 7
PRESENCE OR ABSENCE OF INVENTORS IN THE FAMILY AND AMONG FRIENDS.

Presence of inventors	Family		Friends	
	F	%	F	%
Yes	64	41.0	25	22.6
No	92	59.0	86	77.4
TOTAL	156	100.0%	111	100.0%

(1) Taxation statistics for the 1971 fiscal year - Department of National Revenue - 1973 edition.

The close or remote presence of inventors appears to influence positively this aptitude to invent, since 63.4% of respondents have been exposed to this influence. Among the respondents, 64 (41%) have inventors within their family and 25 (22.6%) know some among their friends. The family thus appears to be a more decisive variable than the close social environment. Even though we are unable to evaluate systematically the effect of these variables on inventive activity, it is nevertheless possible to assume that some factors which can be ascribed to the environment are likely to favor the emergence of inventors.

This kind of climate favoring the creation of inventions may be compared to some extent to the influence successful businessmen can have on the careers of their children, who tend to follow in the traces of the former. This is, at least, one of the conclusions that emerged from a study concerning successful businessmen, mentioned at the beginning of this report.

2. Attitude towards their job.

This dimension of our list of variables intended to measure the incidence of the present occupation of the inventors on their creative activities. The following are the results obtained in respect of the various aspects of this dimension.

A. Type of remuneration.

The fact whether the inventor is self-employed or not may prove to be an indicator as to the motivation to invent due to a need for independence, or even due to a desire to become one's own boss.

Out of the 144 complete replies to this question, only 36 persons, i.e. 25% claimed to be self-employed. The other 108 persons are employed in various firms. This fact allows us to conceive as

a possible motivation for invention the desire to become one's own boss.

B. Size of the firm.

Since the size of the firm may influence job satisfaction, the questionnaire intended to provide data on this point.

TABLE 8

SIZE OF THE FIRMS WHERE INVENTORS ARE EMPLOYED.

Number of employees per firm	F	%
1 to 100	62	53.1
101 to 500	20	17.2
501 and over	35	29.7
TOTAL	117	100.0 %

Over one-half of the respondents, i.e. 62 persons, work in small firms having 100 employees or less; 20 (17.2%) work in medium firms and 35 (29.7%) are employed by firms with more than 500 employees.

C. Job satisfaction.

The degree of job satisfaction is one of the important variables on our list. On the other hand, job dissatisfaction could become a source of motivation to create within some other field in order to achieve recognition, or to find a means of leaving one's job.

TABLE 9

Degree of satisfaction with one's job	F	%
Satisfied, very satisfied	108	70.3
Insatisfied, very insatisfied	46	29.7
TOTAL	154	100.0

In fact, 108 inventors (70.3%) claim to be satisfied or very satisfied with their current job, while 46 (29.7%) are insatisfied or very much so. This strong tendency towards job satisfaction will be studied in greater detail in the section dealing with the characteristic traits of inventors.

D. Creativity on the job.

As a general rule, an important component of the satisfaction derived from a job consists of the possibility of being creative on that job. Table 10 deals with this matter.

TABLE 10

Creativity on the job	F	%
A great amount, enough	74	47.2
Not too much, none at all	83	52.8
TOTAL	157	100.0

Divided almost evenly on this question, 47.2% (74 persons) inventors use sufficient or a good deal of creativity on the job, whereas 52.8% (83 persons) use little creativity or none at all.

These data, as well as the results concerning job satisfaction, indicate that these variables are not exclusively interdependent. Factors other than the possibility of being creative on the job, such as wages, working conditions, job security, etc., may also affect the level of satisfaction. We shall also deal with this point in more detail in the following chapter.

3. Personality traits.

The "personality traits" dimension comprises the variables that are central to our list. This is the dimension based on which it will be possible to detect the factors causing inventors to create and supporting them in that activity. As a result, the variations of the various indicators of this dimension will be studied carefully.

A. Motivations.

The "motivations" variable reveals the source of the energy invested in inventions. The inventors had to make two choices from a list of ten possible motives, in order to identify their motivation. These ten items are comprised within three main motivations:

- a) the pleasure derived from creative activity;
- b) the desire for social advancement;
- c) personal recognition through creation.

The detailed description of the items associated with each one of the three main motivations.

a) Pleasure derived from creative activity.

This motivation concerns the inherent satisfaction derived from the creative act. It includes four elements:

- "in order to solve real problems encountered in everyday life";
- "due to a liking for the work implied in the conception and development of an invention";
- "in order to be able to use one's creative abilities which would otherwise have remained idle";

- "in order to spend one's leisure time more productively".

b) Desire for social advancement.

This motivation reveals a desire to change one's social position due to reasons of personal dissatisfaction. It comprises three elements:

- "in order to improve one's financial standing";
- "due to a desire to enter business and become one's own boss";
- "in order to secure a more interesting job".

c) Recognition through creation.

This third motivation associates the inventive act with a compensatory activity; according to this implication, such activity would compensate for one's recognition that is not being granted elsewhere (job, social life, etc.). It comprises three items linked with self-perception or prestige:

- "in order to make one's creative talents known";
- "in order to prove to oneself that one is capable of creating something new and different that no one had yet thought of";
- "in order to make life easier for others".

Let us see now how inventors chose these three motivations.

Table 11 shows inventor distribution according to their first and second choice and according to all choices made concerning this question. Inherent satisfaction in the creative act clearly appears to be predominant. Indeed, for all three classifications, "the pleasure derived from creation" is the most often selected motivation: 89 times (56.2%) as first choice, 59 (37.3%) as second, and 148 (47%) altogether.

TABLE 11
INVENTORS' MOTIVATIONS TO CREATE.

Motivations	First Choice		Second Choice		Total Choices	
	F	%	F	%	F	%
Pleasure derived from creation	89	56.2	59	37.3	148	47.0
Desire for social advancement	35	21.9	58	37.1	93	29.3
Recognition through creation	35	21.9	40	25.6	75	23.7
TOTAL	159	100.0%	157	100.0%	316	100.0%

As first choices, the "desire for social advancement" and "recognition through creation" are equally in favour: they are mentioned 35 times (21.9%). On the other hand, as a second choice, the "desire for social advancement" is almost as important as the "pleasure derived from creation".

It must be noted, however, that the respondents may feel some reluctance to admit that they seek social promotion or prestige; such a reservation would weaken the effect of inherent satisfaction on the creative act.

In spite of this cautionary reservation and of internal fluctuations, it seems that the "pleasure derived from creation" exceeds the other two as motivational factors. The next two are the "desire for social advancement" and the "recognition through creation".

B. Aspirations.

This second "personality traits" variable provides information concerning what inventors intend to do with their inventions. The preliminary study led to the identification of two trends or two sub-variables: the desire to quit one's job and the desire to start one's own business. The various combinations of these variables, as well as the frequency of each, indicate that three out of the five items suggested are more in tune with the inventors' aspirations:

TABLE 12

VARIOUS ASPIRATIONS OF THE INVENTORS.

<u>Aspirations</u>	<u>F</u>	<u>%</u>
- to sell one's inventions to manufacturers, keep one's job and invent during one's leisure time.	59	37.1
- to live exclusively off one's inventions.	34	21.4
- to start a business with one's inventions and leave one's job.	28	17.7
- to be hired by a company as an inventor.	21	13.1
- to start a business with one's inventions and keep one's job.	17	10.7
<u>TOTAL</u>	<u>159</u>	<u>100.0%</u>

- "to sell one's inventions to manufacturers, keep one's job and invent during one's leisure time", 59 times (37.1%);
- "to live exclusively off one's inventions", 34 instances (21.4%);
- "to start a business with one's inventions and leave one's job, 28 instances (17.7%).

These figures indicate that the strongest tendency is to maintain the status quo. However, when these results are grouped

as a function of the two sub-variables (quit one's job, start a business) different trends emerge.

TABLE 13

INVENTORS' ASPIRATIONS DISTRIBUTED ACCORDING TO THEIR DESIRE TO QUIT THEIR JOB AND THE DESIRE TO ENTER BUSINESS

Aspirations (sub-variables)	F	%
quit one's job	83	52.2
keep one's job	76	47.8
Total	159	100.0%
enter business	66	41.5
abstain from entering business	93	58.5
Total	159	100.0%

Viewed according to the desire to quit or keep their job, the aspirations of the inventors interviewed indicate a tendency to quit their jobs (52.2%) rather than keep them (47.8%). However, only 41.5 expressed a desire to start a business.

It results from these two compilations that the greater part of inventors wish to quit their jobs using their inventions. The results obtained for the "creativity on the job" variable seem to indicate that they might wish to have a job that would make greater use of their creativity. This does not necessarily imply that they have a desire to start in business.

C. Perception of the chances for achieving their aspirations.

While it is interesting to know the inventors' aspirations, it is just as important to verify their realism when expressing those aspirations.

TABLE 14

INVENTORS' PERCEPTION OF THE PERCENTAGE CHANCE OF ACHIEVING THEIR
ASPIRATIONS.

% chance of achieving their aspirations	F	%
0%	20	12.9
25	41	26.5
50	41	26.5
75	33	21.2
100%	20	12.9
TOTAL	155	100.0%

The self-evaluation by the inventors of their chances for achieving their aspirations is distributed along a fairly standard curve. The mean is very close to 50%. This implies that inventors give themselves, on average, a 50% chance of achieving their aspirations. This proportion is rather high if we take into account the magnitude of the change required to achieve these aspirations (for instance, to quit one's job).

Furthermore, this distribution reveals a slight tendency towards the lower percentages, which means that more people give themselves few chances of achieving their aspirations. This respondents would not be too realistic, and their aspirations would be based on dreams rather than on projects. It is thus not at all surprising that the 75% and 100% categories include fewer respondents, since they indicate a greater degree of certainty. These categories were probably chosen by those who are very self-confident, either because they already are successful, or because their aspirations are more modest, or even because they are less realistic than the other respondents.

D. Importance and possession of business sense.

The purpose of these two variables is to check the coherence of the respondents. The first variable, the importance of business sense for achieving success as an inventor, tries to measure up to what point the field of business is associated to that of invention. The second one, i.e. the inventors' self-evaluation as to their own business sense, tries to gauge the respondents' realism in their motivations and in their personal aspirations.

TABLE 15

IMPORTANCE AND POSSESSION OF BUSINESS SENSE, TO AND BY INVENTORS.

Business sense	Importance		Possession	
	F	%	F	%
Little, very little	34	20.9	51	31.7
Enough, a great deal	129	79.1	110	68.3
TOTAL	163	100.0%	161	100.0%

At first sight, these two variables seem closely linked, since 129 persons (79.1%) consider business sense to be quite or very important for success in the field of invention, while 110 (68.3%) deem that they have sufficient business sense, or a great deal of it. However, this proportion proved to be non-significant with the shi-square test.

The results of the "importance of business sense" indicator indicate that to the mind of inventors, invention and business are closely related; furthermore, it must be noted that a quite large percentage of those questioned deem to have business sense.

The respondents' coherence appears to be verified. Indeed, on one hand, approximately 40% of those questioned hope to enter business with their inventions, and on the other hand, 68.3% deem that they possess business abilities. Consequently, it is probable that it is precisely those persons who claim to have business ability that wish to undertake the personal exploitation of their inventions.

4. Link between inventions and work, leisure and studies.

This dimension comprises three variables that will be studied together; they measure the share of inventive activity in the life of the inventor.

TABLE 16

LINK BETWEEN INVENTIONS AND WORK, LEISURE AND STUDIES.

Existence of a link with the inventions	Work		Studies		Leisure	
	F	%	F	%	F	%
Yes	76	48.4	67	45.0	70	46.3
No	81	51.6	82	55.0	81	53.7
TOTAL	157	100.0%	159	100.0%	151	100.0%

It is noteworthy that each one of these variables divides the respondents into two almost equal sub-groups. The closest relationship emerges between inventions and work (76 persons, 48.4%); while the remotest was found between inventions and studies (67 persons, i.e. 45%).

Considering that when dealing with aspirations, 37% regard invention as a leisure activity, it is consistent that almost one-half of the inventors establish a link between invention and their leisures. The same observation applies with respect to the relationship that exists between invention, work and studies, since

53.5% of the respondents are tradesmen, professionals or technicians.

As regards those 52.2% who hope to quit their jobs, they might be included, at least in part, among those 51.6% who invent in a field alien to their work, and among those 55% who invent in a sector unrelated to their studies.

5. Leisure.

The "leisure" dimension was included in order to answer two questions: a) what rank does inventive activity have among the inventors' hobbies; and b), is the inventors' leisure time not spent more actively than that of the Canadian population in general?

A. Inventors' leisure.

The respondents had to select from the following list the three spare-time activities to which they devote the greatest amount of time.

- a) listening to music;
- b) crafts, painting, drawing;
- c) reading;
- d) sports and open-air activities;
- e) shows, cinema, theatre;
- f) tonkering;
- g) television ;
- h) parlour games, cards;
- i) work on inventions;
- j) do nothing in particular, rest;
- k) meet friends;
- l) attend sports events.

TABLE 17DISTRIBUTION OF INVENTORS' HOBBIES.

Hobbies	F	%
Work on inventions	92	19.1
Tinkering	68	14.1
Reading	64	13.3
Sports	47	10.0
Music	44	9.1
Television	42	8.7
Meeting friends	33	7.0
Crafts	32	6.6
Theatre, cinema	20	4.1
Parlour games, cards	14	3.0
Sports events	12	2.5
Rest	12	2.5
TOTAL	480	100.0%

According to the distribution curve shown below, work on inventions is the dominant activity of the respondents. This activity was mentioned 92 times (19.1%). Tinkering was next, with 68 mentions (14.1%) and reading ranked third with 64 mentions (13.3%).

This figures show clearly that inventions play a considerable rôle among inventors' hobbies. This observation supports the results obtained for the "link between inventions and leisure" variable.

The ranking of the "tinkering" item allows us to graft yet another characteristic onto the independent inventor's profile. Indeed, inventors are people who tinker a lot; even work on inventions could often be considered to be tinkering. Undoubtedly, independent inventors have particular skills for manual labor; this is supported by the fact that 34.1% of the respondents are tradesmen, a job sector

in which manual labor predominates.

A comparison was made between the distribution obtained by classifying inventors' hobbies according to the amount of time devoted to them, and that of Canadians taken as a whole. Figure 3 shows that comparison; it must be noted, however, that the "radio" item was not included in the list submitted to the inventors, and that the "tinkering" and "invention" items have no equivalent in the Canadian population statistics.

Television, with 51.7% ranks first as a hobby for Canadians as a whole; it only garnered 8.7% of the inventors' mentions. On the other hand, reading, music, sports and crafts are devoted more time by the inventors than by Canadians in general. Inventors leisure habits are thus clearly differentiated from those of Canadians in general. In this respect, inventors constitute a particular group.

B. Activity index of hobbies.

The list of 12 hobbies submitted to the respondents included six active and six passive hobbies. The following activities were considered to be passive: listening to music, reading, watch shows or sports events, television and rest. On the other hand, the following hobbies were deemed active: crafts, sports, tinkering, parlour games, work on inventions and meetings with friends. This distribution of leisure activities made it possible to calculate the number of active hobbies out of the three choices of each inventor. The result is an index of activity of inventors' hobbies. Table 18 shows the respondents' distribution according to the number of active hobbies out of three choices.

