RENOVATORS AND TECHNOLOGICAL CHANGE IN THE SINGLE FAMILY HOUSING MARKET IN CANADA, 1990-2005

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ABSTRACT

Renovators can continue to learn about and use new technology more effectively in the future if the means of access to this information are improved, if the skill levels of renovators, sub-contractors and trades are regularly upgraded, and if they use the power and accessibility of the Internet to facilitate, to communicate, and to market their services. Renovators need to become better informed about the proposed changes in the National Building Code and about the valuable products, services and information offered by various private and governmental organizations involved with the renovation industry. Because technological change in this industry is evolutionary and gradual, renovators should be able to keep up with the new technology providing they devote a reasonable amount of time and resources to learning about new technology and its application and to upgrading their technical and managerial skills.

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EXECUTIVE SUMMARY

This study examines the dissemination of information about new technology to renovators and the utilization of the new technology by renovators in their renovations of owner-occupied single family detached and semi-detached homes in Canada between the years 1990 and 2005.

Although technological change in the residential renovation industry is gradual and cumulative, it is increasing both in the speed and in the range of new materials, methods and equipment being introduced, especially in the use of electronics in the mechanical and electrical fields and in the use of prefabricated and man-made components. The main trends in the types of technology being used by renovators are: (a) heating, ventilation and air-conditioning products, (b)energy efficient products, particularly windows, and (c) engineered and man-made wood products. These items are designed to increase comfort and convenience, improve the quality of the indoor environment, reduce maintenance, and cut energy costs. In order to remain competitive renovators need to be fully aware of new technology and its implications for controlling costs, increasing productivity and meeting the needs of their clients.

It is becoming more difficult, costly and time-consuming for renovators and even their specialized sub-contractors to keep fully informed about these changes using traditional means of research including trade magazines and trade shows. Sub-contractors and trades have to work hard to keep up with the extent and sophistication of the technological changes that are happening in their own areas of specialization on a global basis. However, the problem is multiplied for renovators. They must know about the existence of the whole range of new technology, including applications and costs for all the sub-trades, and also must be able to select the appropriate sub-contractors and trades to do the work, ones who are knowledgeable about the installation and servicing of these new technologies. With the fewer number of new journeymen entering the ranks of the tradesmen due to the lower levels of construction activity as compared with the peak periods of the late 1980's and the established journeymen needing upgrading, the choosing of the most capable skilled labour who can work with the new technology is becoming more crucial for renovators.

Even more challenges as well as opportunities, lie ahead for renovators in their use of new technology as the philosophy of the building and fire codes moves from just prescriptive to a combined-based formula (i.e., performance and objective-based criteria as well). As a result of these changes, renovators should have more options available to them in their search for solutions both to difficult technical problems and to the requests of their clients for the better utilization of their facilities. Renovators will have to be aware of alternative technologies if they are going to remain competitive in this new regulatory environment.

Renovators need to devote more attention in the future to the following issues:

- Making the access to information about new renovation technology easier and quicker. yet still economical,

- upgrading the skill levels of sub-contractors and trades and maintaining and upgrading the skill levels of renovators in reference to the use of new renovation technology,
- evaluating the potential impact on the home renovation industry of using the Internet and related technology in such areas as searching for information about the existence and use of new technology, finding answers from experts about building science problems, upgrading skill levels, advertising and marketing of products and services, and communicating within the industry about common issues of concern.

RÉSUMÉ

Cette étude, qui vise la période 1990-2005, porte sur la dissémination, aux rénovateurs, de l'information relative à la nouvelle technologie et sur l'utilisation que ces entrepreneurs en font lors des travaux qu'ils exécutent au Canada sur des maisons individuelles et jumelées occupées par leur propriétaire.

Bien que le changement technologique dans le secteur de la rénovation résidentielle soit graduel et cumulatif, il augmente tant pour l'éventail des matériaux, des méthodes et des équipements nouveaux offerts que pour la rapidité avec laquelle ils font leur apparition sur le marché, particulièrement en ce qui a trait à l'emploi de composantes électroniques au sein des installations mécaniques et électriques et à l'utilisation d'éléments ouvrés et réalisés à la main. Les produits suivants bénéficient le plus souvent des nouvelles tendances technologiques retenues par les rénovateurs : (a) produits de chauffage, de ventilation et de climatisation; (b) produits éconergétiques, en particulier les fenêtres, (c) produits du bois ouvrés et réalisés à la main. Ces produits sont conçus pour accroître le confort et la commodité, améliorer la qualité du milieu intérieur, diminuer l'entretien et réduire les frais liés à l'énergie. Afin de demeurer concurrentiels, les rénovateurs doivent très bien connaître la nouvelle technologie et ses répercussions sur la maîtrise des coûts, l'accroissement de la productivité et le respect des exigences des clients.

Il est de plus en plus difficile, coûteux et fastidieux pour les rénovateurs et même pour leurs sous-traitants spécialisés de se tenir à jour sur ces changements au moyen des méthodes traditionnelles de recherche, notamment les magazines et les salons professionnels. Les sous-traitants et les gens de métier doivent travailler fort pour suivre, dans toute leur portée et leur perfectionnement, les changements technologiques qui touchent leurs propres secteurs de spécialisation à l'échelle mondiale. Toutefois, le problème est encore plus complexe pour les rénovateurs. Ceux-ci doivent connaître toute l'étendue de la nouvelle technologie, y compris les applications et les coûts inhérents à tous les sous-traitants, et doivent aussi être en mesure de choisir les sous-traitants et les spécialistes appropriés pour faire le travail, c'est-à-dire ceux qui savent le mieux comment mettre en oeuvre ces nouvelles technologies et s'en occuper. Étant donné que les nouveaux compagnons qui joignent les rangs des gens de métier sont de moins en moins nombreux, du fait de la faiblesse de l'activité de construction par rapport aux périodes de pointe qu'a connues la fin des années 1980, et que les compagnons établis ont besoin de perfectionnement, la capacité de sélectionner la main-d'oeuvre la plus compétente pour utiliser la nouvelle technologie devient de plus en plus cruciale pour les rénovateurs.

L'avenir réserve encore plus de défis, mais aussi d'occasions, aux rénovateurs qui font appel à la nouvelle technologie, puisque la philosophie uniquement normative des codes du bâtiment et de prévention des incendies se dirige progressivement vers une formule combinée (fondée aussi sur la performance ou l'atteinte d'objectifs). Par suite de ces changements, les rénovateurs devraient avoir à leur disposition un plus grand

nombre d'options pour trouver des solutions tant aux problèmes techniques complexes qu'aux demandes de leurs clients dans le but de mieux utiliser leurs installations. Les rénovateurs vont devoir connaître les technologies de rechange s'ils veulent demeurer concurrentiels dans le nouveau cadre réglementaire.

Dans le futur, les rénovateurs devront accorder plus d'attention aux questions suivantes :

- faciliter et accélérer l'accès à l'information sur la nouvelle technologie en rénovation, tout en s'assurant que l'opération demeure économique;
- améliorer les compétences des sous-traitants et des gens de métier, tout en maintenant et en améliorant les compétences des rénovateurs par rapport à l'utilisation de la nouvelle technologie en rénovation;
- évaluer l'impact potentiel sur le secteur de la rénovation résidentielle de l'emploi d'Internet et de la technologie connexe dans des domaines comme la recherche d'information sur l'existence et l'utilisation de la nouvelle technologie, l'obtention de réponses d'experts au sujet de problèmes de science du bâtiment, le relèvement du niveau de compétence, l'annonce et la promotion de produits et services, la communication avec les gens de l'industrie à propos de préoccupations communes.

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CHAPTER 1— INTRODUCTION— LEARNING AND INSTALLING NEW TECHNOLOGY

Overview

Technological change in the residential building industry is increasing both in the speed and in the range of new materials, methods and equipment being introduced, especially in the use of electronic components in the mechanical and electrical fields and in the use of prefabricated and man-made components. In order to remain competitive renovators need to be fully aware of new technology and its implications for controlling costs, increasing productivity and meeting the needs of their clients.

It is becoming more difficult and time-consuming for renovators and even their specialized sub-contractors to keep fully informed about these changes. Sub-contractors and trades have to work hard to keep up with the extent and sophistication of the technological changes that are happening in their own areas of specialization on a global basis. However, the problem is multiplied for renovators. They must know about the existence of the whole range of new technology, including applications and costs for all the sub-trades, and also must be able to select the appropriate sub-contractors and trades to do the work, ones who are knowledgeable about the installation and servicing of these new technologies. With the fewer number of new journeymen entering the ranks of the tradesmen due to the lower levels of construction activity as compared with the peak periods of the late 1980's and the established journeymen needing upgrading, the choosing of the most capable skilled labour who can work with the new technology is becoming more crucial for renovators.

Even more challenges as well as opportunities, lie ahead for renovators in their use of new technology as the philosophy of the building and fire codes moves from just prescriptive to a combined-based formula (i.e.; performance and objective-based criteria as well). As a result of these

changes, renovators should have more options available to them in their search for solutions both to difficult technical problems and to the requests of their clients for the better utilization of their facilities. Renovators will have to be aware of alternative technologies if they are going to remain competitive in this new regulatory environment.

Objectives of the Study

This study examines the dissemination of information about new technology to renovators and the utilization of the new technology by renovators in their renovations of owner-occupied single family detached and semi-detached homes in Canada between the years 1990 and 2005. The technology includes that used by the major housing trades, including electrical, mechanical, carpentry, cladding, etc..

The objectives of the study are:

1) to identify the main trends in new technology through to the year 2005 and to explore the implications of these changes for renovators and sub-contractors and also for the building process itself. To learn which of these technologies the renovators will actually use on their projects and why.

2) to determine how renovators inform themselves about the introduction of items of new technology and the uses of this technology and how effective they consider these means of discovery are.

3) to determine how renovators find sub-contractors and trades capable of installing and servicing new technology.

4) to identify any impediments renovators encounter in learning about and using new technology and to report any improvements renovators recommend to improve this process.