Fifty persons (31%) have only one active hobby out of three, whereas 80 persons (49.7%) have two out of three. Furthermore, 25 persons (15.5%) chose only active hobbies. Hence the truth of the earlier remark that inventors have particularly active hobbies.

A comparison with Canadians in general, for this variable only, reveals that the Canadians' first four hobbies are passive and their fifth is active, whereas with the inventors the first two were active, the third is passive, the fourth is active, and the fifth is passive. This comparison clearly supports the previous statement.

TABLE 18ACTIVITY INDEX OF INVENTORS' HOBBIES.

Number of active hobbies	F	%
0	6	3.8
1	50	31.0
2	80	49.7
3	25	15.5
TOTAL	161	100.0%

6. Inventors' method of working on their inventions.

This section of the study covers the various aspects of the work effected by inventors on their inventions.

A. Regularity of the work.

This variable illustrates how regularly the inventor works. Out of 161 responses to this question, 130 persons (80.7%) stated that they worked irregularly, in intensive periods, whereas the remainder claimed the opposite.

It is thus clear that the inventors questioned work mostly in a sporadic manner. Besides, at the time of the preliminary study, several claimed to work mainly when creative ideas struck them.

B. Number of working hours per week.

Those who work regularly on their inventions were asked to indicate how many hours a week they devote to this. The following tabulation also comprises the indications provided by the 25 respondents who only work irregularly on their inventions.

TABLE 19

NUMBER OF HOURS PER WEEK DEVOTED TO INVENTION WORK.

Number of hours per week	F	%
0 to 5	20	35.8
6 to 10	15	26.8
11 to 15	8	14.1
16 to 20	4	7.2
21 to 25	2	3.6
26 and over	7	12.5
TOTAL	56	100.0%

More than one-half of the respondents devote ten hours per week, or less, to their inventions: 20 up to five hours, and 15 between six and ten hours. The average number of work hours per week is around ten, which can be considered high for a hobby, and low for a professional activity.

There is a surprising fact; the frequency increases in the last category, where seven persons (12.5%) devote more than 26 hours per week to their creations. This is likely to be a particular group of inventors doing their invention work almost full-time.

C. Attitude towards team work.

Considering the trend towards team work in most fields, it would be interesting to check whether inventors are joining the movement.

To the question whether they worked alone or as a team, 146 persons (91.3%) replied that they usually work on their inventions by themselves, while 14 inventors (8.7%) work with others. Therefore, team work is effected in practice by a very small minority.

On the other hand, the respondents had been asked to state their opinion as to the relative advantage or disadvantage of team work, both before and after securing the protection of their inventions. These variables constitute an indicator of inventors' wariness; more specifically, of their fear of having their ideas stolen from them.

TABLE 20

INVENTORS' ATTITUDE TOWARDS TEAM WORK BEFORE AND AFTER SECURING A
PATENT FOR THEIR INVENTIONS.

Attitude towards team work	Prior to protection		After protection	
	F	%	F	%
Is rather advantageous	53	35.0	136	87.8
Is rather disadvantageous	98	65.0	19	12.2
TOTAL	151	100.0%	155	100.0%

Prior to the protection stage, 65% of the respondents (98 individuals) are rather against team work; this ratio is reversed and stressed when patent protection has been secured: 87.8% (136 persons) are then rather in favor of team work. These results clarify the previous ones, and reveal a determinant factor in the inventors' attitude, i.e. the factor of protection. This does not imply that other variables, which explain the reluctance towards team work, should be excluded. For instance, the desire to keep all eventual prestige for oneself could in fact lead to a certain reluctance on the part of inventors towards team work.

7. Experience in the field of invention.

This dimension includes a variety of data deemed pertinent and concerning the invention experiences of the persons covered in this study.

A. Number of inventions.

The inventors were required to state the number of all their inventions that were at least in the stage of conception, whether they had already been registered or not.

TABLE 21NUMBER OF INVENTIONS PER INVENTOR.

Number of inventions	F	%
1	31	19.3
2	33	20.5
3	23	14.1
4 - 5	27	16.8
6 - 13	24	15.3
14 and over	23	14.0
=====		
TOTAL	161	100.0%

Approximately 40% of the respondents have two inventions or less; more than 30% have between three and five; while the others (approximately 30%) have more than six inventions to their credit. Consequently, the mean is three, and thus 50% of those questioned have three inventions or less. Incidentally, the average of this distribution is 8.6 inventions per person due to the fact that 13 persons have more than 20 inventions to their credit.

The group of inventors questioned is thus quite heterogeneous as to the number of inventions: 40% small inventors, 45% medium inventors, and 15% very dynamic inventors.

B. Invention sectors.

In order to identify the production areas that attracted the most attention, a list was drawn up covering 18 invention sectors. The respondents indicated the number of inventions they possessed within each sector.

TABLE 22.DISTRIBUTION OF INVENTIONS AND INVENTORS BY INVENTION SECTOR

Invention sectors	Inventions		Inventors	
	F	%	F	%
Games, toys, educational games	201	14.0	55	10.9
Tools, machine-tools	138	9.5	43	8.5
Automobiles, other vehicles	138	9.5	43	8.5
Leisure and sports	130	9.0	49	10.0
Household appliances	128	8.8	49	10.0
Safety devices	108	7.4	43	8.5
Gadgets	90	6.2	26	5.0
Motors	60	4.1	24	4.7
Construction	60	4.1	28	5.5
Snow	40	2.7	16	3.2
Office supplies	29	1.9	16	3.2
Clothing	29	1.9	11	2.0
Medical	25	1.7	8	1.6
Education	25	1.7	12	2.4
Tobacco trade	25	1.7	16	3.2
Communication, audio-visual	21	1.4	9	1.8
Food	19	1.3	11	2.0
Miscellaneous	185	12.7	46	9.0
TOTAL	1,451	100.0%	505	100.0%

The 163 persons who replied to this question produced some 1451 inventions. The 505 total under the "inventors" column is the sum of the various numbers of inventors who worked in each sector.

Approximately one-half of these 1451 inventions are concentrated in five sectors: 201 (14%) in games and toys, 138 (9.5%) in tools, as many again in automobiles, 130 (9%) in leisure and sports, and 128 (8.8%) in household appliances.

The games and toys sector is by far the most popular. On the other hand, the sectors that require a high level of technical competence (tools and machine-tools, automobiles, motors and construction) also exhibit quite high frequencies.

Incidentally, the rank of sectors according to the number of inventors is much the same. The only significant difference was noted with respect to the first five sectors. According to the number of inventors, leisure and sports and domestic appliances become second and third, respectively, replacing tools and automobiles. However, the gap between "games and toys" and the other sectors is much smaller: it amounted to 14% with respect to the number of inventions, but to only 10.9% w.r.t. the number of inventors.

C. Concentration index.

Having surveyed the inventors according to the number of inventions and to the sectors of activity, we may now take the exploration one step further. Did the respondents touch several sectors ("Jack-of-all-trades" inventors), or did they rather limit themselves to only some sectors ("concentrated" inventors)? A concentration index was calculated for each inventor, based on the maximum number of inventions within a sector, divided by the total number of inventions effected.

Based on this index, the group is divided almost evenly into two sub-groups on either side of a concentration criterion set at 60%. Jack-of-all-trades inventors include 90 persons (57.4%), while "concentrated" inventors number 67 (42.6%).

Unfortunately, the limitations of this study prevent us from checking hypothetical links between the "Jack-of-all-trades" inventor and the inventor who does not carry out his inventions; or between the "concentrated" inventor and the one who invents within his field of professional competence. Two types of inventor, widely divergent in their creative method, would then become evident.

D. Studies at the Patent Office in Ottawa.

a) Number of studies.

If he wants to be sure that his creation is indeed an original invention, the inventor must initiate a study at the Patent Office in Ottawa. Considering the costs involved in such procedures, it is the policy of Invention Quebec to start studies only for inventions of a certain calibre and which offer eventual marketing possibilities. The number of studies requested by each inventor is a measure of the weight he attributes to his own inventions, as well as of his will to succeed, since such studies are a prerequisite for the petition for, and obtention of, a patent.

TABLE 23

NUMBER OF STUDIES (PATENT RESEARCH) UNDERTAKEN IN OTTAWA PER INVENTOR.

Number of studies	F	%
0	22	14.1
1	68	43.3
2	42	26.8
3 and more	25	15.7
TOTAL	157	100.0%

The distribution of inventors according to the number of patent studies in Ottawa shows 22 persons (14.1%) who took no such steps.

On the other hand, 135 persons passed that stage, with one, two or more studies undertaken on their behalf. Most of them (68 persons, 43.4%) had only one study made. The mean of this distribution is 1; thus one-half of the respondents had at least one patent study done. However, the average number of studies per inventor is 1.5; this may be attributed particularly to two inventors who have eight and thirteen studies to their credit, respectively.

b) Percentage of patent studies.

The number of patent studies per inventor might be a significant indicator of the value of the inventions and of their author's conviction. A more precise measurement becomes necessary: the percentage of inventions, for each inventor, that elicited patent studies. Inventors having a high patent study percentage thus prove their determination and faith in the worth of their creations.

TABLE 24
PERCENTAGE OF INVENTIONS FOR WHICH THE INVENTORS CAUSED
PATENT STUDIES TO BE DONE.

Percentage of studies (%)	F	%
0 - 20	54	34.0
21 - 70	50	33.0
71 - 100	51	33.0
TOTAL	155	100.0%

Table 24 shows the inventors distributed among three sub-groups: a) those who caused studies to be effected for 20% or less of their inventions; b) those who caused patent studies to be made for between 21% and 70% of their inventions; and c) those who initiated such studies for 71% of their inventions and more. Distribution among the three categories is almost even.

The result of the third category is quite significant: 51 persons (33%) are sufficiently convinced and determined to have initiated patent studies for at least 71% of their inventions.

c) Results of the patent studies.

A third variable concerns the results obtained from the patent studies. Obviously, there are two possibilities: 1. positive result: there is nothing similar available, and 2. negative result: there is in fact a similar invention.

TABLE 25

RESULTS OF PATENT STUDIES DONE IN OTTAWA, PER INVENTOR.

Results of the patent studies	Positive		Negative	
	F	%	F	%
0	55	36.0	112	73.2
1	66	43.2	33	21.6
2 and more	32	20.8	8	5.2
TOTAL	153	100.0%	153	100.0%

Table 25 shows that 66 persons (43.2%) obtained one positive result, and that 32 (20.8%) obtained two or more. There are thus 63% among the inventors questioned who have received at least one positive reply, i.e. who have effectively invented something novel. The others (55 persons, 36%) caused no patent study to be done or obtained no positive reply.

On the other hand, 33 inventors (21.6%) obtained one negative result, and 8 (5.2%) obtained two or more. A very large majority (73.2%) can be seen in the nil category: either because they have not yet received any negative results, or because they caused no

patent study to be effected in Ottawa.

This distribution of the inventors according to the results of their patent studies done in Ottawa is an indication of the value of their inventions and of their creative potential. It must be noted that the low percentage of negative replies is explained by the preliminary selection effected by Invention Quebec.

E. Invention patents.

Considering the large expenses incurred when requesting a patent and the uncertain profitability, independent inventors generally take that step only for inventions deemed worthwhile. This is why the number of patents held by the inventors is an additional indication of their determination and of the quality of their inventions. The same applies to the number of patent requests.

Out of 163 respondents, 57 (34.9%) made one or several requests for a patent; 26 among them obtained one or more patents. Thus, a little less than one-half of those who applied for the patents obtained them.

TABLE 26
PATENTS APPLIED FOR AND OBTAINED

Number per respondent	Applications for patents		Patents obtained	
	F	%	F	%
0	106	65.1	137	84.1
1 and more	57	34.9	26	13.9
TOTAL	163	100.0%	163	100.0%

At first sight, the number of patents obtained by this group of independent inventors seems quite limited. However, two important points must be taken into account. First of all, Invention Quebec dissuades inventors from spending \$1,000 to \$2,000 for a patent, before its profitability is sufficiently proven; they are advised instead to take out a temporary protection (British Provisional) costing approximately \$125 and valid for 12 months. Moreover, one-half of the members of the Inventors' Club are new clients of Invention Quebec; they cannot be shown yet under the patent-obtained heading, since this involves a stage requiring two to three years in most cases.

In view of these facts, it can be seen that a sizeable proportion of the clients is new with Invention Quebec. Moreover, that organization practices an evaluation of the innovative potential of the invention submitted, before advancing to other stages. Let us recall that the number of inventors who applied for one or more patents exceeds one-third of the group questioned.

F. Years of experience.

The questionnaire asked each individual to indicate the date of his first invention. The number of years of invention experience is distributed as follows: 97 persons (59.9%) have between zero and five years' experience, 31 (19.2%) have six to fifteen, and 34 (20.9%) have been inventing for over 15 years. The majority is thus made up of new inventors (5 years or less). This aspect stresses the newness of the clients of Invention Quebec which was pointed out when dealing with the previous variable.

G. Expenses incurred for the inventions.

The amount of expenses incurred is undoubtedly one of the main pertinent variables to be used in defining the inventors' profile

and in illustrating the evolution of their inventions. The amounts spent indicate inventor motivation, and they make it possible to evaluate what it costs them to realize their creative ideas.

TABLE 27

TOTAL EXPENSES INCURRED BY THE INVENTORS WITH THEIR INVENTIONS.

Total expenses	F	%
\$0 to \$300	60	37.2
\$301 to \$1,000	50	31.4
\$1,001 and over	50	31.4
TOTAL	160	100.0%

The group is distributed quite evenly in each of the following three categories: 60 persons (37.2%) spent \$300 or less (these are perhaps mostly new inventors); 50 (31.4%) spent between \$301 and \$1,000; and the other 50 spent \$1,001 or more. The range of expenses per inventor is between \$301 and \$1,000.

Finally, it worth noting that among the 50 respondents who invested more than \$1,000 in their inventions, 12 spent between \$2,000 and \$5,000, and 18 spent more than \$5,000. This point is proof of their dynamism and deep motivation.

H. Stage reached by the inventors.

The inventor must complete a three-stage procedure in order to implement an invention: a) creation of the invention; b) its protection; and c) its marketing. This division allows us to add another detail to the portrait of the independent inventor, namely the stage he has reached in his work.

The first stage is subdivided into three sub-stages:

- a) the conception proper, which is the creative idea as it matures;
- b) the outline of the blueprints, which must usually be entrusted by the inventor to experts;
- c) the building of the prototype(s). It sometimes happens that some inventors build the prototype before drawing its final plans.

TABLE 28

STAGE REACHED IN THE CREATION OF THE INVENTION.

Stage reached (creation)	F	%
(1) Concept only	23	15.0
(2) Blueprints	43	28.0
(3) Prototype	88	57.0
TOTAL	154	100.0%

Among the 154 persons concerned, 23 (15%) had only reached the concept stage; 43 (28%) have the blueprints of their invention; and 88 (57%) have completed the creation stage. While encouraging, these results do not justify unbounded optimism, since they are calculated based on the most advanced invention of each respondent. Even though they do not indicate the stage of development of all the inventions of this group, these results nevertheless show that more than one-half of those questioned have completed the creation of at least one invention. The latter shall constitute the population to be distributed among the subsequent stages.

It is easy to see the other two levels of the procedure, i.e. protection and marketing, as a sequence of successive stages. This is possible because most of the time inventors secure the protection of their idea before proceeding towards production. The respondents

were distributed among six protection and marketing stages.

TABLE 29

STAGE REACHED IN PROTECTING AND MARKETING THE INVENTION.

Stage reached (Protection and marketing)	F	%
1. No patent studies in Ottawa	18	11.1
2. One or several patent studies in Ottawa	64	39.8
3. Application for British Provisional only	21	13.0
4. Application for patent only	29	18.0
5. One or several patents obtained	23	14.3
6. Has on or several inventions on the market	6	3.8
TOTAL	161	100.0%

50% of the respondents have not yet passed the stage of the patent study in Ottawa; 21 (13%) have only applied for provisional protection (British Provisional) following their patent study. Furthermore, 52 persons are at the patent stage: 29 (18%) are still pending and 23 (14.3%) have already been granted. Finally, six persons, i.e. 3.8% of the respondents have at least one invention currently on the market. It must be noted that the applicants at stages 4,5 and 6 have not necessarily applied for provisional protection.

It appears therefore that the group studied is not very advanced from the viewpoint of the protection and marketing stages. Once again, however, account must be taken of the great number of "new inventors" and of the time-consuming procedure required to pass these various stages. On the other hand, the small percentage of inventors having an invention on the market could be attributed partly to the limited means available to Invention Quebec for assistance

at this stage. However, the recent founding by the directors of Invention Quebec of a periodical ("Inter Contacts") aimed at manufacturers and promoters will probably be able to stimulate the marketing, or at least the sale of promising inventions.

I. Level of satisfaction of the inventors.

The last group of variables of this section measures the level of satisfaction of the inventors with respect to four different aspects of their inventions: expenses, income, creation and protection. The question dealing with income from inventions was not answered fully due to its ambiguity. Indeed, several respondents said they were unable to reply because they had not received any income from their inventions at that time.

TABLE 30

LEVEL OF SATISFACTION OF THE INVENTORS WITH RESPECT TO EXPENSES, INCOME, CREATION AND PROTECTION OF INVENTIONS.

Satisfaction	Expenses		Income		Creation		Protection	
	F	%	F	%	F	%	F	%
Satisfied, very satisfied	108	69.1	8	6.4	106	72.2	98	
Insatisfied, very insatisfied	48	30.9	117	93.6	40	27.8	43	
TOTAL	156	100.0	125	100.0%	146	100.0%	141	100.0%

As regards the expenses incurred, close to 70% said they were satisfied or very satisfied, while the remaining 30% were insatisfied in this respect.

As regards income, 93.6% of the 125 who answered this question said they were unsatisfied or very unsatisfied with the small amount recovered, or even the total lack of returns. However, eight persons expressed their satisfaction in this respect; one can assume that they are the those who have inventions on the market.

On the contrary, the level of satisfaction with respect to the creation of the invention is high: 106 persons (72.2%) are satisfied or very satisfied, while 40 (27.2%) are unsatisfied or very much so.

Finally, as regards the protection item, the level of satisfaction is almost identical to that found in regard of expenses. This should come as no surprise, since the overwhelming majority of expenses are incurred for protection.

Therefore, ^{the} independent inventors questioned are rather satisfied as regards expenses, development and protection, but clearly unsatisfied with the income they have or have not derived to date from their activity as inventors.

8. Attitude towards the relevant organizations.

In order to complete the profile of independent inventors it seems necessary to consider their reactions towards the various organizations they had to contact. The following analysis covers inventors' attitudes towards Invention Quebec, towards patent agents and manufacturers in general.

The first evaluation deals with the inventors' level of confidence towards these persons and organizations, independently of whether they have contacted them or not.

TABLE 31
INVENTORS' LEVEL OF CONFIDENCE IN PATENT AGENTS, MANUFACTURERS AND
INVENTION QUEBEC

Levels of confidence	Patent agents		Manufacturers		Invention Quebec	
	F	%	F	%	F	%
little, very little	54	36.8	95	62.1	20	12.9
enough, a great deal	92	63.2	57	37.9	135	87.1
TOTAL	146	100.0%	152	100.0%	155	100.0%

It must be noted in this case that the number of replies to each question is not the same, and that it is consequently preferable to make comparisons based on percentages.

The respondents' level of confidence in patent agents is split but tends to be high: 36.8 % of the respondents (54 persons) have little or very little confidence in such agents, while 63.2% (92 persons) have sufficient or a great deal of confidence in patent agents.

The ratio is almost exactly reversed as regards manufacturers. The inventors questioned tend to mistrust manufacturers.

Finally, Invention Quebec receives the greatest amount of confidence with 87.1% of the respondents (135 persons) saying they have sufficient or a great deal of confidence in Invention Quebec, whereas only 12.9% (20 persons) have little or very little confidence in that organization.

Thus the respondents have the most confidence in Invention Quebec, somewhat less in patent agents, and still less in manufacturers in general.

What is now the level of satisfaction of the inventors with respect to these persons or organizations? In order to be able to evaluate appropriately the satisfaction of the inventors, we had to make sure that the inventors had indeed met these people.

99 respondents (61.5%) had contacted one or several patent agents; 62 (38.5%) had not made that step. Furthermore, since manufacturers are hard to reach, the questionnaire asked inventors first of all whether they had attempted to contact some manufacturers, and secondly, whether their attempts had been successful. The following replies were given to these two questions: 88 persons (54.4%) made no attempt, whereas the other 74 (45.6%) had indeed attempted to contact manufacturers. Among the persons who attempted, 53 (57.6%) were successful and 39 (42.4%) failed. A certain lack of comprehension or coherence was noted on the part of the respondents, since there were more than 74 replies to the second question. One must conclude that the two questions were not clear enough. However, it turned out that manufacturers are more accessible than expected.

The inventors questioned had then to specify the degree of satisfaction derived from contacts with Invention Quebec, with patent agents and with manufacturers. As before, the response rate was not constant; it is thus preferable to use percentages for comparison purposes.

TABLE 32

LEVEL OF SATISFACTION DERIVED FROM CONTACTS WITH INVENTION QUEBEC,
PATENT AGENTS AND MANUFACTURERS.

Satisfaction from contacts	Invention Quebec		Patent Agents		Manufacturers	
	F	%	F	%	F	%
Satisfied and very satisfied	108	70.5	55	57.7	24	44.5
Unsatisfied and very unsatisf.	45	29.5	41	42.3	30	55.5
TOTAL	153	100.0%	96	100.0%	54	100.0%

There is thus a strong trend towards satisfaction with the work done by Invention Quebec. Indeed, 70.5% of the respondents (108 persons) said they were rather satisfied with Invention Quebec whereas 29.5% (45 persons) said they were unsatisfied or very unsatisfied with it.

The degree of satisfaction derived from contacts with patent agents and with manufacturers is split. 57.7% of the respondents (55 individuals) were satisfied or very satisfied with respect to the patent agents, while 42.3% (41 persons) were rather unsatisfied in that respect. As regards contacts with manufacturers, the proportion was the same, but reversed in favor of unsatisfaction.

Thus, by decreasing order of magnitude, the levels of satisfaction are: the contacts with Invention Quebec are very satisfactory, those with patent agents are much less satisfactory, and finally, contacts with manufacturers are mainly a source of unsatisfaction. It is worth noting that the confidence and the satisfaction of the inventors questioned run parallel and in similar proportions. There is certainly a close link between the confidence inventors have in these persons or organizations and the satisfaction they have derived from their contacts with the latter.

SUMMARY

It is useful to make a synthesis of the salient points at this stage of the presentation of the results. This synthesis will cast a stronger light upon the profile of the independent inventor, taking into account the entire set of facts detailed in this section.

Socio-demographic variables.

The age of more than one-half of the respondents ranges between 35 and 54 years. The group studied comprises a ratio of 9 men to 1 woman. One-half of the respondents are bilingual. As to schooling, 70% of the respondents did not advance beyond the secondary school level; on the other hand, 40% of those questioned have taken training (refresher) courses, mainly in the technical trades, human sciences and business. Most of the persons questioned (73%) are married.

81% of the respondents have full-time jobs. The rate of unemployment among the inventors in the sample amounts to 7.5%. As regards their present occupation, the inventors are mostly tradesmen (34%), professionals and technicians (29%) as well as managers and executives (12%). These professions are overrepresented relative to the Quebec population as a whole. Consequently, the inventors earn annual incomes slightly above the Canadian wage average.

Furthermore, only 25% of the inventors questioned ^{were} self-employed, and over one-half were employed by small firms (less than 100 employees). Moreover, 70% of the respondents said they were rather satisfied with their present job, while 47% believe they are able to use their creativity fully.

A significant fact: 41% of the respondents stated that there were inventors in their families, and 23% said there were inventors among their friends.

Personality traits.

The inventors may be grouped according to three central motivations subjacent to their activity as inventors: first of all, they are motivated by the pleasure they derive from creating (47% of the respondents), then by the desire to advance on the social ladder (29%) and by the personal compensation provided by the self-esteem derived from their inventions (24%).

As to their aspirations, 52% of those questioned hoped that their inventions would allow them to leave their jobs and 41% wish to make a start in business with their creations. However, they estimate themselves that the chances of achieving these aspirations are rather remote. According to 79% of the respondents, business sense is an important quality, or even a crucial quality, if one is to achieve success in the field of invention; 68% estimate that they have this quality to a satisfactory extent.

One-half of the respondents say there is a link between the sector within which they invent, and their job. The same applies to their hobbies and studies. The six hobbies to which the inventors devote most time are the following, in decreasing order: a) work on inventions, b) tinkering, c) reading, d) sports, e) music and f) television. Thus the inventors have on average two active hobbies out of three; furthermore, they spend their spare time much more actively than the Canadian population as a whole.

Method of working.

Concerning the working method of independent inventors, it appears that 81% of the respondents work on their inventions in an irregular manner; however, they devote to it an average of ten hours per week. Most of them (91%) work alone. Furthermore, it was found that 65% of those questioned do not favor team work before being protected, while 88% favor it after the protection of their invention has been secured.

Experience:

From the viewpoint of the number of inventions developed, there are 3 categories of inventors. Forty per cent are small inventors (less than three inventions), 45% are medium inventors (three to thirteen inventions) and 15% are dynamic inventors (over 13 inventions). The group studied included 163 inventors who produced altogether 1451 inventions. In decreasing order, these inventions are to be found mainly among the following sectors: a) games and toys, b) tools, machine-tools, c) automobiles, d) hobbies and sports, and e) household appliances. Among 57% of the inventors questioned there was a tendency to invent in several different sectors, whereas 43% limited themselves to only a few invention sectors.

As regards protection procedures, 86% of the respondents passed the first stage, i.e. the patent study undertaken at the Patent Office in Ottawa. On average, the respondents caused one such study to be done for every second invention they conceptualized. Sixty-four per cent of them were given a confirmation by the Patent Office to the effect that they had effectively invented something novel. This success ratio is a quite remarkable indication of success. On the other hand, only 14% of the group studied obtained one or several patents. It may be noted, however, that 60% of the respondents had only 5 years' invention experience, or less. This observation provides a partial explanation for the small percentage of inventors currently holding invention patents.

On average, the inventors surveyed spent \$300 to \$1,000 on their inventions; some even spent over \$5,000.

The stage reached by the respondents in their invention procedure is quite encouraging. Indeed, 57% of them have completed the development (conception, professional blueprints and prototype) of their most advanced invention. However, protection and marketing procedures appear to be slower: only 50% of the respondents have

passed the Ottawa study stage and are currently engaged in securing provisional protection or a patent, as well as the marketing of their inventions. Very few respondents (3.8%) have inventions on the market.

The inventors' level of satisfaction is high with respect to the expenses incurred, to the development and to the protection; on the other hand, it turned out to be very low as regards the income derived from inventions: 94% of the respondents said they were unsatisfied or very unsatisfied in this respect.

The level of the independent inventors' confidence towards various institutions was also measured. The inventors give Innovation Quebec the highest confidence rating, patent agents come next, and they mistrust manufacturers a little.

In 62% of the cases, patent agents had been contacted, and 58% of the respondents even succeeded in contacting manufacturers in the matter of their inventions. Finally, 71% of the inventors questioned said they were satisfied with the work done by Innovation Quebec, 58% are satisfied with their contacts with patent agents, whereas 55% are unsatisfied with their meetings with manufacturers.

III - CHARACTERISTIC TRAITS OF THE INVENTORS.

What are the foundations of inventive activity? Why, and for what purpose do independent inventors work on their inventions? Does this activity have a link with the degree of job satisfaction, or with some other dimensions in the life of an inventor? These are, in short, the questions tackled in the following study of inventors' characteristic traits.

1. Variables that determine job satisfaction.

Some variables have an effect on the inventors' level of satisfaction with their present job. As mentioned in the previous chapter, 70.3% of the inventors questioned said they were satisfied or very satisfied with their job.

The statistical shi-square test will be used to detect the existence of a link between the variables, which will be studied in greater detail.

First of all, does job satisfaction depend on the income? The chi-square applied to the distribution of the inventors according to these two variables shows - however, without certainty - (chi-square being 6.327, with two degrees of freedom, significant only at the .05 threshold) that the respondents earning the highest wages (over \$11,000) and medium wages (\$6,000 to \$11,000) tend to be satisfied with their jobs, whereas those earning \$0 to \$6,000 per annum are rather unsatisfied with their job.

Furthermore, it was revealing to check the interrelationship that may exist between job satisfaction and the fact of being self-employed. Indeed, there is a clear tendency among those who are self-employed to be satisfied with their present job; similarly, there is more insatisfaction among those employed in various firms. The chi-square of this comparison amounts to 7.398 with one degree of freedom, which is significant at the .01 level. There is thus a 99% chance for this observation to be accurate.

Similarly, one may easily assume that job satisfaction also depends on the possibility of using one's creativity on the job, particularly when inventors are involved. The chi-square between these two variables amounts to 36.940 with a single degree of freedom, which easily exceeds the .001 threshold.

TABLE 33

LEVEL OF SATISFACTION WITH CURRENT JOB AS A FUNCTION OF THE POSSIBILITY OF USING ONE'S CREATIVITY ON THE JOB

	Possibility of using one's creativity	
	little	sufficient
unsatisfied	42	4
satisfied	41	67
TOTAL	83	71

Satisfaction
with current
job

$$\chi^2 = 36.940, 1 \text{ degree of freedom}$$

Table 33 shows the distribution of the inventors surveyed according to the level of satisfaction of their job and to the possibility they have of using their creativity on the job. It appears from this comparison that almost all those who are unsatisfied with their job believe they have few opportunities of being creative on the job. On the other hand, the majority of those who are satisfied with their job are able to use their creativity to its full extent on the job. Satisfaction derived from their job is thus proportionate to the possibility of using their creativity on the job.