5) to identify what impact the changes in philosophy about the national building and fire codes will have on the use of new technology by renovators; and

6) to develop a national consensus on the part of renovators about the key issues facing renovators regarding the management of technological change.

Research Plan and Methods

The study is based on:

(a) an analysis of existing literature and data collections; and
(b) surveys of renovators and other relevant organizations.

A literature and data search were undertaken to gain information about future technological trends by trade in the single family home renovation market and to determine some of the main implications of this technology for the renovation process, labour skills and costs. Two main sources have been used: the Industrial Adjustment Service Construction Trade Sector Studies and the Tardif Delphi Survey of construction technology and labour. Additional studies were also consulted. (See endnotes attached to particular sections of the text.)

Renovators were surveyed to learn about their assessment of the new technology and how they learn about and use it in their projects and what problems they face in doing this. Additional interviews were done with organizations associated with home renovation to learn about their initiatives and programs to facilitate technological change in the home renovation sector. (See Appendix C.)

The survey of renovators was done in two stages. The first was a telephone interview survey of 50 renovators across Canada and the second was a mail survey of the same sample of renovators asking them to evaluate and rank the results and key findings of the telephone survey in which they had participated. The second stage aimed at establishing a national consensus about the main issues and conclusions regarding the management of technological change by renovators. This two-stage survey was an abbreviated Delphi-type of survey.

In most cases, the renovator interviewees were selected as follows:

-the provincial members of the Canadian Home Builders' Association(CHBA) Canadian Renovators' Council (10 interviews);

-the Chairman (or senior executive member) of each of the provincial renovator councils (10 interviews);
-the Chairman of local renovators' councils in each of the provinces (1 to 5 per province) (24 interviews); and
-at least one non-CHBA renovator from each region of Canada (6 interviews); to be selected either from the Yellow Pages or in consultation with the local renovator council Chairman or an official of the local or provincial home builders' association.(See Table D1.1)

Modifications were made (a) to include members of the Association Provinciale des Constructeurs d'Habitation du Quebec (APCHQ) in Quebec since there are no CHBA members in Quebec, and (b) to substitute regular CHBA members in place of Chairmen if the Chairmen are not renovators or if there is not a provincial or local renovators' council. The names of the Chairmen at the various levels of CHBA were identified through contacting the CHBA and its provincial and local affiliates; the National Headquarters of CHBA does not maintain an up-to-date listing of all Chairmen and members at the provincial and local level[1].

The responses to the issues raised in the Survey by the non-CHBA/APCHQ renovators who were selected were similar to the answers of the CHBA/APCHQ members, except when the questions focused on the CHBA or APCHQ. The non-association renovators tended to place more importance on other factors than what impact these organizations have on the industry. This was notably the case when assessing the sources used by renovators to learn about new technology. However, several non-members did remark that these organizations did make notable contributions to the renovation industry, particularly when raising industry-wide issues with government.

The renovators chosen were general contractors or project managers, not sub-contractors who do renovations. They were responsible for the completion of the whole renovation project. Some renovators did only renovations, while others did both renovations and new construction, with renovations comprising a large share of their firm's business. Some firms had separate divisions for new construction and for renovation.

The renovators interviewed in the Survey considered themselves to be

better than average in their use and knowledge of new technology as compared with other renovators in their geographical area. Table 1.1 gives the national distribution of this self-evaluation of 50 renovators on their use of new technology. (See Table D1.2 for provincial details.)

TABLE 1.1 RENOVATORS' SELF-EVALUATION ON THEIR USE OF NEW TECHNOLOGY, CANADA

SELF-EVALUATION CATEGORIES	%
Technology Leader	16
One of the Leaders	18
Above Average	50
Average	16
TOTAL	100

The telephone survey was open-ended with room for discussion and elaboration of specific points raised by the interviewees. Interviewees were contacted initially by telephone and given information about the study and the nature of the questions to be
asked and, if the interviewee was willing to participate in the study, a time for the interview was scheduled. A copy of the questionnaire is included in Appendix A.

The survey of organizations, such as Canada Mortgage and Housing Corporation (CMHC), CHBA (including the Manufacturer's Council), and the Institute for Research in Construction (IRC) in Ottawa and with National Association of Home Builders and various print and online renovation publications in the United States, were done through telephone interviews. These interviews explored both institutional approaches to facilitating technological change in the home renovation industry and the identification of major new trends in technology and their anticipated impacts. The changes in the philosophy in the National Building Code were discussed with IRC, including the expected impact of these changes

on the renovation industry and the building process itself.

In addition to the interviews mentioned above, considerable information about these organizations and their activities was gathered from their websites, including latest publications and press releases and services offered.

While no interviews were conducted with manufacturers about their latest products, research was done using manufacturers' websites and product brochures, trade magazines, and visits to various building supply distributors (eg., Cashway Building Centres, Beaver Lumber, Home Building Centre, Home Depot, Gerrie Electric, Westburne-Ruddy Electric, and various kitchen and bath showrooms). Although there are significant differences in the amount and relevance of information and the specific identification of new technology by manufacturers in their websites, it is possible to obtain a reasonably good picture of new technology trends and the support manufacturers provide their customers in respect to performance characteristics and correct installation procedures and troubleshooting.

A comparison was made between the expected technological trends as seen by each of the construction trades (from the literature search) and those trends as reported by the renovators through the telephone interviews. The implications of these technological trends on such factors as costs, productivity, the work process, and skill levels were also identified.

The main findings of the Survey are presented in Chapter 8. The Conclusions and Recommendations are to be found in Chapter 9. Summary national statistical tables are presented in the main body of the study. Significant provincial variations from the national observations are noted in the text; readers wanting more detailed provincial and national information can refer to the appropriate table in Appendix D of the report, as indicated in the text.

CHAPTER 2 — THE MAIN TRENDS IN NEW RENOVATION TECHNOLOGY

THE NATURE OF TECHNOLOGICAL CHANGE IN HOUSING RENOVATION

Technological change in the residential renovation industry is gradual and cumulative. There are a large number of new products or improvements to existing products introduced each year. No single change is likely to completely alter the renovation process or cause a need for complete retraining of renovators. However, it is important for renovators and their trades to keep up with these changes in order to improve the quality of renovations and to be aware of proper installation procedures. Small changes in the performance criteria of a given technology can have an impact on the functioning of the remainder of the house. For instance, the use of improved windows, the most popular single product identified by renovators in the Survey, can change moisture levels, air quality, and energy use in the house, thus having an impact on the heating, ventilation and air-conditioning system.

NEW TYPES OF TECHNOLOGY TODAY

The most significant types of new technology being used by the renovators who participated in the Survey are:

- (1) heating, ventilation and air-conditioning products, such as furnaces, air exchangers, and heat exchangers;
- (2) energy efficiency products, such as windows, doors, building wraps, and insulation; and
- (3) engineered wood products for structural purposes, flooring, framing, cabinets, and finish carpentry.

The use of these types of new technology are fairly similar across Canada, although allowances have to be made for temperature and moisture considerations. The above types of new technology directed at energy conservation and air quality are being used because they are more cost efficient for the consumer to operate, produce more comfort and convenience in the home, and provide better and healthier air quality. Engineered wood is being used because it provides structural advantages (eg.; length of span), is cost competitive, and is available (compared with

solid natural wood products). Ease of maintenance is important for these and other types of new technology. (Table D1 gives more information on these and other types of technology being used by renovators.)

Renovators say they will continue using similar new technology in the future as long as (a)their customers want it, (b) it is feasible to use technically and economically and (c) it produces a better quality renovation.

Similar trends have been identified in other studies on renovators. For instance, a recent study of CHBA renovators reported that their customers asked most frequently about (in order of frequency) hardwood floors, high performance windows, high efficiency heating, and gas fireplaces.[2]

Most of the renovators surveyed are also using new technology in their own businesses. Computers and software for estimating, accounting and for CAD, fax machines, cellular phones are examples of the office technology being used to improve communications and to reduce the manual tasks in running a business. This office technology has made it possible for owners of small firms to do both the office work and the on-site supervision/work. Computer drawings of proposed renovations are becoming more important to customers as they decide what changes to make and which renovator to use.

GENERAL TRENDS IN BUILDING TECHNOLOGY

In the early 1990's, the Tardif Technology Study surveyed experts in each of the construction trades and asked them to identify and rank the most significant emerging technologies. While some of these technologies are probably more appropriate to industrial or commercial building construction, it is still worthwhile to identify them as they may be introduced over time into the residential renovation sector either completely intact or in a modified form.

Table 1.1 identifies the most significant emerging technology for each of the trades.

TABLE 1.1 MOST SIGNIFICANT EMERGING TECHNOLOGY FOR EACH TRADE

TRADE	MOST SIGNIFICANT TECHNOLOGY
Sheet Metal Worker	Computer-based training systems
Electrician	Automated buildings
Carpenter	Prefabricated door jamb/moulding combinations
Insulator	Minimum energy use house design
Bricklayer	Mortarless blocks
Cement Mason	Self-leveling concrete floors
Plasterer	New product to eliminate taping of drywall joints
Painter	Low contaminant- emitting architectural bldg. products
Roofer	Single ply roof membranes
Plumber	Computer-based training systems
Sprinkler Fitter	Computer-based training systems

Table 1.2 accumulates the data for all of the trades and ranks the emerging technologies in terms of expected impact on the industry. The importance of being computer literate and being knowledgeable about the building as an integrated system are clearly identified in this data. In this latter regard, the control of these systems is increasingly being based on electronic and microprocessor technology--this technology can be very sophisticated and it changes very quickly. Four of the top ten technologies are in the design area, followed by three which are new materials; only one is in the "tools" category. "Tools" figured less prominently in the Survey of renovators as well

TABLE 1.2 TOP TEN EMERGING TECHNOLOGIES FOR ALL TRADES

RANK	EMERGING TECHNOLOGY
1	Computer-based training systems (Methods)
2	Minimum energy use house design (Design)
3	Computer simulation of construction parts (Methods)
4	Low contaminant-emitting architectural building products (Materials)
5	Modular mechanical systems (Design)
6	Integrated residential space, water heating and ventilation systems (Design)
7	Prefabricated light weight concrete panels(Materials)
8	Mortarless blocks (Materials)
9	Automated buildings (Design)
10	Articulating and telescoping boom (Tools)

The next table 1.3 gives more detail on the emerging technologies for all the construction trades as a whole by type of technology. While there are examples of individual new products in this list, the majority of new technologies are ones which are system based; the latter have implications for the construction and operation of the whole house or other type of building as a system.