It was assumed earlier that inventors who were unsatisfied with their job had perhaps a tendency to invent in another field. In this case, the chi-square test proved to be non-significant and consequently this assumption must be rejected. However, a tendency

to invent within the same field as one's job was noted among those who believe their creativity can be used on the job. It would thus seem - without, however, certainty - that the respondents invent in a sector other than their job only inasmuch as they are unable to fully utilize this creativity in their present job.

2. Inventors' job satisfaction and aspirations.

It is, moreover, worth wondering whether there is some relationship between the inventors' aspirations and the degree of satisfaction they feel with their job.

TABLE 34

(JOB) ASPIRATIONS AS A FUNCTION OF THE SATISFACTION WITH THE PRESENT JOB.

	<u>(Job) Aspirations</u>	
	<u>to quit one's job</u>	<u>to keep one's job</u>
Unsatisfied	31	15
Satisfied	47	58
TOTAL	78	73

$$\chi^2 = 6.559, 1 \text{ degree of freedom}$$

It appears that the majority of those who are unsatisfied with their job hope to leave it, and that most of those who wish to keep their job are rather satisfied with it. The chi-square is 6.559, with one degree of freedom, a significant figure at the .02 threshold. It is thus possible to conclude with sufficient certainty that dissatisfaction at work causes inventors to want to leave their job using their inventions for that purpose.

It also seems that the desire to enter business with one's inventions is linked to job dissatisfaction. However, this observation is somewhat uncertain, since the chi-square is significant at the .05 level only.

It was also established that those who wish to quit their jobs are mostly people using little of their creativity on the job.

TABLE 35
(JOB) ASPIRATIONS AS A FUNCTION OF ONE'S ABILITY TO USE ONE'S
CREATIVITY ON THE JOB

	Possibility of using one's creativity on the job	
	LITTLE	SUFFICIENT
(Job) Aspirations		
to quit one's job	52	26
to keep one's job	29	46
TOTAL	81	72

$$\chi^2 = 12.032, 1 \text{ degree of freedom}$$

As evidence thereof, out of 78 persons wishing to quit their job, 52 only use little of their creativity on that job, whereas the others (26 persons) use theirs fully. Those who wish to keep their job are mostly people who make sufficient use of their creativity in their present job. This statement is confirmed by a chi-square amounting to 12.032, with a single degree of freedom, which is significant at the .001 level.

It would now be interesting to know whether it is the same inventors who wish to quit their job who want to go into business with their inventions. This question may be answered by establishing a shi-square between the distribution of the inventors according to

their desire to quit their job (job-aspirations) and that of going into business (business-aspirations).

TABLE 36

(BUSINESS) ASPIRATIONS AS A FUNCTION OF (JOB) ASPIRATIONS.

		(Job) Aspirations	
		keep one's job	quit one's job
(business) Aspirations	do not wish to go into business	59	21
	wish to go into business	17	62
	TOTAL	76	83

$$\chi^2 = 43.459, 1 \text{ degree of freedom}$$

Calculation of the chi-square reveals the existence of a close link between these two variables; indeed, it amounts to 43.459 with a single degree of freedom, which is highly significant, even at the .001 threshold. It appears thus that the majority of the respondents who wish to keep their jobs do not wish to go into business and vice-versa, those who want to quit their job wish mostly to go into business with their inventions. Thus, it is much the same people who want to quit their job who also want to go into business; they number approximately 62, i.e. a little more than one-third of the inventors surveyed.

As a follow-up to this observation, it would be just as interesting to know whether the inventors who wish to go into business invest significantly more into their inventions. Once again, the chi-square test shall decide this question. The chi-square applied to these two variables is 9.922 with two degrees of freedom; it is thus significant at the .01 threshold. From the distribution obtained, it is possible to state that the inventors surveyed who wish to go

into business spend proportionately more on their inventions than the other inventors questioned.

It comes as no surprise that the inventors' aspirations concerning the desire to go into business are linked to their motivations. Indeed, as shown in Table 36, the chi-square between the set of motivations expressed (two choices per inventor) and the aspirations concerning business amounts to 12.129 with two degrees of freedom; it is thus significant at the .01 threshold.

TABLE 37

INVENTORS' MOTIVATIONS AS A FUNCTION OF THEIR (BUSINESS) ASPIRATIONS.

		Motivations (two first choices)		
		Recognition through creation	Social advancement	Pleasure of creating
(business) Aspirations	do not wish to go into business	42	32	82
	wish to go into business	31	59	63
	TOTAL	73	91	145

$$\chi^2 = 12.129, 2 \text{ degrees of freedom.}$$

A little less than one-half of those who invent mainly because of the personal recognition they derive from this activity wish to go into business. Two-thirds of the respondents who seek social advancement also wish to go into business. Finally, less than one-half of the people motivated by the pleasure derived from creation wish to go into business. Ceteris paribus, there are thus more people who wish to go into business among those who seek social advancement than in the other motivational categories. This result, which is obvious at first sight, confirms once more the respondents' coherence.

It was established that the inventors who seek social advancement by means of their inventions believe that it is important, or even indispensable, to have business sense in order to be a successful inventor. Business sense is more important in their opinion than in the opinion of inventors who invent because of the pleasure or personal recognition they derive from it.

The reader may recall that the inventors were asked to evaluate their chances of achieving their aspirations. A study of this question concluded that the respondents had expressed aspirations that were idealistic rather than realistic. In effect, another comparison confirms this conclusion. The Chi-square between their aspirations concerning the desire to quit their job and their perception of the chances for achieving those very same aspirations is significant at the .05 threshold (being 6.266 with two degrees of freedom). The distribution of the respondents according to these two variables indicates a tendency - among those who wish to quit their job - to evaluate their chances of achieving their aspirations at 25% or less. Since the chi-square, however, is not very significant, this observation must be considered with certain reservations.

An additional attempt was made to identify the variables affecting the perception of inventors' chances of achieving their aspirations. The chi-square revealed that the latter variable was closely linked to the inventors' ability to use their creativity on their job, and also to their satisfaction with the development of their inventions.

The majority of the respondents who have little possibility of being creative on their job give themselves a zero to 25 per cent chance of achieving their aspirations.

TABLE 38

PERCEPTION OF THE CHANCES FOR ACHIEVING ONE'S ASPIRATIONS AS A FUNCTION OF THE POSSIBILITY OF USING ONE'S CREATIVITY ON THE JOB.

	Perception of the chances for achieving one's aspirations (in per cent).		
	0% to 25%	50%	75% to 100%
little	42	18	18
sufficient	18	20	33
TOTAL	60	38	51

$$\chi^2 = 13.819, \text{ 2 degrees of freedom.}$$

On the contrary, most respondents who have good opportunities of being creative at their jobs evaluate their chances of achieving their aspirations at 50 per cent and more. This is probably due to the fact that the latter wish mainly to keep their job and they have no particular desire to go into business with their inventions. The chi-square of this distribution is highly significant (13.819 with two degrees of freedom, i.e. significant at the .001 threshold).

The perception of the chances for achieving their aspirations is influenced in the same direction, and even more markedly, by their satisfaction with the creation (development) of their inventions. The more satisfied the inventors questioned claim to be with the development of their inventions, the more confident they feel of achieving their aspirations: (this conclusion is supported by a chi-square significant at the .001 threshold).

3. Protection and marketing stage reached.

It is possible to identify some characteristics of independent inventors based on the stage they have reached in protecting and marketing their inventions.

Indeed, reaching of the various invention stages tends to vary as a function of the number of years of experience accumulated by the inventor. Considering that the transition from conception to marketing usually takes a fairly long time (5 to 8 years according to Invention Quebec), it is natural that the more experienced inventors should be closer to their objective. The chi-square between these two variables is significant at the .01 threshold.

A tendency to make more attempts to contact manufacturers may be noted furthermore among the inventors who are most advanced in the procedure. This, too, is logical, since most of those surveyed do not approach manufacturers until the protection of their inventions has been secured. Finally, it was also noted that it was mainly the most advanced inventors who effectively succeeded in contacting manufacturers.

IV - PROTECTION.

The problem of protection is undoubtedly one of the main questions related to invention. It is a very controversial subject. Is the Canadian patent system appropriate for the objectives sought? Are modifications necessary? If so, which? Unfortunately, the present study cannot answer these questions. However, it revealed the attitudes and behaviour of independent inventors with respect to protection and to patent agents. In his study on invention, Wilson (1) devotes a whole chapter to the Canadian patent system, debating its advantages and flaws.

1. Contacts with patent agents.

First of all, let us recall that 99 persons, i.e. 61.5% of the inventors surveyed have had contacts with patent agents. Patent agents were thus approached by a majority. It is important to know whether these contacts have effectively helped the inventors in their procedures. This question can be answered by a comparison: the calculation of the chi-square between the protection and marketing stage reached by the inventors, and their contacts with patent agents. This calculation is significant at the .01 threshold, since the chi-square obtained is 10.231 with two degrees of freedom.

(1) Wilson, Andrew H., - L'Invention dans le Contexte Actuel, Information Canada 1970, pp. 13-46.

TABLE 39
(PROTECTION AND MARKETING) STAGE REACHED AS A FUNCTION OF THE CONTACTS
WITH PATENT AGENTS

	<u>(Protection and marketing) stage reached</u>		
	Patent studies in Ottawa	Applications for protection	Patent and marketing
No contact	38	19	4
One or several contacts	42	31	25
TOTAL	80	50	29

$$\chi^2 = 10.231, \text{ 2 degrees of freedom.}$$

Table 39 shows that close to one-half of the respondents who are at the stage of patent studies in Ottawa have contacted no patent agent, whereas the other half did so. Among the 50 persons who are at the stage of the application for patent protection, 31 have already contacted patent agents. Finally, almost all those surveyed (25 out of 29 persons) who obtained a patent or marketed their inventions have also approached patent agents for their services.

It appears thus that on the one hand the contacts with patent agents increase (proportionally) as more advanced stages are reached, and on the other hand, that the most advanced inventors have almost all approached patent agents.

Now, it is self-evident that these contacts were not entirely cost-free. It is possible to check the average cost to the inventor when approaching a patent agent. The best indicator thereof is a comparison between the total expenses incurred by the inventors, and their contacts with patent agents. This comparison yields a chi-square of 18.482 with two degrees of freedom, significant

at the .001 threshold. There is thus a quite close link between these two variables. Also, it was noted that inventors who contacted patent agents tend to spend significantly more on their inventions. These expenses range from \$300 to \$5,000 or more. These expenses are easily explained by the costs involved in obtaining patents. Neither should it be surprising to note that the inventors' total outlays also vary according to whether one or more patents were obtained. The relationship between these last two variables is quite certain: the chi-square is 27.420 with two degrees of freedom, significant at the .001 threshold. Table 40 shows the distribution of the inventors according to their total expenses and as a function of how many patents were obtained.

It appears to be clear that most respondents who were granted one or more patents spent \$1,000 or more for their inventions. Taking this result into account, it seems plausible that the major part of inventors' expenses concerns the acquisition of patents. This obtention cost is very consistent with the figure suggested in the Wilson (1) study, i.e. \$1,000 on average for each registration.

TABLE 40

INVENTORS' TOTAL EXPENSES AS A FUNCTION OF PATENTS OBTAINED.

		Total expenses		
		\$300 or less	\$301 to \$1,000	\$1,001 to \$5,000 or more
Patents obtained	No patent	59	44	31
	One or several patents	1	6	19
	TOTAL	60	50	50

$$\chi^2 = 27.420, 2 \text{ degrees of freedom.}$$

(1) Idem., p. 28.

It was further noted that there are more inventors dissatisfied with the costs entailed by their inventions among those who have contacted patent agents. However, this observation must be used with caution since it has 5 chances out of a hundred of being random. It would nevertheless seem that the people who contacted patent agents and who spent more on their inventions are quite dissatisfied with the cost of the latter to date.

It may also be noted that the satisfaction of contacts with patent agents affects the inventors' confidence in the former. Comparison of these two variables yields a chi-square of 22.486 with a single degree of freedom which is significant at the .001 threshold. Table 41 shows the distribution thus obtained.

TABLE 41

CONFIDENCE IN PATENT AGENTS AS A FUNCTION OF THE SATISFACTION
DERIVED FROM THE CONTACTS WITH THEM.

	Satisfaction from contacts with patent agents	
	dissatisfied	satisfied
Confidence in patent agents		
little confidence	23	8
sufficient confidence	13	45
TOTAL	36	53

$$\chi^2 = 22.486, 1 \text{ degree of freedom}$$

Thus, the majority of those who have little confidence towards patent agents are dissatisfied with their contacts with the latter, whereas the majority who trust them sufficiently are also satisfied with having used their services. It appears clearly that the degree of inventor confidence with respect to patent agents varies as a function of the satisfaction derived from having used their services.

2. Satisfaction of the inventors surveyed with respect to protection.

After listing these various observations concerning patent agents, it is advisable to study the overall level of satisfaction of the inventors surveyed with respect to the protection of their inventions.

We may advance a first comparison between the stage reached and the level of satisfaction with the protection. The chi-square between these variables was 6.889 with two degrees of freedom: it is significant at the .05 threshold. This comparison reveals a tendency, among the inventors who have reached the most advanced protection and marketing stages, to be more satisfied, proportionately, with respect to protection, than those less advanced. If we are to go by this result, the obtention of a patent or of provisional protection should satisfy the inventors surveyed so far as protection is concerned.

This conclusion may be verified by means of yet another chi-square. Indeed, calculation of the chi-square between satisfaction with protection, and the obtention of a British Provisional yields 8.131 with one degree of freedom, which is significant at the .01 threshold.

TABLE 42
SATISFACTION WITH PROTECTION AS A FUNCTION OF ACQUIRING A
BRITISH PROVISIONAL

	<u>Number of British Provisionals</u>	
	<u>none</u>	<u>one or several</u>
Satisfaction		
felt with the		
protection		
available		
	dissatisfied	2
	satisfied	25
	TOTAL	27

$$\chi^2 = 8.131, 1 \text{ degree of freedom.}$$

As shown in Table 42, of those who were dissatisfied with the protection almost none resorted to provisional protection; also, 25 out of 27 persons who acquired a British Provisional said they were satisfied with the protection of their inventions. It is thus clear that the British Provisional is perceived by its users as a satisfactory solution so far as the protection of inventions is concerned. Furthermore, it seems that some inventors, doubting whether their inventions will yield returns, prefer the provisional protection to the patents, which must be held longer and at greater cost.

Another particular aspect of the satisfaction expressed by those surveyed concerning the protection is the link between that variable, and the confidence they have in patent agents. Indeed, it seems quite certain (at the .01 threshold) that the more satisfied inventors are with respect to the protection, the more they tend to trust patent agents; and conversely, the stronger their trust towards patent agents, the more satisfied the inventors appear to be with the protection of their inventions.

A last information regarding inventors' satisfaction with respect to protection: it has been possible to evaluate the impact of this variable on the inventors' perception of their chances of reaching their aspirations. The chi-square between these two variables is 10.352 with two degrees of freedom, and is consequently significant at the .01 threshold.