TABLE 1.3 EMERGING TECHNOLOGIES BY TYPE OF TECHNOLOGY (TOP 3 BY TYPE)

TYPE	RANK	EMERGING TECHNOLOGIES
Materials	1	Low contaminant-emitting architectural building products
	2	Prefabricated light weight concrete panels
	3	Mortarless blocks
Tools	1	Articulating and telescoping boom
	2	Fall arrest systems
	3	Automated inspection systems
Methods	1	Computer-based training systems
	2	Computer simulation of construction parts
	3	Field joining methods for modular, factory-built exterior wall panels
Design	1	Minimum energy use house design
	2	Modular mechanical systems
	3	Integrated residential space, water heating and ventilation systems

OTHER TRENDS OBSERVED IN RENOVATION TECHNOLOGY

From other experts contacted in the course of this study, the following trends in new technology were observed:

- better quality products at lower cost and easier to use—emphasizing market competitiveness for the manufacturer and the renovator [3],
- new materials for roofing (metal systems), insulation (blown and batts), engineered wood, panel siding systems, foam foundation forms, and new wood shingles (pine and spruce)[4],
- same trends as for new construction, although introduction may be slower due to decreased opportunities for use[5],
- less complicated installation procedures to reduce errors; increased comfort levels as end product through use of more energy efficient systems and better and safer air quality and environmental control systems; more flexibility in addressing personal fashion through greater variety of materials and designs[6]

RENOVATORS AND NEW HOME BUILDERS: NEW TECHNOLOGY

There are varying opinions about whether new technology gets introduced first by renovators or by new home builders. Those who think that renovators tend to use it first point out the many problem solving opportunities available in renovation which can be addressed by new technology. Those who see new home builders as the leaders point to the greater opportunities to reduce risk and to increase the payback on research investment due to the greater number of similar units in which the new technology can be used. New home builders, especially those who are producing large numbers of units, also seem to get more attention by manufacturers' representatives than do small volume renovators so they may be better informed about new technology. Possibly general contractors who do both new home building and renovations have the best advantage in this regard. Some renovators interviewed in the Survey have commented on the advantages a very large scale renovator would have in the use and economical acquisition of new technology.

FUTURE TRENDS

The technology of the short- and medium-term future is likely to be a variation and improvement of the technology of today. The changes will be incremental and gradual. There will continue to be a large number of new products or improved versions of existing products. Methods will become more refined and new variations will be introduced. Renovators and their sub-contractors and trades will be pressed to keep up with the changes and to learn the individual aspects of using and installing the new technology. The most significant challenges in this regard will come in technology which involves electronic control systems and computers. This type of technology requires advanced training in theory and practice, especially on the service/repair side. It also is subject to very rapid change which can be very difficult to keep up with. Other major challenges will come in balancing out the sciences and technology of moisture control, indoor air quality, energy conservation and consumer economics when doing major renovations and major additions.

CHAPTER 3—HOW RENOVATORS LEARN ABOUT NEW TECHNOLOGY

PROFESSIONAL RENOVATORS WANT TO LEARN ABOUT NEW TECHNOLOGY

Professional renovators put a high priority on learning about new technology.[7] Of the renovators interviewed in the Survey, slightly over half said that renovators in their area are committed to learning about new technology and that these ones are professional renovators.[8] (See Table D3.1)

SOURCES OF INFORMATION ABOUT NEW TECHNOLOGY

Most renovators still learn about the existence of new technology by using the traditional sources. Table 3.1 (see Table D3.2) for more detail) reveals the importance of trade magazines, suppliers, trade shows, and trade association meetings.[9] [10] Trade magazines are the most important single source--they are easily accessible all across the country and they can be used whenever the renovator chooses. Trade shows (the ones for the renovation industry, not the ones for homeowners) are important sources of information, especially for hands-on experiences, but these shows are mainly staged in major urban centres and are not easily accessible for renovators in more remote areas like Manitoba, Saskatchewan, and Prince Edward Island and those in small towns and rural communities.

TABLE 3.1 RENOVATORS' TOP FIVE SOURCES OF INFORMATION ABOUT NEW TECHNOLOGY

SOURCE OF INFORMATION	%
1 Trade Magazines	62
2 Trade Association	56
3 Suppliers	36
4 Trade Shows	32
5 Manufacturers	26

The percentage of renovators getting information from subs about new technology is artificially elevated compared to the information about the other sources. Renovators were asked to identify what sources they used in general. Renovators who did not identify sub-contractors as a source of information subsequently were asked whether they obtained information about new technology from their sub-contractors.[11]

The Internet is growing in importance as a vehicle for learning about new technology, but it is only being used by a small minority of the renovators interviewed in the Survey. Some of the other renovators expressed interest in exploring this source in the future. It is expected that a majority of renovators will use the Internet as a way of learning about new technology by the start of the next decade. The "CHBA Pulse Survey of Canadian Homebuilders, Winter 1997/1998" revealed that 44% of the renovators surveyed have Internet access and 11% have web-sites; renovators have somewhat lower rates of usage than all homebuilders (53% and 20%, respectively).[12]

RENOVATORS' ASSESSMENT OF THEIR ABILITIES AT LEARNING ABOUT NEW TECHNOLOGY

Almost two thirds of renovators think they are successful in finding out about what new technology is coming on to the market. (See Table D3.3) Of the remaining third who consider they are only doing fair at this activity, there is disproportional representation from British Columbia(67%) and Manitoba (75%).

HOW RENOVATORS LEARN ABOUT INSTALLING NEW TECHNOLOGY

Renovators rely heavily on manuals and brochures from the manufacturer to learn how to install new technology. This was especially the case in British Columbia, Nova Scotia and Newfoundland. The following table, Table 3.2, (for more detail see Table D3.4) gives the national percentage responses for the top five sources of this type of information.

TABLE 3.2 THE FIVE TOP SOURCES OF INSTALLATION INFORMATION

Sources	Responses (%)
Manuals/brochures from Manufacturer	62
Other Information from Manufacturer/supplier	24
Seminars/demonstrations	14
Information from Subs-contractors	10
Information from Trades	4

RENOVATORS' EVALUATION OF THE QUALITY OF INFORMATION IN MANUFACTURERS' INSTALLATION MANUALS

The renovators regarded the information they received from the manufacturers (mainly the manuals/brochures to be generally good, although there was more dissatisfaction being felt by renovators in Nova Scotia and Ontario than by those in the other provinces. (See Table D3.5) There are variations in the quality and usefulness of the information provided depending on the particular manufacturer. There is room for improvement in this information— manufacturers would do well to review their manuals after consulting with renovators and trades as to how effective the manual really are on the job-site.

RENOVATORS' EVALUATION OF THEIR OWN ABILITIES TO LEARN HOW TO INSTALL NEW TECHNOLOGY

Seven out of ten of the renovators interviewed consider they are effective in learning how to install new technology. (See Table D3.6)

HOW RENOVATORS LEARN ABOUT THE ECONOMIC COSTS AND BENEFITS OF USING NEW TECHNOLOGY

Having good information about the economic costs and benefits of new technology is very important to renovators when they are deciding whether or not they should be using the technology. Accurate information about the economic costs and benefits of using new as compared with existing

technology is not readily available. Generally speaking, renovators consider themselves to be on their own on this subject; 56% of the renovators rely on their own research for this information. (See Table D3.7) This may mean actually trying out the new technology on a project or trying to assemble representative statistics about the actual operation of the technology. A considerable number of renovators (44%) use information provided by the manufacturers, but a quarter of the renovators are skeptical of the reliability of this information, saying that it is mainly sales promotion data or ideal case information. Of those renovators who are unsure of this data, the most skeptical are located in Quebec and Nova Scotia.

The majority of renovators think they are doing a good or very good job of learning about the economic costs and benefits of new technology. (See Table D3.8) However, a third think their performance is only fair and are trying to improve their efforts; British Columbia and Manitoba have the highest number of renovators in this category. Access to independent third party evaluations of new technology would be of great benefit to renovators.[13] Renovators are acutely aware of the serious problems that can arise to those who are the first on the block to use brand new technology which has only the manufacturer's claims to support it. If the product does not do what the manufacturer claims, the renovator can be faced with major repairs, litigation, unhappy customers, financial losses, etc..

SCHEDULED LEARNING ABOUT NEW TECHNOLOGY

A high proportion of renovators(82%) schedule specific time in their schedule to learning about new technology.(See Table D3.9). During this time the types of activities undertaken most often are: attendance at courses or seminars (22%) , reading trade magazines, reports, etc. (15%), and attendance at manufacturers' demonstrations (14%). (See Table D3.10) The taking of courses was more prevalent in Ontario and Quebec and British Columbia than in the other provinces. Maritime renovators show more interest in manufacturers' demonstrations than renovators in other part of Canada.

THE MAIN PROBLEMS ENCOUNTERED BY RENOVATORS IN LEARNING ABOUT NEW TECHNOLOGY

The main problems encountered by renovators in learning about new technology are:

- shortages of time to do research, and
- finding that they are not getting enough information from either the manufacturers or the suppliers.

These problems are found among renovators all across the country. Some other problems seem to be concentrated in particular regions— the timing of courses in the Western Provinces and the high cost of courses in the Eastern Provinces. (See Table D3.11)

LEARNING IMPROVEMENTS SUGGESTED

Renovators are looking more and more to the makers of the new technology to provide more and better information and to make this information more easily accessible (See Table D3.12) The three most frequently mentioned changes renovators say they would like to see happen to achieve this objective are:

- the scheduling of more hands-on demonstrations (34%),
- the distribution of more new product information by manufacturers (30%), and
- the availability of more new technology information on the Internet (24%).