TABLE 43

PERCEPTION OF THE CHANCES OF ACHIEVING ONE'S ASPIRATIONS AS A
FUNCTION OF THE LEVEL OF SATISFACTION IN THE MATTER OF PROTECTION.

		Perception of the chances of achieving one's aspirations (Percentages)		
		0% to 25%	50%	75% to 100%
Satisfaction with respect to the matter of protection	DISSATISFIED	23	11	7
	SATISFIED	28	28	39
	Total	51	39	46

$$\chi^2 = 10.352, 2 \text{ degrees of freedom.}$$

After examining Table 43, it may be noted that there approximately equal numbers of satisfied and dissatisfied inventors (as regards protection) who give themselves 0 to 25 per cent chance of achieving their aspirations. On the other hand, there are clearly more people among those satisfied with their protection who estimate their own chance of achieving their aspirations at 50 to 100 per cent. It seems thus that satisfaction with their protection causes inventors to be more optimistic with respect to the realization of their aspirations.

REMARKS:

Some clarifications are needed concerning the opinions of inventors, expressed in regard of protection.

Indeed, in the opinion of the respondents, the patent or the British Provisional are likely to offer adequate solutions of the matter of protection. It seemed obvious that the inventors were quite satisfied with the protection of their inventions when they

resorted to either one of these two security measures. However, as Wilson states in his recent study, the Canadian patent is far from affording incontestable protection. Yet the inventors surveyed seem to be certain that their ideas will not be copied if they hold a patent, or even only some provisional protection, and that this protection is in itself a token of sure-fire success.

In fact, however, there is no doubt that very few patented inventions are actually marketed. One may conclude that the inventors questioned display a certain lack of realism. This attitude might perhaps be attributed to a lack of information about patents. Consequently, it would be advisable to provide independent inventors with appropriate information on the relative value of patents concerning inventions.

V - BALANCE-SHEET OF THE ACTIVITIES OF INVENTION QUEBEC.

The purpose of the present chapter is to deal with Invention Quebec in the light of the comments made by the inventors who approached that organization. The rôle and the services offered by Invention Quebec will thus be studied herein.

It is, indeed, essential in a study of this scope to look at the only non-profit organization aimed at the independent inventors in Quebec. Furthermore, comparison of various variables should reveal some attitudes and behavioural patterns of the inventors surveyed towards Invention Quebec.

1. Membership and particulars of the Inventors' Club.

The first stage of the Invention Quebec activity balance-sheet covers the membership of the Inventors' Club, as well as some characteristics of the users of its services.

It is known that some members of the Inventors' Club had already had dealings with Invention Quebec prior to the foundation of the Club. These inventors thus have so-called old invention files. Among the respondents, 32 persons (19.8%) had at least one old file, 14 persons (8.7%) had two and 13 respondents (7.9%) had three of them or more. However, the majority of the respondents (103 people, 63.6%) had no old file with Invention Quebec.

In some cases, the respondents were able to open new invention files since they became members. 69 persons (42.6%) opened a new file; 13 persons (8.1%) opened two, and 2 persons (4.2%) opened three new files or more. On the other hand, 73 persons (45.1%) did not open any new files. Consequently, a little over one-half of those surveyed have conceived and submitted at least one invention since they became members of the Inventors' Club.

Incidentally, by comparing inventors according to the number of old and new files they have, it is possible to calculate the proportion of Club members recruited among old customers. On the one hand, we know that inventors who have no old file are necessarily new clients. On the other hand, Club members do not necessarily have an active new file. The only files that are active are those for which some services have been used since the foundation of the Club. It may thus happen that an inventor has a quite advanced invention, yet has no new file; which indicates that the inventor did not use services.

It can be seen from Table 44 that 69 of the persons having one or several new files have no old files. They can be considered to be new clients. Moreover, their files are active. On the other hand, there are 39 respondents who are old clients and who did not open any file since they became members. 20 persons have both old and new files.

TABLE 44

COMPARISON OF INVENTORS ACCORDING TO THE NUMBER OF OLD AND NEW FILES THEY HAVE WITH INVENTION QUEBEC.

	<u>Number of new files per respondent</u>	
	<u>none</u>	<u>one or more</u>
None	34	69
1 or more	39	20
TOTAL	73	89

$$\chi^2 = 16.593 \quad 2f = 1$$

Calculation of the chi-square between these two variables yields 16.593, with one degree of freedom; this chi-square is significant at the .001 threshold. This distribution of the respondents

exhibits a clear trend, indicating with 99.9% certainty that Invention Quebec increasingly recruits its members from among new clients. Invention Quebec is thus still expanding the number of its clients. Based on these results, it may be assumed that the type of clients of Invention Quebec is changing due to the charges required from now on from the users of the services offered.

Another comparison supports the preceding results. The chi-square between the number of old files and the file or registration number of the members who answered the questionnaire is also significant at the .001 threshold. With the numbers of the files examined ranging from 100 to 440, there is in fact a scarcity of old clients among the last 200 registered. It thus seems clear that Invention Quebec is joined by increasing numbers of new inventors.

It is necessary to study the use of the various services offered. Such a study will make it possible to evaluate the influence of Invention Quebec among independent inventors.

We were able to distribute the respondents according to the number of services they used at Invention Quebec. Table 45 shows this distribution.

TABLE 45

DISTRIBUTION OF THE RESPONDENTS ACCORDING TO THE TOTAL NUMBER OF INVENTION QUEBEC SERVICES THEY USED

Total number of services used	F	%
None	74	45.7
1 to 3	48	29.7
4 and more	40	24.6
TOTAL	162	100.0%

The distribution obtained indicates that 74 respondents (45.7%) used no services since their registration with the Club. However, 48 persons (29.7%) used up to three services and 40 people (24.6%) used four or more. Altogether, the respondents used 400 times the various services offered by Invention Quebec since the foundation of the Club (January 1974), up to the time of this survey (May 1974), i.e. a period of only five months. It seems clear that Invention Quebec has been very active since the new operating formula was introduced. It must be noted, however, that the various types of services offered have not been used to the same extent.

TABLE 46

PERCENTAGE USE OF THE VARIOUS SERVICES OFFERED BY INVENTION QUEBEC

Number of instances of use of the services	F*	%
Protection	226	56.5
Technical evaluation	100	25.0
Prototype	35	8.7
Blueprints	34	8.5
Marketing	5	1.3
TOTAL	400	100.0%

*F = frequency of use.

Thus, according to Table 46, the most used services were the protection services, with 226 uses (56.5%). Technical evaluation came second with 100 uses (25%), the prototypes and blueprints with 35 and 34 uses, respectively and finally, the marketing services with only 5 uses, i.e. 1.3%.

Thus, the main usefulness of Invention Quebec for independent inventors until now resided in its protection services, and in the technical evaluation of the inventions submitted to it.

It is worth knowing which inventors (old or new clients) use to the greatest extent the services offered by Invention Quebec. Calculation of the chi-square between the number of old files and the number of services used per respondent answers this question. Table 47 shows the distribution obtained.

TABLE 47
COMPARISON OF INVENTORS AS A FUNCTION OF THE NUMBER OF OLD FILES
AND OF THE NUMBER OF SERVICES USED PER RESPONDENT.

	<u>Number of services used per respondent.</u>		
	None	1 - 3	4 and more
None	35	37	31
1 or more	39	11	9
TOTAL	74	48	40

$$X^2 = 15.600 \quad dl = 2$$

Among the new clients (who have no old file), 35 respondents used no services, 37 used up to three and 31 used 4 services or more. On the other hand, among old clients, 39 people used no services, only 11 used one to three services and 9 used more than three.

The chi-square is 15.60, with two degrees of freedom, which is significant at the .001 threshold. New clients thus use significantly more services than old ones do. Once again, it may be that the expenses required affect the use of the services, at least for the old clients familiar with the earlier cost-free practice.

Having surveyed the use made of the services offered, it is worth looking at the cost of these services to the inventor. Table 48 shows the distribution of the inventors questioned according to their expenses with Invention Quebec.

TABLE 48
INVENTORS' EXPENSES WITH INVENTION QUEBEC.

Expenses incurred with Invention Quebec	F	%
\$ 0	76	47.0
\$ 1 to \$ 100	52	32.2
\$101 to \$500	34	20.8
TOTAL	162	100.0%

It is readily seen that the great majority of the inventors surveyed did not spend large amounts of money with Invention Quebec, since 76 persons (47%) spent nothing, while 52 (32.2%) spent between \$1 and \$100; on the other hand, some 34 respondents (20.8%) spent between \$101 and \$500 with that organization. It seems indeed that it is not very costly for independent inventors to deal with Invention Quebec, particularly if the total number of the services they have used is taken into account.

It is necessary to specify a last point concerning the expenses incurred with Invention Quebec. No doubt, there are 76 persons who did not spend anything with Invention Quebec, and as many who used none of the services. This does not necessarily imply that the inventors involved are recent clients. It may happen, indeed, that fairly advanced inventors join the Club, but do not have the money available to pursue their invention procedures. This is probably the case with most old clients who became members of the

Inventors' Club out of a desire to keep in touch with Invention Quebec.

2. Satisfaction and confidence towards Invention Quebec.

The analysis of these two dimensions reveals two particularly significant aspects: independent inventors' satisfaction and confidence towards that organization. Are these two variables interdependent or independent? Which factors determine the level of satisfaction and the degree of trust? These are the questions covered in the following section.

Before proceeding with the study, it would no doubt be useful to recall that 87.1% of the respondents have a great deal of trust in Invention Quebec, and that 70.5% are satisfied with the assistance provided by this organization.

The first question must be answered by calculating a chi-square between the two variables, "confidence" and "satisfaction" towards Invention Quebec. Table 49 shows the distribution of the respondents according to these two indices.

TABLE 49
DISTRIBUTION OF THE INVENTORS ACCORDING TO THE SATISFACTION AND
CONFIDENCE THEY HAVE TOWARDS INVENTION QUEBEC

	Confidence in Invention Quebec		
	little	sufficient	
Satisfaction with Invention Quebec	Dissatisfied	15	28
	Satisfied	5	102
	TOTAL	20	130

$$\chi^2 = 24.227, \text{ 1 degree of freedom.}$$

The chi-square is 24.227 with one degree of freedom, which is highly significant (threshold of .001). As to the internal variation of this distribution, it is noted that out of the 20 persons who have little faith in Invention Quebec, 15 are also dissatisfied with it, while only 5 are satisfied with it; out of the 132 people who have sufficient trust, the majority (102 persons) are also satisfied with the assistance received, while 28 are dissatisfied with it. The two variables may thus be considered to be interrelated; moreover, they vary in the same direction, i.e. those dissatisfied have little confidence, whereas satisfied respondents have sufficient confidence in Invention Quebec.

A. Satisfaction with Invention Quebec.

Let us study now the second variable. Using the chi-square test, it is easy to identify the variables that determine the satisfaction or dissatisfaction of inventors towards Invention Quebec.

When this test is applied to the distribution of the respondents according to their satisfaction with Invention Quebec and to their satisfaction with the creation (development) of the inventions, it indicates that there is perhaps a link between these two variables. The chi-square is 5.272, with one degree of freedom, which is significant at the .05 threshold. There is thus a 5 per cent possibility that the link observed is due to chance. With some reservation, it may be stated in view of this that the satisfaction towards Invention Quebec goes hand in hand with the satisfaction of the inventors questioned as regards the development of their inventions.

A second test comparing the respondents' satisfaction concerning the protection of their inventions with their level of satisfaction towards Invention Quebec, is more significant. The chi-square is 7.543 with one degree of freedom. Here, the link

has less than one chance in a hundred of being random. Table 50 shows the distribution of the respondents according to these two variables.

TABLE 50

DISTRIBUTION OF THE INVENTORS ACCORDING TO THE LEVEL OF SATISFACTION WITH INVENTION QUEBEC AND WITH THE LEVEL OF PROTECTION AS A WHOLE.

	Satisfaction with the protection	
	Dissatisfied	Satisfied
Satisfaction with respect to Invention Quebec.	Dissatisfied	18
	Satisfied	72
	TOTAL	90

$$\chi^2 = 7.543, 1 \text{ degree of freedom}$$

One-half of the persons dissatisfied with Invention Quebec are also dissatisfied with the protection of their inventions, whereas the other half is rather satisfied with the protection. Out of the 96 respondents who were satisfied with Invention Quebec, 72 were also satisfied with their protection, while 24 were dissatisfied with it. These two variables are interrelated, and tend to vary in similar fashion. It is thus plausible to believe that the satisfaction towards Invention Quebec is partly determined by the protection it secured for the inventors surveyed.

Moreover, another chi-square confirms this conclusion: it involves a comparison of the level of satisfaction of the respondents towards Invention Quebec, with their use of a provisional protection (British Provisional), one of the services offered by this organization. The chi-square is 9.608, with one degree of freedom, which is significant at the .01 threshold.

The trend expressed by the distribution obtained indicates that the users of the British Provisional coverage are significantly more satisfied with Invention Quebec than the non-users. It is thus still more evident that the inventors surveyed are satisfied with Invention Quebec for, among other reasons, the invention protection services offered by that organization.

The service for the technical evaluation of inventions has a further effect on the respondents' level of satisfaction towards Invention Quebec. Indeed, the chi-square test for this new variable indicates a tendency among the users of this service to be more satisfied than the non-users. Table 51 illustrates this observation.

TABLE 51

INVENTORS' LEVEL OF SATISFACTION AS A FUNCTION OF THEIR USE OF THE TECHNICAL APPRAISAL SERVICE

	Satisfaction towards Invention Quebec	
	Dissatisfied	Satisfied
None	32	49
Once or more	12	59
TOTAL	44	108

Use of the technical evaluation service

$$\chi^2 = 9.4, \text{ one degree of freedom.}$$

The most salient fact in this comparison is that among the users of the technical appraisal service 59 people are satisfied with Invention Quebec, while only 12 are dissatisfied. The chi-square is 9.4, with one degree of freedom; it is thus significant at the .01 threshold. There is thus a quite certain link between the use of the technical evaluation service and the satisfaction felt with respect to Invention Quebec.

Logically, an inventor who is dissatisfied with the work of Invention Quebec will not be inclined to spend much money on it. This conclusion has been verified.

Indeed, a comparison between satisfaction and expenses at Invention Quebec confirms that statement. The chi-square is 12.725, with two degrees of freedom, and thus significant at the .01 threshold.

TABLE 52

DISTRIBUTION OF THE INVENTORS ACCORDING TO THE EXPENSES AND THE SATISFACTION TOWARDS INVENTION QUEBEC.

	Expenses at Invention Quebec		
	None	\$1 to \$100	over \$100
Dissatisfied	29	13	2
Satisfied	42	37	29
TOTAL	71	50	31

$$\chi^2 = 12.725, 2 \text{ degrees of freedom.}$$

It is easy to note in Table 52 that the respondents dissatisfied with Invention Quebec are mostly people who did not spend anything with this organization, and conversely, that there are more satisfied persons among those who spent there between \$1 and \$100, and mainly among those who spent over \$100 with Invention Quebec. Thus the expenses with Invention Quebec and the level of satisfaction towards this institution vary in the same direction; in other words, satisfaction with Invention Quebec is proportional to the expenses incurred, and vice-versa.