The distribution of responses for the first two changes is fairly even across Canada, but the responses regarding the Internet are much stronger in Newfoundland and Manitoba than elsewhere. Most renovators in areas outside the major urban centres realize that manufacturers are concentrating their sales resources mainly in the big markets where the financial returns are likely to be highest. The Internet potentially gives all renovators, regardless of the size of the market or the size of the individual firm, instant access to this information at any time of day. For those renovators with a computer already, the cost of hooking up to the Internet to acquire this information from manufacturers as well as all other types of technical and business information is fairly inexpensive for most renovators.

SUMMARY

Renovators still rely on the traditional means of learning about new technology, particularly the use of trade magazines and participation in trade associations. However, their sources do not offer an economical, convenient and comprehensive one-stop source of information about new technology and its application and installation. Renovators, particularly the professional ones, say they want to learn about new technology, but are short on time and research resources. The creation of a redesigned magazine or a new Internet catalogue may provide answers to renovators in this search; this issue is explored in greater depth in Chapters 8 and 9.

CHAPTER 4 — HOW RENOVATORS GET NEW TECHNOLOGY INSTALLED

THE USE OF SUB-CONTRACTORS AND TRADES

Most renovators use a combination of their own tradespeople and sub-contractors to instal and service new technology as well as existing technology on their projects. There are still a few renovators that do all the work themselves or use their own crews. There are also renovators (about 15% of those in the Survey) who use sub-contractors exclusively to do all their installations— these renovators are operating as project managers and they will usually have their own site supervisors. (See Table D4.1)

THE USE OF SUB-CONTRACTORS

The renovators who use sub-contractors normally do so for specific trade specialties. (See Table D4.2) Electricians, plumbers, and heating, ventilation and air conditioning (HVAC) installers are usually employed on a regular basis for all projects. For the other trade specialities, some renovators will use subs for masonry, roofing, flooring, stucco, or drywall either on a regular basis or on a project by project basis depending on the difficulty of the work or on the workload of their own trades.

THE USE OF OWN TRADES

Except for those who use sub-contractors for every task, renovators use their own trades mainly for carpentry.

Almost all renovators will have their own site supervisors and probably a small crew, at least, to do minor repairs and final clean up, and to fill in when there is an emergency.

PROJECT MANAGEMENT

Although the number of examples is small at present, there seems to be a growing interest among renovators in becoming project managers, leaving all or most of the actual installing to sub-contractors. The main advantages to this approach are:

- renovators can devote the increased amount of time to keep up with new technology,
- renovators can use the time thus made available to increase and improve client contacts and,

- renovators who are also design builders can use the extra time to really develop and perfect design concepts.

This approach provides a fair amount of flexibility as to the size and number of projects which can be undertaken by a renovator. This "trend" to project management across Canada, however, does not seem to be happening in United States.

WHICH SUB-CONTRACTORS AND TRADES ARE USED?

Renovators almost always either use the same sub-contractors for all of their projects or draw the sub-contractor whom best meets the requirements of each particular job from a pool of prequalified sub-contractors. The main exceptions would be:

- if they were dissatisfied with the work done by a sub-contractor, or
- if the renovators want to test the marketplace for price competitiveness, or
- if the sub was not experienced enough in installing the technology being used in the project, or
- if the client preferred that a different sub-contractor be used.

HOW RENOVATORS ACQUIRE THE SERVICES OF QUALIFIED SUB-CONTRACTORS AND TRADES

A small number of the renovators interviewed has had occasion to use sub-contractors other than their regular ones to install new technology. In these cases, renovators use a variety of techniques to acquire qualified sub-contractorss for the project. Some of the main methods used include: contact supplier/manufacturer for list of qualified installers, search Yellow Pages, ask other builders and contractors, or check with the local Home Builders' Association.

PROBLEMS ENCOUNTERED IN GETTING NEW TECHNOLOGY INSTALLED

Only a small number of the renovators interviewed (24%) have encountered one or more instances when they had a problem getting a particular new technology installed. In most cases, it has involved a technology in the electrical, plumbing, or HVAC fields. Some specific examples cited include: pulse furnace, ground source heating, fibreoptic cables, heating control system, computer software, and sound system installation. While there were renovators with problems from across

Canada, half of the renovators with problems were from New Brunswick, Nova Scotia, and Newfoundland.
In a recent study on renovations involving indoor air quality and ventilation, similar findings were encountered:
"Finding subcontractors to do the work to deal with ventilation and indoor air quality problems was not a serious problem at all. Only 29% rated finding subcontractors as even a moderate problem and just 10% rated it as a serious problem. APCHQ [L'Association Provinciale des Constructeurs d'Habitation du Quebec] members were more likely to indicate that finding subcontractors is a problem: 19% of APCHQ members rated this as a serious difficulty and another 26% rated it as a moderate difficulty, compared to 8% and 14% respectively for CHBA [Canadian Home Builders' Association] members, and 11% and 24% respectively for non-members."[14]

RENOVATOR/SUB-CONTRACTOR RELATIONS AND THE USE OF NEW TECHNOLOGY

The use of new technology is having an impact on the relationship that exists between renovators and their sub-contractors. The most important changes are:

- more supervision of sub-contractors is needed (36%),
- better communication is required to guarantee proper installation procedures for new technology and increased productivity (30%),
- renovators think they must know as much as their sub-contractors about new technology in order to use the new technology effectively (20%), and
- renovators need to require that their sub-contractors regularly upgrade their skills about new technology in order to continue working with them.

Approximately a third (36%) of the renovators have not noticed any significant change in their relationship with their sub-contractors—however, some have said that they were *already* doing some of the practices identified above as changes. (See Table D4.3)

SATISFACTION OF RENOVATORS WITH THE CAPABILITIES OF SUBS AND TRADES

While the renovators who were interviewed in the Survey are generally satisfied with the level of knowledge and capability possessed by their

own sub-contractors and trades, there is some unease about the competence of the other sub-contractors and trades in their area in installing new technology. Half of the renovators say that the majority of sub-contractors and trades in their area are competent(See Table D4.4). However, about quarter said a majority of trades in their area are not capable of working with new technology. The remaining renovators give passing grades to only half of the sub-contractors and trades in their area. This reveals a significant percentage of renovators are concerned that a half or more of the sub-contractors and trades in their area are not keeping up with new technology. The most serious dissatisfaction is being experienced in Nova Scotia, British Columbia, Quebec, and Ontario where 60%, 50%, 34% and 34% respectively of the renovators said the majority of sub-contractors and trades in each of their provinces were not capable of working with new technology.

THE NEED FOR UPGRADING OF SUB-CONTRACTORS AND TRADES

The need for regular upgrading of the trades has been identified in the Industrial Adjustment Service Sector Studies.[15] In studies of, carpentry, electrical, and mechanical (includes plumbing and heating/ventilation/air conditioning), three trades central to housing renovation, the percentage of trades who regularly upgraded their skills was inadequate to maintain skill levels sufficient for the effective use of current technology. Two areas which require considerable training and upgrading for all of these trade specialities are computer usage and trade interrelatedness. The former involves training in both basic computer skills and applications such as CAD, project management, inventory control, and communications. The latter, trade interrelatedness, involves making each trade specialty aware of what the other specialities do on the job site and focuses on training each trade to do their job in such a way as to, at least, not interfere with the other trades and hopefully to improve the efficiency of the others' work.

With the fewer number of apprenticeships being offered now (due to the surplus of trades in most specialities on a national basis) and the increasing number of trades retiring, the question of upgrading will become more and more critical in the medium- term future. With only a few apprentices entering the trades, there will be only a very small injection of new knowledge, ideas and energy into a labour pool which is

increasing in average age fairly rapidly (eg.; the brick laying and masonry trades are particularly affected by this ageing problem). As the journeymen grow older, many will be looking to retire, switch occupations, or reduce the proportion of heavy physical work currently being done. There is little incentive for those about to retire or switch to other occupations to start upgrading their skills if they have not already been doing it on a regular basis. The industry in the medium- and long-term could be faced with the double problem of a shortage of trades who are capable of working with current and new technology and an absolute shortage of trades (regardless of skill levels).

While it is clear that more upgrading is needed, it is less clear how this training will be accomplished. Some trades do upgrade and hopefully are rewarded by getting work and job satisfaction because of it. However, for those trades who have not upgraded in the past and who have neither the motivation nor time/finances to do so now, different incentives are probably needed. Some of these incentives include demands by clients for trades who only have up-to-date skills, requirements by renovators that their sub-contractors and trades upgrade regularly in order to continue to work for them, financial encouragement by government or associations, or compulsory requirements for upgrading by licensing or certification bodies. (See Table D4.5)

SUMMARY

Most renovators use sub-contractors on their projects, particularly for electrical and mechanical work. Generally, they use the same group of sub-contractors and are reasonably satisfied with the work done. However, renovators have identified a need for a significant percentage of sub-contractors and trades in their locality to upgrade their skills. Renovators have suggested some approaches to solving this problem of skill-upgrading ranging from compulsory enforcement to incentives.

CHAPTER 5—WHY USE NEW TECHNOLOGY?

BENEFITS FOR RENOVATORS AND CLIENTS

Renovators gain considerable benefits from using and knowing about new technology.

The most significant is the positive impact on marketing and sales by being able to incorporate the latest techniques and products into their presentations to clients[16]. Other significant gains from using new technology are maintaining/improving productivity levels, being able to keep ahead of clients in their awareness of new technology, and being able to introduce better quality and better quality control into their renovations. (See Table D5.1) Renovators expressed concern that some of their clients are as aware of, or even more knowledgeable about, new technology (particularly products) than they are. A considerable number of clients are right on top of the latest technology and designs from their reading in renovation and home improvement magazines, Internet usage, and attendance at home shows. Unfortunately, much of the consumers' knowledge is very limited since it is largely focused on just the attributes and aesthetics of the new technology rather than the science of proper installation and application. However, if there are too many instances of the clients knowing more than the renovator about new technology, the renovator's credibility as to being a knowledgeable builder can be jeopardized when this news is spread around the neighbourhood by word of mouth.

Almost all the renovators interviewed in the Survey are satisfied that they are using new technology to both the best advantage of their firm (92%) and the best advantage of their clients (94%);the balance of renovators say they are uncertain of the amount of benefits derived. Both the firm and the clients are beneficiaries of these improvements in quality and productivity and product knowledge.

EFFECTS OF THE USE OF NEW TECHNOLOGY ON THE BUILDING PROCESS

Approximately three-fifths of the renovators interviewed think that the use of new technology has made some impact on the on-site renovation

building process. However, there are no clear patterns as to the type or degree of these impacts. Some impacts mentioned include productivity gains, need for fewer workers, greater speed, better quality, more flexibility and more attention to both energy efficiency and the quality of the indoor environment. A significant number of renovators (38%) say they see little change occurring or that the process is the same as before.

EFFECTS OF THE USE OF NEW TECHNOLOGY ON RENOVATORS' OFFICES

Almost all (92%) of the renovators interviewed consider that new technology is having an impact on both the way they run their offices and the relationship that exists between their office and their job-sites. The main types of office technology being used are communications devices (eg., cell phones, fax machines, pagers, e-mail, and the Internet) and computers/software (for accounting, estimating, CAD, and word processing). This technology is:

- increasing productivity,
- speeding up response times,
- helping renovators to prepare more professional and attractive proposals for clients,
- improving communications between renovators and both their clients and their resource people (sub-contractors, trades, and suppliers), and
- giving them more control over their businesses.

SUMMARY

The use of new technology is regarded by renovators as beneficial to both their own businesses and their clients. Some of the main benefits are better marketing and sales opportunities, improved quality of the renovations done, and increased productivity.

CHAPTER 6–THE IMPACT OF THE NEW NATIONAL BUILDING CODE ON THE USE OF NEW TECHNOLOGY

THE INTRODUCTION OF OBJECTIVE-BASED CODES

Changes are scheduled to be introduced into the National Building Code at the beginning of the next decade. The main new ingredient is a different philosophy. In addition to the current prescriptive criteria, objective-based and performance elements are being introduced.

The new codes are to be "organized around a framework which clearly states the intent (objective) of each code requirement and then relates each of these objectives
to higher, and subsequently top level, objectives of the code document. Accompanying each requirement would be one or more acceptable solutions. Acceptable solutions could be either performance- or prescriptive-based. In some cases both kinds of solutions, performance and prescriptive, may be available to address a specific requirement within the code.".[17]

Objective-based codes are "codes whose requirements are based upon explicitly stated objectives. These objectives are stated in terms of a clear and logical hierarchy. The hierarchy starts with a number of key objectives related to fundamental issues such as health and safety. These objectives essentially define the scope of the code. More specific objectives are then expressed under each of these general objectives, for example: safeguard people from injury caused by structural failure; safeguard people from injury or illness when evacuating buildings during a fire,".[18]

The National Building Code may not apply to all renovation work. It will depend on the extent and type of renovation being done and also the policies of the authority having jurisdiction. In addition, those renovations for which no building permits have been obtained would not be effected by the building code changes. Renovators doing major renovations (eg., large additions and substantial structural changes) are likely to be more effected than renovators doing minor renovations or repairs, particularly if the latter are more cosmetic than structural.

SOME ANTICIPATED BENEFITS FOR RENOVATORS

The above changes, in theory, should give more flexibility to renovators to use solutions to building problems or design opportunities not covered now in the building code. The authors of the new code expect the use of objective-based codes should make alternative building renovation decisions more feasible, should allow for more new technology to be introduced faster, and should permit renovators to reduce or contain costs during the construction phase through the use of better technology and more productive methods.[19]

RENOVATORS NEED MORE INFORMATION ABOUT THE CHANGES

The renovators who participated in the Survey were asked about this change in building code philosophy. Unfortunately, a large majority of the renovators had minimal or no information about the changes. Even though the interviewer gave a brief explanation of these changes and the renovators did respond to questions about them, it might be misleading to report the findings in statistical tables as hard data. Instead the findings will be presented as preliminary comments or first impression about the issue of objective-based codes in general, rather than definitive answers to the changes in the new code itself.

RENOVATORS' ASSESSMENT OF THE CHANGES

In general, renovators liked the idea of introducing more flexibility into the building process especially when new design considerations are being attempted in older structures. In theory, they hope that the changes in the code will give them more freedom to experiment with new materials, methods and designs. Providing there is not going to be significant additional financial and administrative costs, renovators seem to be willing to try these additional options when opportunities arise.

Renovators have significant reservations about the capability of the existing administrative apparatus to put the changes into effective in a manner which will be conducive to renovators' participation. Most renovators have serious reservations about the willingness of building department officials and inspectors to make decisions in view of their concerns about their own legal self-protection and about the limited awareness most renovators claim that these officials have about new

technology (See the Building Inspectors section of Chapter 7 of this Study for more information on this subject). Most renovators expect that because of this over self-protectiveness and limited awareness of new technology by building departments, the approval and inspection processes will become more cautious and slower and legal responsibility will be shifted to engineers and architects through requirements that any component of the renovation not in the prescriptive code will require an engineer's or architect's stamp. Renovators are concerned that there should be uniformity in interpretation between building department officials and inspectors both within the same jurisdiction and between jurisdictions since current inconsistencies could become much more severe as the level of interpretation by building officials increases. All of these extra requirements and slowdowns may increase the cost of the renovation and further complicate the scheduling of the project. Changes in the code which are designed to spur innovation and productivity may in their execution create serious impediments to both intended benefits. Some concern has been voiced that all philosophies in the code should have the same standards of performance and that the objective-based approach not be used as a gateway to inadvertently lower standards (for example, during boom times when there are severe pressures to get things done quickly).

THE GUIDING FORCES BEHIND THE PROPOSED CHANGES

The Canadian Codes Centre of the Institute for Research in Construction and other participating organizations across the country have been involved for several years in drafting the New Building Code by introducing changes in philosophy and by making it compatible with international standards and approaches. Various approaches have been used to inform everyone involved with home building and renovation through forums, presentations, literature distribution and a web-site.

STEPS BEING TAKEN TO OVERCOME IMPEDIMENTS TO THE CHANGES

In order to overcome some of the main concerns about the introduction of the redesigned building code as they apply to liability, uniformity of interpretation, expertise levels of building inspectors and building departments and the level of public knowledge about the changes are being addressed as follows:

- Legal liability: panels of lawyers are being established to explore this issue; in Alberta, steps have been taken by the government to exempt building departments and building inspectors from being sued. It is still very possible that greater reliance will be placed on renovators to get changes not expressly identified in the prescriptive code to be authorized by an engineer or architect.
- Uniformity of interpretation: a standard formula is being introduced which should simplify the process of accomplishing an objective and provide the basis for uniform decisions among jurisdictions.
- Expertise levels of building inspectors and building departments: experts are expected to be available to consult with building department officials and building inspectors when problems of expertise arise.
- Level of public knowledge about the changes: several steps, including public hearings, speeches, magazine articles, an up-to-date website and a formal publication of the official document in 1999(two years before the official introduction of the changes) are being taken to inform renovators and all other interested parties about the new code. For renovators to take advantage of the changes in the new code, renovators will have to be knowledgeable of both the new code and the technology they intend using. The building code will not be completely revamped in 2001; the process will be in stages with only the first step occurring in 2001.

RENOVATORS NEED MORE INFORMATION AND TRAINING ABOUT THE CHANGES

If the awareness levels of the changes in the New Building Code found among the respondents to the Survey are even partially representative of the current level of knowledge possessed by all renovators and builders, considerably more will need to be done to train the industry to use the New Building Code in a fairly short period of time. Some adjustment in attitudes and approaches will be needed to work in the environment of the new philosophy which requires a more active role for renovators than is the case now with the prescriptive philosophy.

CHAPTER 7— ORGANIZATIONS AND THE PROMOTION OF NEW TECHNOLOGY

Introduction

Numerous organizations participate daily in the promotion and distribution of new renovation technology and provide valuable services to the renovation industry and their constituents. For this study, only a few of these organizations have been selected for review by the renovators included in the Survey.

Renovators were asked in the Survey to identify what various organizations connected with housing renovation do to promote new technology for renovators. The organizations and entities include:

- Canada Mortgage and Housing Corporation
- Canadian Home Builders' Association/Association Provinciale des Constructeurs d'Habitations du Quebec (includes local affiliates)
- Institute for Research in Construction
- Building inspectors
- Manufacturers of renovation technology, and
- Building supply and equipment distributors.

The role of each of the above organizations will be addressed separately and information also will be presented on the renovators' assessment of the current and future performance of these organizations.

CANADA MORTGAGE AND HOUSING CORPORATION

Renovators' evaluation of its importance in promoting the use of new technology

Canada Mortgage and Housing Corporation(CMHC) is considered by renovators to be a significant promoter of new renovation technology. Of the renovators surveyed, 84% say that CMHC has a very important or important role to play in this regard. (See Table D7.1a)

Renovators' evaluation of its current activities

Three-quarters of the renovators have a good evaluation of the current activities of CMHC. (See Table D7.1b) The poor evaluations appear more among renovators from Manitoba, Saskatchewan, New Brunswick, and

Nova Scotia.

Renovators' evaluation of its current level of activities
Half of the renovators see the current level of CMHC activity in the promotion of new technology as high. (See Table D7.1c) The renovators who see the current level of activity as being low are mainly from the Prairies and New Brunswick and Nova Scotia.

Renovators' evaluation of its future level of activities
Almost 70% of the renovators would like to see the future level of CMHC activity in this regard to be more; this is especially the case in Ontario and the Prairies and Alberta. (See Table D7.1d)

Renovators' evaluation of its mode of activity
Most renovators see CMHC having an active role in the promotion of new technology, (See Table D7.1e) Renovators in Manitoba and Saskatchewan regard the role to be too passive.