Another interesting observation concerning the respondents' satisfaction with Invention Quebec is the relationship between this variable and the number of new invention files. According to the chi-square obtained between these two indices (6.924, with one degree of freedom, significant at the .01 threshold), it appears that satisfaction with the work done by Invention Quebec is proportional to the number of active files of the respondents: the more new inventions are entrusted by the inventors to Invention Quebec, the more satisfied they are with its services. The reverse is also true: the respondents who are satisfied with the services tend to submit more inventions.

Finally, the detailed study of the satisfaction with Invention Quebec as a function of the professional position of the inventors surveyed seems to indicate that this latter variable probably has an influence on the level of satisfaction. The chi-square of this comparison amounts to 13.794, with, however, 4 degrees of freedom; it is significant at the .01 threshold. The only noteworthy fact in this comparison is that the managers and executive employees say they are less satisfied with Invention Quebec than inventors belonging to other job sectors. It thus seems possible that managers are more demanding towards Invention Quebec, or that they take a more critical view of the effectiveness of this institution.

B. Confidence in Invention Quebec.

It is also feasible to derive some indications on the inventors' confidence towards Invention Quebec.

The confidence extended to Invention Quebec is also linked to the level of satisfaction of the inventors with the protection available (refer to Table 53).

TABLE 53

DISTRIBUTION OF THE INVENTORS ACCORDING TO THEIR CONFIDENCE IN
INVENTION QUEBEC AND THEIR SATISFACTION WITH THE PROTECTION OBTAINED.

	Satisfaction with the protection	
	Dissatisfied	Satisfied
Confidence in Invention Quebec		
Little	13	5
Sufficient	28	89
TOTAL	41	94

$$\chi^2 = 17.203, 1 \text{ degree of freedom.}$$

The chi-square between these two variables is 17.203 with a single degree of freedom, which is highly significant even at the .001 threshold. It may be noted that the majority of those who have little confidence in Invention Quebec are also dissatisfied with the protection; moreover, those who deposit a great deal of confidence in Invention Quebec are mainly people who are satisfied with the protection of their inventions. Consequently, the confidence of those questioned in Invention Quebec is closely linked to their level of satisfaction with the protection extended by that organization.

This statement is confirmed by yet another finding. Indeed, it was noted that all the respondents who resorted to provisional protection (i.e. 25 persons) said they had sufficient confidence towards Invention Quebec. It so happens, however, that the provisional protection of inventions is precisely one of the protection services offered by Invention Quebec.

There is also a tendency towards great confidence in Invention Quebec among the inventors who say they are satisfied with the (development) creation of their inventions. Indeed, out of the 100 persons who are satisfied with the development work, 91 say they have

sufficient confidence in Invention Quebec. However, the shi-square test is only significant at the .05 threshold.

The following is a particularly significant observation. According to the chi-square test, it would seem that respondents who have a great deal of confidence in Invention Quebec also believe they have a good chance of achieving their aspirations. Table 54 illustrates this.

TABLE 54

PERCENTAGE CHANCE OF ACHIEVING ONE'S ASPIRATIONS AS A FUNCTION OF THE CONFIDENCE EXTENDED TO INVENTION QUEBEC/

	<u>Percentage chance of achieving one's aspirations</u>		
	<u>0% to 25%</u>	<u>50%</u>	<u>75% - 100%</u>
Confidence in Invention Quebec			
Little	12	2	4
Sufficient	47	36	46
TOTAL	59	38	50

$$X^2 = 6.159, 2 \text{ degrees of freedom.}$$

Table 54 shows that the inventors who have little confidence in Invention Quebec give themselves few chances of achieving their aspirations (between zero and 25%). On the other hand, those who give themselves 50 to 100% chances of achieving their aspirations are almost exclusively people who show sufficient confidence towards Invention Quebec. The chi-square obtained is 6.159 with two degrees of freedom, which is significant at a .02 level. Based on this result, it is plausible to believe with relative certainty that the people who have sufficient confidence in Invention Quebec perceive this institution as a valid means of achieving their aspirations.

It is noteworthy that there is a common trait between the confidence towards Invention Quebec and that towards patent agents.

TABLE 55

COMPARISON BETWEEN THE CONFIDENCE EXTENDED TO INVENTION QUEBEC
AND THE CONFIDENCE TOWARDS PATENT AGENTS

	Confidence in patent agents	
	Little	Sufficient
Confidence in Invention Quebec		
Little	13	7
Sufficient	39	82
TOTAL	52	89

$$^2 = 7.917, 1 \text{ degree of freedom.}$$

In effect, according to Table 55, 2/3 of those surveyed who have little confidence in Invention Quebec have also little confidence in patent agents. Conversely, the majority of those who have sufficient confidence in Invention Quebec also have sufficient confidence towards patent agents. However, there are 39 people who show more confidence towards Invention Quebec. The chi-square of these two distributions is 7.917, with one degree of freedom, which is highly significant, at the .001 threshold. One may say that the respondents have a proportional degree of confidence in patent agents and in Invention Quebec; however, their confidence in Invention Quebec is generally stronger.

Finally, a last observation concerning the inventors' confidence in Invention Quebec. This is a comparison with the number of services used per respondent. Note that this index does not take into account the various types of services that were used (technical appraisal, blueprint, prototype, protection or marketing).

The chi-square calculated between these two variables was non-significant. It seems that there is no apparent link between the confidence in Invention Quebec and the total number of services that were used by the inventors surveyed. The confidence extended to Invention Quebec would thus not depend on the number of services used by the independent inventors.

3. Stage reached by the members of the Inventors' Club.

A last section completes the study of Invention Quebec. It is an important question whether the use of the services offered by Invention Quebec really contributes to the advancement of the inventions. In order to reply to this question, it is sufficient to compare the protection and marketing stage reached with the number of services used per inventor. Table 56 shows this comparison as well as recall of the various protection and marketing stages.

The distribution obtained indicates first of all that the majority of respondents at stage 1 and 2 (patent studies in Ottawa) have made little use of the services: 38 did not use any, while 32 used 3 services or less. The inventors who are at stages 3 and 4 (application for protection) are the greatest users of the services: 25 persons (the majority) had resorted to more than 3 services. Finally, and this is quite surprising, most of the inventors at stages 5 and 6 (patent and marketing) - 18 persons out of 29 - used none of the services offered by Invention Quebec.

TABLE 56

PROTECTION AND MARKETING STAGE REACHED AS A FUNCTION OF THE
NUMBER OF SERVICES USED.

	Number of services used		
	None	1 to 3	4 and more
1 and 2*	38	32	11
3 and 4	17	8	25
5 and 6	18	7	4
TOTAL	73	47	40

$$\chi^2 = 27.557, 4 \text{ degrees of freedom.}$$

- * Stage 1: no studies in Ottawa (Patent Office).
 Stage 2: one or several patent studies, only.
 Stage 3: application for British Provisional, only.
 Stage 4: application for a patent, only.
 Stage 5: obtention of one or more patents.
 Stage 6: one or more inventions on the market.

The chi-square between these distributions is 27.557 with four degrees of freedom; it is very significant, even at the .001 level. The stage reached by the inventors surveyed thus depends up to a certain point on the number of services used. Indeed, the more services are used, the higher the stage reached, at least, up to stage 4 (application for patent); on the other hand, once this stage is reached, the use of the various services seems to have no effect on the reaching of stages 5 and 6 (patents and marketing).

It may be concluded from these results that the services offered by Invention Quebec are particularly useful in helping inventors to pass the stages preceding the obtention of the patent.

Beyond that stage, the number of services used does not seem to have any marked effect.

Moreover, a comparison of the (protection and marketing) stage reached by the inventors with their expenses at Invention Quebec shows the same trends as previously. The majority of those who have spent the most with Invention Quebec have reached the application for protection (stages 3 and 4), and most of those who are at stages 5 and 6 (patent and marketing) have not spent anything with Invention Quebec. Finally, those who spent little with Invention Quebec are mostly at the stage of the patent study in Ottawa. The chi-square of this comparison is also significant at the .001 threshold (55.053 with four degrees of freedom). This last chi-square test leads to the conclusion that the most advanced inventors have certainly reached stages outside Invention Quebec, probably prior to their joining the Inventors' Club. Since the majority of the users of the services have not passed yet through all the stages, it ^{is} impossible to know whether the marketing services started a short time ago by Invention Quebec are adequate. Indeed, perhaps these respondents have simply not had enough time yet to think of marketing their inventions. The Invention Quebec invention marketing services have thus not been sufficiently used yet for an appropriate appraisal.

Finally, a last comparison will add some observations to the above. It could be assumed a priori that the more money an inventor invests in his inventions, the faster they would move through the various protection and marketing stages. In order to check this, a comparison was made between total expenses, on the one hand, and the stage reached, on the other. (Table 57).

TABLE 57

PROTECTION AND MARKETING STAGE REACHED AS A FUNCTION OF TOTAL
OUTLAYS MADE BY THE INVENTORS.

	Total expenses		
	\$0 to \$300	\$300 to \$1,000	over \$1,000
1 and 2	42	25	12
3 and 4	16	19	15
5 and 6	1	6	22
TOTAL	59	50	49

Stage reached
(Protection
and marketing)

$$\chi^2 = 41.541, 4 \text{ degrees of freedom.}$$

It appears almost certain (at the .001 level, the chi-square being 41.541 with four degrees of freedom) that the protection and marketing stage reached varies as a function of the total expenses incurred. In effect, the majority of those who spent between \$0 and \$300 are at the patent study stage in Ottawa (stages 1 and 2), whereas most of those who spent over \$1,000 are at stages 5 and 6 (patents and marketing). Those who are at the patent application stage (stages 3 and 4) are distributed almost evenly among the three expenditure categories.

There is a marked difference between this distribution and that according to the expenses incurred with Invention Quebec. It follows that the more advanced inventors have apparently invested their money outside Invention Quebec, probably with patent agents. Finally, it appears that the cost of reaching the patent stage is on average over \$1,000 to the independent inventor, which could be fairly expensive for the average client.

It can thus be concluded that to a large extent, Invention Quebec conforms to the aspirations of inventors seeking means of going through the first protection and marketing stages of their inventions.

VI - PROBLEMS, ASSISTANCE REQUIREMENTS AND SUGGESTIONS.

Having outlined a profile of independent inventors and studied their reactions with respect to protection, as well as their behaviour towards Invention Quebec, it seems timely now to consider their problems and needs. This section, which deals with the problems, assistance requirements and suggestions of the inventors surveyed will enable us to provide a more complete and more faithful description of the reality facing independent inventors.

1. Problems encountered, need for financial and expert aid.

The inventors who responded to the questionnaire were asked about the problems they had encountered within their inventive work. This was an open question, since it proved impossible to provide reply categories that would not have restricted too much the scope of investigation. After receipt of the questionnaires, a study of the replies revealed about ten typical problems. Each respondent could mention three problems; 375 problems were described by the inventors surveyed. Table 58 shows the frequency within the ten problem categories.

TABLE 58

PROBLEMS MENTIONED BY THE INVENTORS

Types of problem	F	%
- Lack of money	117	31.2
- Marketing, lack of contacts with manufacturers	54	14.4
- Isolation	48	12.8
- Lack of equipment	43	11.5
- Complexity and slowness of legal procedures	25	6.7
- Lack of information	24	6.4
-Lack of time	24	6.4
- Lack of knowledge	10	2.6
- Danger of being robbed or exploited	10	2.6
- Other	20	5.4
TOTAL	375	100.0

It is clear that the financial problem is by far the most acute problem. Indeed, lack of money was mentioned 117 times, i.e. in 31.2% of the replies to this question. The marketing of inventions is the second most frequent problem; thus, 54 replies (14.4%) concern either the lack of outlets for marketing inventions, or the lack of contacts with manufacturers, or other problems relating to the marketing of inventions. The problem of independent inventor isolation ranks third, with 48 mentions (12.8%). This problem is characterized by the lack of expert assistance from trustworthy people, by the scarcity of contacts with other inventors, by the lack of services in the place of residence, and finally, by a certain number of prejudices towards inventors, particularly the negative attitude of manufacturers. Moreover, lack of equipment (workshops, tools, materials) was mentioned 46 times, i.e. 11.5% of all replies. It seems that these four types of problem are paramount in the opinion of the inventors surveyed.

Other smaller problems were also reported. They involve the complexity and slowness of legal protection procedures (25 mentions, 6.7%), the lack of information - particularly concerning protection procedures and existing inventions - the lack of time for invention purposes (with 24 mentions each, 6.4% of replies), the lack of knowledge or schooling (10 mentions, 2.6%) and finally, the danger of having one's ideas stolen or of being unduly exploited (also 10 mentions). There are also 20 miscellaneous problems mentioned herein.

It appears thus that the various prerequisite procedures required for the marketing of the inventions are expensive, to say the least, in the opinion of independent inventors. The latter do not give the impression of being able to invest the amounts required for the implementation of their ideas, if the inventors are abandoned to their own fate.

In effect, a study of the replies concerning the need for financial assistance shows that 143 respondents, i.e. 88.2% say they need such an assistance; only 19 persons (11.8%) say they do not need it. Thus, almost all those surveyed would like some financial assistance in order to complete their discoveries.

In order to identify the most problematic aspects, from the financial viewpoint, the inventors were asked to indicate the two stages for which they needed financial assistance most. Most respondents provided two items in their answer to this question. Table 59 shows the distribution of the respondents according to their choice concerning the stages for which they wish to obtain some financial assistance.

TABLE 59

STAGES WHERE FINANCIAL ASSISTANCE IS DESIRED.

Stages of financial assistance	First choice	2nd choice	Total choices expressed	
	F	F	F	%
Technical evaluation	15	6	21	7.4
Blueprints	9	6	15	5.3
Prototype	42	16	58	20.4
Applications for protection (Patent, British Provisional)	42	26	68	24.0
Sale of inventions to manufacturers	11	31	42	14.8
Commercial evaluation (market study)	13	24	37	13.0
Exploitation of the invention by the inventor himself	11	32	43	15.1
TOTAL	143	141	284	100.0%

First of all, financial assistance is mainly desired for making prototypes and for applications for protection (patents or British Provisional). According to the second choice, the respondents need financial assistance mainly in order to exploit their inventions themselves, or to sell them to manufacturers, i.e. mainly for the marketing stage of the inventions. Applications for protection rank third. There are four levels, according to the whole set of choices expressed: applications for protection (68 choices, 24%), prototypes (58 mentions, 20.4%), exploitation by the inventor himself (43 choices, 15.1%), and sale of inventions to manufacturers (42 mentions, 14.8%).

In summary, the inventors surveyed believe they need financial support, mainly for the protection of their ideas, the making of prototypes and the marketing of their inventions.

The interviews held during the preliminary survey had identified another important flaw, according to the inventors. In effect, some inventors said they needed to be helped and advised by experts in the specific sector of their invention, particularly as regards the various technicalities that are not exactly public knowledge. This question was thus retained.

It appears that 139 inventors, i.e. 86.3% of the respondents need expert assistance, while 22 (13.7%) believe they can manage in this respect. The requirement for expert assistance thus turned out to be slightly less extensive than the need for financial aid.