Renovators' overall impression of CMHC's role in promoting the use of new technology
Renovators generally like the quality of the materials produced by CMHC on renovation technology.[20] They would prefer to see more information made available and ideally to get the information free or at nominal cost, but most renovators realize the financial constraints under which CMHC is operating and are trying to be both realistic and sympathetic of CMHC's current limitations. Renovators express the need for more information on technology to be directed to renovation rather than new construction and for more data on local and regional conditions and trends.

How CMHC communicates information about new technology
CMHC uses several approaches to communicate its information about new technology and to promote the use of new renovation technology. Some of the main ways include:

- Publications: a wide variety of printed works and videos about technical and business aspects of renovation geared both to renovators and homeowners are available on an order basis and as direct mailouts to those who belong to organizations like CHBA,

Information about current research reports is presented in the CMHC's "Housing Research Quarterly". CMHC has just started a program in conjunction with some building supply distributors which will arrange for CMHC publications to be displayed in building supply stores. The "Before You Renovate" Catalogue is designed to direct renovators and those interested in home renovation to the appropriate publications for their needs.

- Library Resources: the Canadian Housing Information Centre of CMHC has a vast collection of information on housing construction including technological change and has reference librarians which can help renovators and other researchers with their literature searches.
- Trade Shows: CMHC participates in trade shows by giving presentations and by answering questions from renovators at the CMHC booth.
- Training Programs: through the National Renovator Training Program, renovators receive training in many facets of the business of home renovation; future components may include technical training involving the use of new technology.
- Television Shows: CMHC is involved in the sponsorship and production of television shows about renovation and new products and techniques, such as the show, "The Resourceful Renovator".
- Media Relations: CMHC maintains regular contact with the news and information media and with a wide range of organizations(eg., the Renovators' Council of CHBA) interested in housing renovation to keep them fully informed about recent CMHC activities and programs related to renovation and technological change,
- Internet: CMHC maintains an active website and an e-mail address. The web-site gives information about the organization and activities of CMHC, including the latest research initiatives and findings. CMHC is continuously reviewing the role of its website as more and more renovators and homeowners gain access to the Internet.
- Renovation Month: CMHC strongly supports the activities of renovators during Renovation Month through participation in renovation demonstrations, trade shows, trade association meetings and seminars, and publicity campaigns.
- Market Research: CMHC regularly does market research to identify how well CMHC is meeting the needs of renovators and to target

ways of improving its performance through the better delivery of current programs or through the launching of new initiatives.

For all of the above approaches, CMHC schedules particular activities for times when they will be best received by renovators and other industry professionals. For instance, seminars are offered in late fall and in the winter when renovators tend to have more free time away from the job-site.

CANADIAN HOME BUILDERS' ASSOCIATION/ ASSOCIATION PROVINCIALE DES CONSTRUCTEURS D'HABITATIONS DU QUEBEC

Renovators' evaluation of its importance in promoting the use of new technology

Most renovators(including non-members) consider the Canadian Home Builders' Association (including its provincial and local affiliates) and L'Association Provinciale des Constructeurs d'Habitations du Quebec are either very important or important organizations for promoting new renovation technology. (See Table D7.2a)

Renovators' evaluation of its current activities

Four-fifths of the renovators are satisfied the current activities of these organizations to promote new technology. However, some renovators, particularly those from Manitoba think the activities are inadequate. (See Table D7.2b)

Renovators' evaluation of its current level of activities

As to their evaluation of these organizations' level of current activity, 36% of the renovators interviewed in the Survey say it is high and 38% say it is moderate. (See Table D7.2c) Of those who regard it to be low, the highest percentage is among renovators in Manitoba.

Renovators' evaluation of its future level of activities

Almost two-thirds of the renovators, particularly those in Ontario and Manitoba, want these organizations to increase their level of activity in promoting new technology. (See Table D7.2d)

Renovators' evaluation of its mode of activities

A large majority of renovators see these organizations as active champions of the use of new renovation technology. (See Table D7.2e)

Renovators' overall impression of its role in promoting the use of new technology

Renovators see these organizations:

- helping to disseminate information about new technology,
- providing venues for the discussion of new technology,
- encouraging renovators to experiment with and to use new technology,
- helping renovators convey their needs for and concerns about new technology to researchers and developers, and
- promoting policies which will develop the best business and technical climate for the use of new technology.

Renovators do not see these organizations doing actual technical research or product testing. Strong approval is shown by the renovators for the following types of activities conducted by these organizations: demonstrations of new products by manufacturers/suppliers at regular meetings, magazines, newsletters, and training courses/seminars. Some concern was voiced about the need to direct more attention to the issues affecting renovators as opposed to those of new home builders; this concern was expressed very strongly among Manitoba renovators.

How CHBA and APCHQ communicate information about new technology

Both CHBA and APCHQ offer a considerable number of services which help their members acquire information on new technology. Some of this information is available to the public, including renovators who are non-members, through the websites of these organizations and their local affiliates.

For instance, CHBA promotes the use of new technology either directly or indirectly through the following means:

- information about new technology is discussed and made available through the Canadian Renovators' Council, Manufacturers' Council, Technical Research Committee, and National Education and Training Advisory Committee to name just a few of the CHBA bodies involved. The CHBA website contains information on the work of

these bodies plus a considerable amount of additional information about new technology and trends

- the CHBA magazines, Canadian Builder and CHBA Renovator Report, regularly have information about new technology and its application.
- CHBA maintains close liaison with all of the major governmental and private sector organizations connected with the use of new technology and has promoted both the advancement of technological change and the development of a business climate conducive to this change.
- participation in Renovation Month activities.
- participation in renovation demonstration projects and R-2000 activities. and
- demonstrations and discussions by manufacturers and technical specialists are an important input to meetings of the renovators' councils, especially at the local level.

The APCHQ performs similar functions and also maintains a renovation warranty program which oversees the construction practices and the use of technology by renovators approved for the program.

INSTITUTE FOR RESEARCH IN CONSTRUCTION

Renovators' evaluation of the role of its importance in promoting the use of new technology

The Institute for Research in Construction, a part of the National Research Council of Canada is considered to have an important role in facilitating the use of new renovation technology by only 12% of renovators and a moderate role by 16%. (See Table D7.3a) The remaining 70% of renovators have never heard of this organization or know too little about it to make comments. This high "unawareness" level should be kept in mind when evaluating the following findings about activity levels and direction.

Renovators' evaluation of the role of its current activities

Only about 20% of the renovators surveyed consider the current activities of IRC to be good; the strongest support comes from renovators in Ontario. (See Table D7.3b)

Renovators' evaluation of the role of its current level of activities
It is easily understandable from the above information to learn that 80% of the renovators consider the IRC to be operating at a low level of activity. (See Table D7.3) Renovators who think that the current activity level is higher are mainly based in Ontario.

Renovators' evaluation of the role of its future level of activities
After renovators were briefly told of the type of work being done at IRC, almost all renovators interviewed said that IRC should increase its current level of activity in the future. (See Table D7.3d)

Renovators' evaluation of the role of its mode of activities
Only 28% of renovators see the IRC as having an active presence in the encouragement of the use of new renovation technology. (See Table D7.3e)

Renovators' overall impression of its role
The main message renovators have for the IRC is "publicity". The IRC needs to better inform renovators about itself and what services it can offer renovators across Canada. Several of the renovators who know about the IRC use and respect the information about building science provided by IRC and it is expected that other renovators will also be satisfied with the services available once they gain a better working knowledge of the IRC.

Information about IRC and its role in promoting the use of new technology
The IRC was created in 1947 to be the building research arm of the National Research Council. It does research and testing and international standards co-ordination on all aspects of building science. The IRC is composed of the following sections:

- Building Envelope and Structure
- Fire Risk Management
- Indoor Environment
- Urban Infrastructure Rehabilitation
- Canadian Codes Centre (including the National Building and Fire Codes)
- Construction Materials Evaluation, and

- Quality Management.

The IRC has a great amount of information of use to renovators interested in new technology, particularly in the areas of materials, methods, and designs. This information is available in printed versions and, increasingly, on the Internet. Examples of the information available include "Construction Technology Updates" (recent topics covered are: steel studs in residential construction, performance of bonding agents, problems with roofing membranes, etc.), the quarterly newsletter, "Construction Innovation" (available in print form and online), and the "Registry of Product Evaluations" produced by the Canadian Construction Materials Centre (regularly updated test results of building materials comprising approximately 85% of all products by product type). Renovators should carefully explore the information and resources available from the IRC. The Internet site of IRC gives extensive information about the organization and provides information about new technology directly or gives instructions as to how to order it. The "Registry of Product Evaluations", mentioned above, is now on the Internet. Both the Internet and the print versions are available free of charge.

BUILDING INSPECTORS

Renovators' evaluation of their importance in promoting the use of new technology

Most renovators (80%) do not consider building inspectors to be important as promoters of the use of new technology. (See Table D7.4a) Of those renovators who do think they have a role, most consider this to be usually a result of the commitment of individual inspectors rather than the building inspection process itself.

Renovators' evaluation of their current activities

Almost all renovators consider the current activities of building inspectors in encouraging renovators to use new technology to be poor. (See Table D7.4b)

Renovators' evaluation of their current level of activities
The current level of activity of building inspectors in facilitating the introduction of new technology is considered by most renovators (86%) to be low. (See Table D7.4c)

Renovators' evaluation of their future level of activities
All renovators would like to see this change so that building inspectors will at least become more interested in and more knowledgdeable about new technology and its uses. (See Table D7.4d)

Renovators' evaluation of their mode of activities
As can be expected, renovators see building inspectors as passive in their promotion of the use of new technology. (See Table D7.4e)

Renovators' overall impression of the role of building inspectors in promoting new technology
Although some renovators know building inspectors who try to keep up with the latest technical developments and who are open-minded about the use of this technology, the majority of renovators look upon building inspectors as being behind the times, or "code-bound", or reluctant to change, or deficient in training about new methods, or self-protective (i.e.; afraid of legal liability when they make decisions not supported directly by the building code). While renovators acknowledge that building inspectors must diligently adhere to their enforcement and administrative responsibilities, they think that the inspectors should also be knowledgeable enough about new technology to properly evaluate its use in renovations. Many renovators commented that they frequently have to inform the building inspectors about the use of new technology.

MANUFACTURERS OF NEW TECHNOLOGY

Renovators' evaluation of their importance in promoting new technology
Just over half of the renovators surveyed say that manufacturers are currently moderately important in promoting new technology. (See Table D7.5a) More renovators in Ontario put them in the important category than

in any other province.

Renovators' evaluation of their current activities
Almost three-quarters of the renovators say the current activities of manufacturers are good in encouraging the use of new technology. (See Table D7.5b) However, some renovators, particularly those in Manitoba, were not satisfied in this regard.

Renovators' evaluation of their current level of activities
About a third of the renovators consider the current activity level of manufacturers in cultivating the use of new technology to be high. (See Table D7.5c) Twenty percent. of the renovators, including all the renovators from Manitoba, complain the level is low.

Renovators' evaluation of their future level of activities
Almost all the renovators, especially those from British Columbia, Alberta, Manitoba, and Quebec, are urging the manufacturers to increase their level of activity in championing the use of new technology. (See Table D7.5d)

Renovators' evaluation of their mode of activities
Most renovators see manufacturers as being active rather then passive in promoting the use of new technology. (See Table D7.5e)

Renovators' overall impression of manufacturers' role in promoting new technology
Renovators think manufacturers should do more to keep them up to date about new technology and to train them better in its installation. Specifically, they want:

- more hands-on demonstrations and seminars,
- more contacts by sales representatives,
- more visits by renovators to manufacturers' production facilities to see how the new technology is made, and
- more literature giving details about product uses, economics and availability are being requested by renovators.

Some renovators, particularly those who do business in more remote locations and those who have small firms, feel they are being ignored by manufacturers. Renovators also consider that manufacturers are paying more attention to new home builders than to renovators; some renovators

think that this situation will change only when large-sized renovation firms are developed.

Manufacturers' technology information and promotion practices

Manufacturers usually devote considerable resources to promoting their products because this is a crucial way for them to sell their wares and thereby stay in business. Decisions are made about how each product is marketed to each potential customer group, including expected sales relative to the cost of selling. Since manufacturers want to get the highest sales relative to the lowest cost of selling, they frequently target larger markets and larger firms— this is especially the case when sales representatives are used. Marketing decisions may vary from region to region. New technology may be marketed differently from existing technology. Each manufacturer will have its own marketing and sales strategy.

In a brief overview of the web-sites of some manufactures of construction materials and tools/equipment, it was found that there are considerable variations in the types and extent of information provided about new technology. Some manufacturers clearly identify new products in a separate section of the website, while others simply list all their products together. Some manufacturers give extensive information about the uses, technical specifications, installation procedures, and availability of new products, while others provide only a cursory description. It is clear from the comments made by renovators in the Survey that they want new products to be clearly identified and fully described.

BUILDING SUPPLY AND EQUIPMENT DISTRIBUTORS

Renovators' evaluation of their importance in promoting new technology

Almost three-fifths of renovators regard building supply and equipment distributors as currently being only moderately important in facilitating the use of new technology. (See Table D7.6a) However, among the renovators who think the suppliers have an important role, the support is especially strong in New Brunswick. Some specific distributors or chains of distributors seem to be doing a better job than others in the eyes of the

renovators.

Renovators' evaluation of their current activities
Three quarters of the renovators think the current activities of distributors are good as regards to helping encourage the use of new technology. (See Table D7.6b) However, from the comments of renovators cited below, possibly some of the renovators do not consider that the distributors are financially capable of fulfilling this role and are looking more to the manufacturers for this type of support.

Renovators' evaluation of their current level of activities
Almost 60% of the renovators think the current level of activity of distributors in encouraging the use of new technology is high. (See Table D7.6c) Renovators in Manitoba and Saskatchewan, in particular, think that this level is low.

Renovators' evaluation of their future level of activities
Many renovators (68%) and especially those from Manitoba, Ontario, Alberta, and Nova Scotia, would prefer distributors to increase their level of activity in facilitating the use of new technology. (See Table D7.6d)

Renovators' evaluation of their mode of activities
Most renovators see distributors as being passive in their promotion of the use of new renovation technology. (See Table D7.6e)

Renovators' overall impression of distributors' role in promoting the use of new technology
Although a few of the renovators are satisfied with the information they receive from building supply and equipment distributors, most say that much more information can and should be provided. In most cases, renovators must ask these distributors for information on new technology which they themselves have already identified— it is not usual for the distributors to inform renovators about new technology, unless there is a special promotion by a manufacturer. Renovators are looking to distributors to conduct more hands-on demonstrations geared to professional renovators rather than how-to shows for do-it-yourselfers. Some renovators commented that the staff of these distributors were not

well trained to give technical information and that the economics of these distributors was to sell their products (now more and more to homeowners than professional renovators) as quickly as possibly with the lowest overhead including staff salaries.

Distributors' technology information and promotion practices
The marketing practices of manufacturers which were discussed above also apply in large part to distributors. Renovators would prefer that their distributors clearly identify items of new technology in their store, provide detailed brochures about them and also demonstrate proper usage and installation procedures.

OTHER ORGANIZATIONS
A considerable number of other organizations contribute in varying degrees in the promotion of new renovation technology whether they be a government organization, such as Natural Resources Canada (energy conservation) or an association, such as the Canadian Wood Council. Many of these organizations provide very valuable information on new technology and its use through their direct activities and their publications and increasingly through their websites.

SUMMARY
Private and governmental organizations involved in the home renovation industry can and do make significant contributions to renovators by stimulating and facilitating the use of new technology by the industry. These organizations need to regularly assess the types and services they offer to renovators and the means they use to deliver them. The use of the Internet, e-mail and online discussion forums provide exciting new possibilities for these organizations to increase their effectiveness in helping renovators and homeowners to use new technology better. These organizations should continue to use the traditional means of communication and should use hands-on demonstrations of new technology as much as possible.

CHAPTER 8— MAIN FINDINGS

The main findings of the Survey of renovators were identified after the results of the first stage of the Survey were analyzed. They are presented in Table 8.1.

Table 8.1

SOME OF THE MAIN NATIONAL FINDINGS ON RENOVATION TECHNOLOGY FROM THE INTERVIEWS WITH RENOVATORS

1. Technological change is evolutionary--small, gradual changes frequently taken from new construction. There are no major learning curves, but the accumulations of these small learning experiences require time and resources to use the new technology to best advantage. The most significant new technologies being used by renovators are in the fields of heating, ventilation, and air-conditioning(HVAC) and energy efficiency products. The most frequently mentioned single product was high energy efficiency windows.
2. The use of new technology is largely governed by demands of the client (including their architect, when used) and the eagerness of the renovator, assuming there is knowledge about the technology and the technology is available. Maximum usage occurs when both clients and renovators are knowledgeable about the new technology and are willing to take a calculated risk in using non-traditional products or methods.
3. The use of new technology is usually regularly supported by professional renovators for marketing, quality, or productivity reasons. Non-professional renovators are usually not as highly committed to using new technology.
4. The general process of technology transfer by professional renovators (learning about the new technology, getting it to the job-site, and installing it) is proceeding fairly well for the renovators interviewed, although there are some improvements needed:
5. Learning about new technology— the traditional trade magazines, manufacturers' brochures, trade shows, home builders' association meetings etc. are all valuable sources of information, but there is no central one-stop source of information for all new renovation technology. Currently, it can be very time consuming to search out new technology especially if the use of new technology is a major tenet in a business strategy.
6. Learning about the installation of new technology— manuals and information from the manufacturers are generally good, but there is a strong demand from renovators (especially by those outside of major markets) for more on-site hands-on demonstrations by manufacturers on the use and installation of new technology.
7. Most renovators use the same group(s) of installers of new technology whether they are their own trades or sub-contractors and are reasonably satisfied with the work done. However, 48% of the renovators interviewed said that a half or more of the trades and subs in their area are not "up to speed" in regard to the use and installation of new technology and are not upgrading their skills sufficiently. Renovators say that some trades are not interested in upgrading as long as long as customers do not ask for new technology requiring new skills. For those trades wanting to upgrade, renovators suggest there should be more on-site hands-on demonstrations by manufacturers, if possible

during the slower times of the year. Renovators use sub-contractors mainly for electrical, plumbing and HVAC, while many of their own trades do carpentry.

8. Most of the renovators interviewed require more information about the background, concept, procedures, and implications of objective-based criteria in the new National Building Code in general and how the new criteria affect the use of new technology in particular.

9. Renovators want: manufacturers to take a more active role in informing renovators about new technology and in putting on demonstrations; suppliers to be more active in promoting new technology; Canada Mortgage and Housing Corporation (CMHC) to be a major player in this field and to take a leading role (budget permitting); and Canadian Home Builders' Association (CHBA)(and its provincial and local counterparts) and L'A ssociation Provinciale Des Constructeurs d'Habitations Du Québec (APCHQ) to be facilitators and communicators in the promotion of new technology (e.g., manufacturers' participation at meetings and articles in association newsletters), but not major collectors of this information.

10. The Internet is still a minor source of information about new technology for most renovators interviewed, but it is growing rapidly in importance as more manufacturers list specifics of their products (descriptions, uses, installation procedures, technical specifications, dealers, etc.), and as industry organizations (e.g., Canadian Wood Council and CHBA), government organizations (Canadian Construction Materials Center and CMHC) develop their sites. Several renovators remarked that their clients learned about new products they want to use in their renovations from Internet sites. Every year the number of renovators who get on the Internet (26% of those interviewed) or who have easier access to it (at home, at friends', or at public libraries) is increasing.

    The use of the interest as a research tool for new technology should seriously be considered by renovators, especially those outside of major markets and those wanting quick results.