As before, the inventors were asked to specify the stages at which this need for expert or technical assistance was most acute. Table 60 shows the distribution of the replies to this question.

TABLE 60
STAGES AT WHICH EXPERT ASSISTANCE IS DESIRED.

Stages of expert assistance	First choice	Second choice	Total choices expressed	
	F	F	F	%
Technical evaluation	14	2	16	5.8
Blueprints	22	5	27	9.8
Prototypes	33	29	62	22.5
Applications for protection (Patent, British Provisional)	28	26	54	19.5
Sale of inventions to manufacturers	18	30	48	17.4
Commercial evaluation (market study)	18	25	43	15.6
Exploitation of the invention by the inventor himself	6	20	26	9.4
TOTAL	139	137	276	100.0%

Once again, prototypes and applications for protection rank first as stages needing assistance. The second choice of the respondents was concentrated mainly upon the following five stages: prototypes (29 choices), applications for protection (26 choices), sale of the inventions to manufacturers (30 mentions), market survey (25 choices), and exploitation of the invention by its author (20 mentions).

The above results are somewhat different if the choices expressed are taken as a whole. According to this latter distribution, it seems that the inventors questioned need expert assistance mainly for four stages of their procedures. These are, in decreasing order, the making of prototypes (62 choices, 22.5%), application for protection with 54 choices (19.5%), then the sale of inventions to manufacturers (48 mentions, 17.4%) and finally, the commercial evaluation of invention profitability (48 choices, 17.4%).

Consequently, it appears that almost all of the inventors surveyed need both financial aid and expert assistance in order to protect their ideas, build prototypes and market their inventions.

Based on the above results, it becomes obvious that few independent inventors will succeed in completing their inventions without financial support and advice from experts in that field.

2. Inventors' suggestions to the Federal Government.

In view of the various problems expressed and of the numerous assistance requirements, what provisions must be made in order to prevent a considerable wastage of potential and effort? It would be timely now to look at the solutions perceived by the inventors themselves. Indeed, considering their experience, they are often able to point out some serious flaws in this respect. Also, some inventors have advanced several appropriate solutions to the problem.

As was done with the problems encountered, the suggestions were elicited by means of an open question. The various suggestions made in connection with the federal government were grouped into the the seven categories shown in Table 61.

TABLE 61

INVENTORS' SUGGESTIONS TO THE FEDERAL GOVERNMENT.

Various suggestions to the Government	F	%
Financial aid to inventors (scholarships, research grants, loans, etc..)	86	27.0
Subsidies to an organization that would offer services for independent inventors.	65	20.2
Marketing assistance	56	17.4
To improve protection and make it more accessible.	46	14.3
Give access to workshops, laboratories, research centres, etc...	30	9.3
Improve the information given to inventors	14	4.4
Other suggestions	24	7.4
TOTAL	321	100.0%

First of all, Table 61 shows that 86 suggestions (27%) deal with the temporaneousness of eventual financial assistance; this assistance could, for instance, be granted as low-interest or interest-free loans. The suggestions also include scholarships, research funds or tax rebates. Some respondents expressed the wish that loans be repayable only if the invention turns out to be profitable. Other inventors favor the organization of an annual invention competition where prizes would be awarded to the most promising inventions.

Secondly, the inventors surveyed suggested a subsidy to an organization that would offer various services to inventors, such as Invention Quebec. 65 mentions were made to this effect, i.e. 20.2%.

According to a majority of the respondents, this organization should help inventors free of charge from the beginning to the end of the procedure involved in their inventions: technical evaluation, development, protection and marketing of inventions. A refund could be provided for inventions that are successful. Furthermore, this organization should be able to provide information concerning the worth of an invention, its chances of success, and the costs required for its completion. Some people envisage rather the creation of a government agency that would buy the valid ideas and inventions in order to develop them. Others suggest the government should participate in setting up a co-operative of independent inventors.

Suggestions relative to the marketing of inventions come next: there are 56 of them (17.4%). According to these suggestions, the federal government should take steps to encourage and facilitate contacts between the isolated inventor and the manufacturing industry. It is suggested to collect information about existing companies and their invention requirements, and to advise inventors about the findings. Some persons suggested placing marketing experts and legal advisors at the disposal of independent inventors. The inventors could be given publicity facilities, for instance, by organizing commercial exhibitions. Finally, subsidies could be considered to companies actively interested in inventors.

The fourth type of suggestion concerns the protection. 46 comments were made in this respect, i.e. 14.3%. The main proposal here is to simplify and shorten the procedure involved in applying for a patent. Several demand that patents be granted to independent inventors free of charge. Adequate provisional protection should also be offered during the development stage of the invention. Some suggest further that procedures for judicial action in plagiary cases should be speeded up and made less costly.

There were 30 suggestions (9.3%) concerning the ease of access to research centres, workshops or laboratories on the part of isolated inventors. One of the recommendation would involve placing at the inventors' disposal some existing premises, materials and the resources of educational institutions.

Some 14 suggestions cover the improvement of the information supplied to independent inventors. Some would even like to see the opening of documentation and information centres covering every aspect of inventions.

Finally, 24 suggestions cover various general matters.

After reading this summary of the solutions proposed by the inventors, it is obvious there is no lack of ideas. These various alternatives, even though not equally applicable, would nevertheless deserve to be elaborated and incorporated selectively into the final recommendations of this report.

VII - RECOMMENDATIONS AND CONCLUSIONS.

Sections II, III and IV of this report contain respectively the inventors' socio-demographic aspects, their main characteristic traits, as well as their attitudes concerning the protection of their inventions.

Since the essential data of the three preceding sections were already presented in Tables, as concisely as possible, it would serve no purpose to reconsider here each one of these facts.

It should also be recalled that the second main objective of this study was to detect the main problems encountered by the independent inventors and to attempt^t to formulate some suggestions capable of facilitating the task of this category of inventors.

In a recent work titled "The Innovators" (1), a team of experts from the New York Wall Street Journal examined the rôle played by inventors in the U.S.A. According to figures provided in that book, there are about 225,000 independent inventors in the U.S. The self-same inventors garnered 25% of all patents issued by the U.S. Patent Office in 1967 (2). Even though this percentage is relatively high, the authors specify that forty years ago almost all patents granted by the Patent Office were issued to independent inventors. The reasons adduced for this radical change may be attributed largely to the higher level of complexity of several modern discoveries, requiring ever-growing scientific knowledge, as well as access to research laboratories where teams of experts in various fields often must work together on the same invention. This does not, however, justify excessive pessimism as regards the future potential of discoveries made by inventors who work outside this trend.

(1) The Innovators - How Today's Inventors Shape Your Life Tomorrow.
Dow Jones Books, 1968, pp. 110.

(2) Idem, pp. 15.

On the contrary, everything ought to be done to assist those Canadians who have inventive talents, since only 1/20 of the patents issued in Canada come from Canadian citizens, 2/3 of Canadian patents being granted to U.S. residents (1). Furthermore, the same source provides data concerning the province of residence of those Canadian inventors who obtained a patent in 1967-68. The following is a list of the number of inventions and of their origin.

TABLE 62

NUMBER AND ORIGIN OF INVENTIONS PATENTED BY CANADIANS IN 1967-68.

<u>PROVINCE OF ORIGIN</u>	<u>NUMBER OF INVENTIONS</u>
Ontario	659
Québec	369
British Columbia	92
Manitoba	35
Saskatchewan	26
Nova Scotia	7
New Brunswick	2
Newfoundland	1
Prince Edward Island	1
Yukon and Northwest Territories	1
TOTAL	1,263

The above table shows clearly that Ontario and Quebec are the two most productive Canadian provinces so far as invention is concerned. Since this study covers essentially the inventive potential of Quebec, it must be noted that this province has a very fertile nucleus of independent inventors who make a significant contribution to invention in Canada. Wilson's study of invention remarks that a distinction must be made between independent inventors who are really gifted and those who only have visions.

(1) Wilson, Andrew H., *L'invention dans le Contexte Actuel*, Information Canada, Ottawa 1970, p. 16.

The mandate given to the person responsible for this study did not include the elaboration of a detailed technical evaluation of the real potential of the inventions developed by the members of the Club des Inventeurs Inc. Suffice it, however, to recall some figures: the 163 respondents have 1429 inventions spread among 18 sectors of activity. Over 30% of the respondents have more than six inventions to their credit. As regards patents, 16% of the respondents hold at least one, while several others have patents pending. Also, 11 inventions have already reached the marketing stage. According to a statement made in 1972 by Air Marshal C.L. Annis of the Canadian Patent Society, only 1% of the inventions submitted to that society become a real financial success for their authors (1). Even though at first sight this observation is disheartening, it should not lead to the conclusion that independent inventors should be abandoned to their own fate. Indeed, in a recent book titled "Invention, Discovery and Creativity", A.D. Moore discusses a considerable series of discoveries by independent inventors, which contributed greatly to the development of the American economy (2).

If it is true that Canadian economic dynamism is based partly upon the exploration and development of great innovations, then it is advisable to propose an infrastructure that would take this reality into account. It would not be very realistic to recommend a single means of action towards this problem, which was discussed, among others, by the Science Council of Canada in its report titled "Innovation in Difficulty" (3). Concerted action on invention and its branches can only be done on several simultaneous paths. In his study, Wilson (4) arrives at the conclusion that "discovery and invention are the domain of the scientist, whereas innovation is mainly due to entrepreneurs."

(1) Horizon 4, 1972.

(2) Moore, A.D., "Invention, Discovery and Creativity", Doubleday and Co., 1969, p. 160.

(3) "Innovation in difficulty" - Report No. 15, Information Canada, 1971.

(4) Wilson, Andrew H., "L'invention dans le contexte actuel", Information Canada, 1971, p. 74.

In several instances throughout this report, it was demonstrated that inventors attribute a great value to business sense, and that several of them would like to market their inventions themselves. On the other hand, almost all the literature concerning inventors agrees on the point that few inventors have an intuitive notion of business and marketing (1). It follows that independent inventors are generally poorly suited to marketing their inventions themselves. It is thus necessary to have an organization for detecting the potential of inventions, which could act as a catalyst in promoting the interests of the inventors in a given region. Based on the study of the data, everything indicates that Invention Quebec satisfies at this time the aspirations of a considerable portion of the independent inventors in Quebec. However, in order to ensure the continuity of its work, this organization should have additional funds available for the future expansion of its activities, since this is an essentially non-profit organization that cannot expect to support itself adequately for playing a greater rôle even while requiring minimum dues and charges from its members. It has already been agreed that the present clients of Invention Quebec are mostly small independent inventors. The latter claim that the lack of financial resources constitutes their biggest handicap as regards their efforts to succeed in developing their inventions. This fundamental difficulty, however, does not cause us to recommend a return to Invention Quebec services offered entirely free of charge, since a fair number of clients said they were very satisfied with the amount they spent in return for the services rendered. It should be recalled here that the clients who were most unhappy with this organization were - in almost every case - the same ones who had spent nothing at all with Invention Quebec.

Since the greatest expense is due to the procedure for obtaining the patent, a committee could be set up to evaluate the inventions submitted by independent inventors. In this manner,

(1) "The Innovators", Dow Jones Books, 1968, p. 22.

the members of the committee would be able to evaluate the success potential of the inventions submitted to them, before letting those inventions proceed all the way to the patent obtention stage. If that committee had at its disposal a sufficient annual budget (for example, in the same ratio as the number of patents granted per province), it could award grants in order to cover patent obtention costs for the most deserving independent inventors, who might perhaps fail to reach that final stage if left on their own. Obviously, the membership of such a committee must be such as to prevent any arbitrary decisions. Such a formula could be incorporated into the organization for evaluating invention potential mentioned above, which would provide continuity in the operation of the activities.

Since the stage of patent obtention must not be considered to be the ultimate goal in every case, it would be just as interesting to stress the rapid diffusion of inventions such as "gadgets", games and other similar discoveries, via a kind of consortium comprising inventors, entrepreneurs, professors and students from some business administration schools. Since the entrepreneurial spirit often results from the combination of innovations with the perception of unfilled needs, it would no doubt prove to be very educational for the groups involved to attempt joint ventures, in order to speed up the marketing stage of some inventions. As regards discoveries of a more scientific nature, it would be equally desirable to maintain the same type of co-operation, besides having access to researchers and the laboratory facilities available in universities and other educational institutions. In this fashion, the concept of multi-disciplinarity, as well as the team spirit essential for discoveries of greater scope, would both be enhanced without requiring excessive expenses from the parties involved.

All accepted methods of publicity for the diffusion of innovations should be carefully surveyed with the assistance of communication experts. In this connection, let us recall that an effort is now being made to publicize some Canadian innovations on permanent exhibition at the Galerie de l'Invention at Place Bona-

venture in Montreal. For the past 65 years, a large-scale fair has been held in Paris for tinkerers of every description; it is called Concours Lépine ; the "R System" (Resourceful) is stressed there. This annual competition draws 300,000 visitors each year (1), and it offers a unique chance to the small inventors wishing to exhibit their inventions and publicize their talent at no cost to themselves. Every event of this type could be a very positive motivating force to the numerous inventors who invent primarily in order to achieve social promotion and recognition.

In order to ensure the proper operation of this type of initiative, duly authorized persons should be supported by the government authorities interested in publicizing innovation in Canada and abroad.

Several respondents who were asked to comment on their contacts with manufacturing firms said they were disappointed with their limited success. There are many reasons that could explain this failure, among others the lack of preparation of the two parties for this type of dialogue. It is estimated that there are between 2,000 and 3,000 (2) small and medium-size manufacturing firms in Canada which could benefit from more frequent contacts with inventors, particularly in the high-technology sectors. In order to encourage this rapprochement, a program of invention bonuses could easily be set up in industry. In many documented cases, manufacturing firms offer sizeable amounts to their employees who draw the management's attention to some new means of increasing productivity and of simplifying operations of a technical nature. This attitude prevails at the Compagnie Fer et Titane of Quebec, among others.

(1) The New York Times, March 3, 1974.

(2) Wilson, Andrew H., op. cit. p. 60.

Since a fair number of the inventors covered in this study work for very diversified companies, and since they claim there is a link between their job and their inventions in 48% of the cases, there is thus a creative potential that could be used to bring together the smart employers and their workers, provided that both parties are willing to co-operate closely for a common goal.

Also, some government subsidies similar to the numerous existing federal assistance programs could be earmarked specifically to firms that want to develop and market Canadian inventions. These subsidies could cover the acquisition of the patent rights and the development costs of some particular invention.

There are also several firms that own a portfolio of inventions that have not been marketed, but which have nevertheless reached an advanced development stage. Such is the case with the Compagnie S. Albert in Montreal, a pioneer in various fields connected with air pollution. Firms of that magnitude should increase their contacts with provincial and federal research councils. There are in Quebec and elsewhere several organizations of scientific research, for instance the Industrial Research Centre of Quebec, the purpose of which is mostly the solving of advanced industrial technical problems. This purpose, even though very realistic, does not favour too much the co-operation with independent inventors, whose problems are seldom of a very complex nature.

After stating their financial problems and the difficulty of communicating with manufacturers, the inventors' third-ranking preoccupation is the isolation of the inventor, or the lack of expert assistance. Needless to say, the field of inventions is very complex. This is even more so concerning the numerous legal procedures surrounding the divulgation, the preliminary steps and the protection of the inventions proper.

Due to the very complexity surrounding the protection of an invention, some inventors develop a frightened mentality that can be easily exploited in several ways by shady persons and organizations. The Patent Office, now under the Federal Department of Consumer and Corporate Affairs, should prepare for the inventors a very simplified fly-leaf covering the main ways of securing a patent, as well as some specifications concerning the value of a patent in general, in order to demistify as much as possible the rather opaque character of this question at this time even in the opinion of those familiar with the subject.

Should there still remain some inventors who have difficulty interpreting the normal stages required to secure appropriate invention protection, free clinics dealing with invention and with the Canadian patent regulations as a whole could be held at regular intervals in the main cities.

These clinics could be directed by a few travelling invention experts, as practiced already for the promotion of the various corporate assistance programs under the aegis of the Department of Industry, Trade and Commerce in Ottawa.

Finally, a concerted invention policy should follow development guidelines that would be stressed more than others. In order to be consistent, such a policy must be predicated on the feedback of a great deal of data in many invention sectors within high-technology fields. After setting up a selective data bank covering a variety of inventions, it would be relatively easy to single out certain trends that offer the greatest commercial potential. To mention only discoveries originating in universities, a large number of high-technology firms emerged in the Boston area, as well as on the West Coast of the U.S. This example of success could be multiplied several times, provided that a concentrated effort is made to detect certain promising inventions and to co-ordinate them with the industrial sectors with the greatest future growth potential.

To mention but a few examples of growth, the games and toys industry in the U.S. grew by 40% between 1967 and 1970 (1). (Several inventors in our sample are outstanding in this field). The sale of various products for household pets alone amounted to \$4 billion in 1972 in the U.S., where 57% of the population owned one or more pets (2).

Without stressing further the correctness of this last recommendation, it seems that there cannot be a steady progress in promoting inventions without a very perspicacious, almost visionary, attitude aiming resolutely towards the growth sectors coveted by today's business world. Without that perspicacity, the best invention might remain a mere idea for want of marketing opportunities.

(1) Business Week, January 27, 1973.

(2) Montreal Star, January 29, 1974.

APPENDIX AINTERPRETATION OF THE CHI-SQUARE

The chi-square technique has all sorts of applications in statistics. This study will use but one of its numerous applications. It will be used to check whether the distribution compared two by two in the contingency tables are random, or whether they are correlated.

Thus, a non-significant result will indicate independence or non-correlation between the variables compared. The chi-square will then be the proof of the independence of the distributions analyzed.

If, on the other hand, it is impossible to prove the independence of two series of variables, the various chi-square tests will be significant and there will be every reason to believe that there is a reciprocal influence between the two variables. However, the certainty of the link observed will depend on the probability threshold (.05, .02, .01 or .001) exceeded by the chi-square.

When the calculation of the chi-square is significant at the .05 or .02 thresholds, the link will be considered to be uncertain. We shall speak then of a trend linking the two variables. Indeed, at these probability thresholds, there is still a 2 to 5 per cent chance that the link observed is random.

On the contrary, when the chi-square exceeds the .01 or .001 thresholds, the reciprocal influence of the variables will be deemed quite or very probable. There is, in this case, less than one chance in 100 of being wrong. These basic principles will be applied throughout the study.

APPENDIX BQUESTIONNAIRELABORATORY OF SOCIAL PSYCHOLOGY

RESEARCH PROJECT ON QUEBEC INVENTORS

CONFIDENTIALITY.

Do not sign your questionnaire. All information supplied by you in this questionnaire will remain confidential. Only the members of the Social Psychology Laboratory will have access to the questionnaires, which will be destroyed after their study.

The number printed on the back of the questionnaire is absolutely necessary, for it will allow us to determine accurately the proportion* of inventors in each Quebec region and sub-region who have replied to the survey. The presence of that number does not affect the confidentiality of the survey in any manner whatever.

HOW SHOULD THIS QUESTIONNAIRE BE FILLED OUT?

Read each question carefully. There are no wrong or correct answers. Your reply should be dictated by your opinion and your personal experience alone.

Do not forget to answer the general questions at the end. These informations are essential for the interpretation of the results. They cannot be used to identify you in any manner whatever.

IMPORTANT

Place the completed questionnaire in the envelope bearing the address of the Social Psychology Laboratory. Return the questionnaires as soon as possible, Friday, May 17 being the deadline.

* Transl. Note: French text reads "proposition" (= proposal), probably a typing error.

1 - How many inventions do you have to your credit ?

(Count all your inventions that are at least at the conception stage, whether they are registered or not).

_____ invention(s)

2 - How many inventions do you have in each one of the following sectors ?

- _____ 01. Leisure and sports
- _____ 02. Games, educational games, toys
- _____ 03. Tools, machine-tools, machinery
- _____ 04. Household appliances, electrical household appliances, toiletries, storage equipment (library, racks, containers)
- _____ 05. Automobiles and utility motor vehicles
- _____ 06. Motors (all types of motor)
- _____ 07. Construction materials and procedures
- _____ 08. Snow collection, removal or melting devices
- _____ 09. Medical: remedies, surgical devices, prostheses, etc...
- _____ 10. Education and teaching methods
- _____ 11. Security: all types of security systems, except those worn as clothing
- _____ 12. Communication and audio-visual
- _____ 13. Office supplies
- _____ 14. Tobacconist's supplies: everything related to cigarettes, pipes and cigars
- _____ 15. Food
- _____ 16. Clothing
- _____ 17. Gadgets
- _____ 18. Miscellaneous: whatever cannot be included elsewhere.

3 - For how many of your inventions have you done patent studies in Ottawa, or caused such research to be done ?

Number of patent studies: _____

4 - How many times did you obtain each of the following patent study results?

- a) Unpatentable invention, there is something similar to your invention ()
- b) Patentable invention, there is nothing similar to your invention ()
- c) Result not known yet ()

5 - Do you work on your inventions:

- regularly (a little each day or each week) ()
- or
- irregularly (in bursts, for intensive periods) ()

6 - If you work regularly, could you estimate how many hours you devote on average per week to your inventions ?

- 0 to 5 hours per week ()
- 6 to 10 hours per week ()
- 11 to 15 hours per week ()
- 16 to 20 hours per week ()
- 21 to 25 hours per week ()
- 25 hours per week and more ()

7 - Do you usually work on your inventions alone or with other persons ?

- alone ()

or

- with others ()

8 - What do you think of team work for working on the development of your inventions?

a) BEFORE the inventions are protected, team work is a means that has:

- only advantages ()
- more advantages than drawbacks ()
- more drawbacks than advantages ()
- only drawbacks ()

b) AFTER the protection of inventions has been secured, team work is a means that has:

- only advantages ()
- more advantages than drawbacks ()
- more drawbacks than advantages ()
- only drawbacks ()

9 - The following are a few reasons why some people are inventors.

01. To publicize their creative talents
02. To prove to themselves that they are capable of creating something novel, something different of which no one had thought before
03. To improve their financial situation
04. To solve real problems encountered in their everyday life
05. Because they like the work implied in the conception and development of an invention
06. Due to a desire to go into business and become one's own boss
07. To make life easier for others
08. To be able to use their creative abilities, which would have remained unused otherwise
09. To spend their spare time more productively
10. In order to obtain a more interesting job

Indicate below the numbers corresponding to the two statements that come closest to your personal reasons.

first choice : _____

second choice: _____

10 - In order to succeed as an inventor, would you say business sense is:

- very important ()
- important ()
- of little importance ()
- of no importance ()

11 - How much money did you spend on your inventions to date?

- between \$0 and 100 ()
- between \$101 and 200 ()
- between \$201 and 300 ()
- between \$301 and 400 ()
- between \$401 and 500 ()
- between \$501 and 1,000 ()
- between \$1001 and 2000 ()
- between \$2001 and 5000 ()
- over \$5000 ()

12 - When did you start on your first invention?

- less than 1 year ago ()
- 1 to 5 years ago ()
- 6 to 10 years ago ()
- 11 to 15 years ago ()
- 16 to 20 years ago ()
- 21 to 25 years ago ()
- over 25 years ago ()

13 - Are you satisfied or dissatisfied with your inventions from the following viewpoints:

a) the costs they have meant to you

very satisfied satisfied dissatisfied very dissatisfied
() () () ()

b) the income they have brought you

very satisfied satisfied dissatisfied very dissatisfied
() () () ()

c) their development (blueprint, prototype, operation)

very satisfied satisfied dissatisfied very dissatisfied
() () () ()

d) their protection

very satisfied satisfied dissatisfied very dissatisfied
() () () ()

14 - The following is a list of 12 different hobbies.

- | | |
|--------------------------------|------------------------------|
| 01. listening to music | 07. television |
| 02. crafts, painting, drawing | 08. parlour games, cards |
| 03. reading | 09. working on inventions |
| 04. sports, outdoor activities | 10. do nothing special, rest |
| 05. watch shows, films, plays | 11. meet friends |
| 06. tinkering | 12. attend sports events |

Indicate the three (3) to which you devote most time.
Place them by order of importance:

1st : _____
2nd: _____
3rd : _____

15 - Is there a relationship between what you invent and:

- what you do as spare-time hobbies?
yes () no ()
- what you do as your job?
yes () no ()
- the studies you have done, or that you are doing now?
yes () no ()

16 - Select among the following possibilities that which interests you most.

Check with an X the item of your choice. Make one choice only.

1. Go into business with my inventions and quit my present job ()
2. Be hired by a company to invent new products ()
3. Sell my inventions to a manufacturer, keep my present job and continue to invent in my spare time ()
4. Live off my inventions alone by selling them to manufacturers ()
5. Go into business with my inventions and keep my present job ()

17 - Indicate your estimate of what your chances are for achieving this possibility"

0%	25%	50%	75%	100%
()	()	()	()	()

18 - What are the main problems you had to face to date as an inventor?

1. _____

2. _____

3. _____

19 - To what extent do you believe you have business sense?

a great deal	sufficient	little	very little
()	()	()	()

20 - In your opinion, to what extent can an inventor trust the following persons or organizations:

a) patent agents ?

very little	little	sufficient	a great deal
()	()	()	()

b) Invention Quebec ?

very little	little	sufficient	a great deal
()	()	()	()

c) manufacturers ?

very little	little	sufficient	a great deal
()	()	()	()

21 - Are you satisfied or dissatisfied with the work done for you by Invention Quebec ?

very satisfied	satisfied	dissatisfied	very dissatisfied
()	()	()	()

22 - Have you already contacted a (or several) patent agent(s) ?

yes () no ()

23 - If yes, are you satisfied or dissatisfied with your contacts with patent agents ?

very dissatisfied dissatisfied satisfied very satisfied
() () () ()

24 - Have you tried to get in touch with one or several manufacturers in order to sell your inventions ?

yes () no ()

25 - If yes, have you succeeded in contacting manufacturers ?

yes () no ()

26 - If you succeeded, were your contacts with these manufacturers:

- very unsatisfactory ()
- unsatisfactory ()
- satisfactory ()
- very satisfactory ()

27 - Do you need financial assistance as an inventor ?

yes () no ()

28 - If you need financial assistance, what are the two (2) stages for which you require that assistance ?

1. technical appraisal of the invention
2. blueprint
3. prototype
4. application for protection (patent and British Provisional)
5. sale of the invention to a manufacturer
6. commercial evaluation of the invention (market survey)
7. exploitation of the invention by the inventor himself

Indicate below your first two choices:

first choice: No. _____

second choice: No. _____

31.- In your opinion, what steps should the federal government take in order to help inventors ?

1. _____

2. _____

3. _____

32 - What age bracket are you in ?

() under 20 years () between 40 and 44 years

() between 20 and 24 () between 45 and 49

() between 25 and 29 () between 50 and 54

() between 30 and 34 () between 55 and 59

() between 35 and 39 () 60 years and over

33 - Sex: Male ()

Female ()

34 - What language(s) do you speak fluently ?

French () English () Other: _____

35 - To your knowledge, have there been, or are there, inventors among:

- your family and relatives yes () no ()

- your surroundings and friends no () no ()*

* Translator's Note = the French copy has two negations. First "no" should really be "yes".

36 - What schooling level did you reach ?
(indicate highest level only)

- elementary ()
- secondary (sciences, classical
or commercial) ()
- secondary (trades) ()
- college (other than
technical) ()
- technical college ()
- university ()

37 - What is the highest degree you hold ?

38 - Have you taken, or are you taking now, additional (refresher) courses ?

yes () no ()

If so, which ? _____

39 - Civil status

Married () Single () Other ()

40 - If you are married, does your spouse work at this time ?

yes () no ()

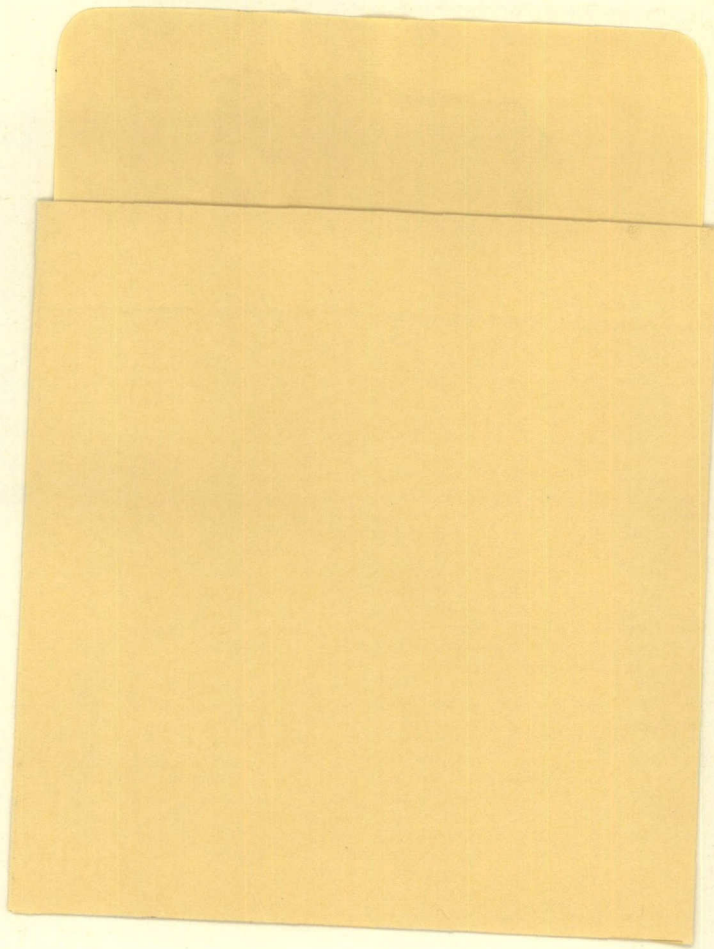
41 - What is your present occupation ?

- I am a housewife ())
- I am a student ()) }----- go to question 44
- I am unemployed ())

- my occupation is : _____

42 - Are you self-employed ?

yes () no ()



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