    There is a need for instructional material and training programs to teach renovators how to use the Internet as a tool for research and communications.

    There is also the need for a centralized on-line catalogue of new renovation technology (may also be distributed as a magazine or newsletter).

In order to develop a consensus about these findings, a second stage of the Survey was sent out by mail to the renovators interviewed by telephone in stage one of the Survey, This second stage asked the renovators how strongly they agreed or disagreed with these findings. (See Appendix B for a copy of the questionnaire to stage two and for the results by province.) The weighted national results are presented below in Table 8.2. The respondents collectively agree with all of the findings. The strongest support is for issues 7 and 9 (trades/subs satisfaction and upgrading and the roles of various organizations and associations in promoting technological change. The weakest support is for issue 4 (the degree to which the technological transfer process is successful for renovators; much of this low ranking is due to low rankings from renovators in Nova Scotia.

Table 8-2

Mail survey responses to main findings of telephone interviews, Canada and Provinces

					PROVINCE						CANADA	
Main findings	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	AVERAGE
1 Gradual change	4	4	0	4.3	4.5	4.3	4	4	0	4.3	33.4	4.2
2 Client driven / business	4.4	4.5	0	4.3	4.5	4.7	4	4.3	0	4.7	35.4	4.4
3 Aware of new technology	4.6	4.3	0	4.7	4.5	4.3	4	4.3	0	5	35.7	4.5
4 Transfer process a success	3.6	4	0	3.7	4.5	3.7	3.8	3.7	0	4	31	3.9
5 One stop for information	4.4	4	0	4.7	5	4.7	4	3	0	4.7	34.5	4.3
6 Hands on demos	4.4	4	0	4.3	4.5	4.3	4.3	4	0	4	33.8	4.2
7 Trades and subs good	4.2	4.8	0	4.7	4.5	5	4.5	4	0	5	36.7	4.6
8 Nat'l Building Code	4.6	4.8	0	4.3	4.8	4.3	4.5	3.3	0	5	35.6	4.5
9 Roles of organizations	4.6	4.3	0	4.3	5	4.7	4.5	4.7	0	4.3	36.4	4.6
10 Internet usage	4.6	4	0	4.3	4.3	4.3	4	3	0	5	33.5	4.2

Scale:
5....Agree Strongly
4....Agree
3....Neither
2....Disagree
1....Disagree Strongly

29 respondents to survey

These results indicate the need to devote more attention in the future to the following issues:

- making the access to information about new renovation technology easier and quicker. yet still economical,
- upgrading the skill levels of sub-contractors and trades and maintaining and upgrading the skill levels of renovators in reference to the use of new renovation technology,
- evaluating the potential impact on the home renovation industry of using the Internet and related technology in such areas as searching for information about the existence and use of new technology, finding answers from experts about building science problems, upgrading skill levels, advertising and marketing of products and services, and communicating within the industry about common issues of concern.

a) Access to Information

Using current and future communication technology presents some practical and exciting and cost-effective possibilities for renovators to dramatically improve their accessibility to information about new technology. To be cost-effective renovators should be able to learn immediately and with minimum research commitments about new technology and how it can be used in a specific project or type of project to solve a problem and/or to provide a competitive advantage. The existence of the appropriate new technology must be identified and then contacts need to be made to get details on its use and availability. As of now, there is no centralized source of information about new technology per se and the traditional sources of trade magazines, trade shows, manufacturers' brochures and reps need to be searched. The information exists, but it is not collected in a single data file which can be accessed easily. The ideal would be an Internet site which would cross-list new technology by type and by manufacturer— this information should be obtained instantly at any time of day from any location in Canada with Internet access and at reasonable cost of time and money. The listing for each new technology could include properties of the new technology, applications, installation procedures, technical specifications, costs, distributors, and availability. The effective use of new technology by

renovators can translate into competitive advantage and satisfied customers. In the latter instance, it is quite possible that the clients have found about new technology from their own searches on the Internet.

The easier access to this kind of information is very important to renovators who work outside of the major urban centers because of their more limited contacts with manufacturers' representatives and more difficult circumstances to attend the leading trade shows. It is also crucial to renovators doing high-end and large-scale renovations who need to be able to solve problems quickly to avoid costly delays in schedule. Ideally this type of information could be assembled by a trade magazine (e.g., the Internet magazine, BUILDER ONLINE is considering doing this). The full co-operation of the manufacturers in providing current and complete information would be essential to make this endeavor successful. A preliminary step to such an inventory would be to encourage manufacturers to set up separate section in their web-sites devoted to new products and giving full information on them, as outlined above. This information could be updated every four months or whenever new products are introduced. If the above is done, renovators could at least go through product/manufacturer directories and immediately identify new products and trends much more easily than at present. One of the advantages of using the Internet for this information collection is the possibility of linking each entry to the full web-site of the manufacturer for information about the company and about the whole range of products/services being offered (not just new technology) A similar approach could be adopted by manufacturers with regard to their print advertising as well.

Some information about technology and building practices is already available, but is not being accessed. Two examples of this are information about the new National Building Code and the information about building products compiled by the Canadian Construction Materials Center of the Institute for Research in Construction. In both cases, renovators either are unaware of this information or do not know enough about the importance and relevance of it to make further enquiries. Other examples exist regarding the services offered by various governmental bodies and associations to renovators. More and different approaches to

ways of communicating to renovators probably have to be explored to increase renovators' awareness of important issues and services. On the other hand, renovators would probably find considerable benefits in exploring these services whenever they have time to do some research, possibly during slow times.

In addition to getting improved access to written and graphical information about new technology, renovators also are looking to manufacturers and suppliers to offer more hands-on demonstrations, particularly at actual job-sites. While words, pictures and videos are valuable, renovators need to physically work with the new technology to accurately assess it and to learn to correctly install it in various working environments.

b) Getting New Technology Installed Properly by Upgrading Knowledge and Skill Levels

While most of the renovators interviewed in the survey are personally satisfied with the knowledge and skill levels of the trades they use on their jobs, almost half say that the majority of trades in their area are not keeping up with new technology.

This finding is supported by the Industrial Adjustment Service sector studies of the construction trades. The electrical, mechanical, and carpentry studies show low levels of upgrading taking place— in the mechanical field less than half of the trades have taken even one upgrading course since becoming journeymen and the percentages of those who have taken two or more courses are much lower. This low level of upgrading is taking place in a context of:

— overall surpluses of trades, even though there may be local shortages or shortages in one or more types of construction,

— very few new entrants into the apprenticeship programs (the addition of new entrants cannot be justified when there is an oversupply of journeymen, with high rates of unemployment and underemployment),

— increasing average ages of journeymen (how many trades in their late 40s and 50s will want to start to upgrade?) and (at what age will they want to retire or get less strenuous and more stable employment outside of the construction industry?).

These conditions indicate that the trades are not keeping up with advances in technology and that the situation will not be changing in the future unless there are more new entrants and more journeymen upgrade. It also means that some time in the future a large influx of trainees will have to be enticed into the construction industry to prevent labour shortages. Will a sufficient number of young people be interested in construction work to meet this demand, given negative stereotypes about construction work and the potential income and employment instability caused by the cyclical nature of the housing industry and the possibility of obtaining more appealing employment opportunities in other industry sectors?

This situation will impact on the ability of renovators to get new technology installed correctly and can significantly reduce the amount of expert technical advice renovators get from their subs and trades about new technology. This will be most felt in the technology based electrical, mechanical and HVAC trades (particularly the greater use of electronic control systems and instrumentation), since a large percentage of renovators use subs for these specialties.

Renovators as well as sub-contractors and trades need to upgrade their skills and learn new ones. Professional pride, profit improvement, the demands of clients, and code enforcement drive renovators to improve their technical and business skills. Some renovators, especially those who are not professionals, are not committed to learning about new technology or to upgrading their skills; they will be able to continue to do so as long as (a) their customers are concerned only about renovating at the lowest cost and are not very demanding about technical and product expertise, and (b) they are not forced by building inspectors to improve their construction practices. Training requirements for renovators will vary of course, depending on their scale of operations---the requirements for renovators doing minor renovations and repairs will be considerably different from renovators doing major renovations and additions involving new mechanical systems and moisture and air quality controls. At the very least, renovators need to be sufficiently aware of new technology and building science to be able to discuss technical issues with their trades and to determine if the installation has been done correctly.

c) Using the Internet

Renovators need to evaluate seriously what the use of the Internet can do for their businesses. The Internet, a new medium of communications that is economical, fast, accessible, interactive, and useable (i.e., does not require extensive training for basic use), can effectively address some of the most important issues identified in the previous chapters, namely, the need for easier access to information on new technology, the necessity of upgrading technical skills, and the benefits of using "technological awareness" as a marketing and sales strategy.

Renovators may find the use of the Internet beneficial to them in addressing all of the issues identified in the previous paragraph, or just some of them, or even none of them. The use of the Internet may be mixed with the traditional means of finding and disseminating information, particularly when hands-on experience is wanted. However, 3-D graphic and video simulations are becoming increasingly sophisticated and "real" so that the Internet may be a viable substitute for actual hands-on experience as well.

The use of the Internet provides renovators with the opportunity to acquire and disseminate information at a reasonable cost once the computer hardware has been acquired. It frees the renovator from the constraints imposed by geography (e.g., distance from major urban centers) and time zones. It also gives the renovator great flexibility in scheduling when research or advertising are done since the Internet is open around the clock.

Most renovators have access to the Internet, although some may have easier access than others. Some have direct access in their offices or homes. Others may have to visit friends or relatives who are connected to the Internet. Still others may have to use the facilities provided by public libraries, computer cafes, or commercial providers.

While many renovators have some familiarity with the use of computers in their businesses for functions, such as accounting, estimating and scheduling, they are often daunted at the prospect of learning about Internet hardware and software. The cost in time and money and the

alteration of the mind-set may cause renovators to hesitate at the prospect of learning how to use the Internet and e-mail.

Renovators interested in learning about using the Internet can start by reading a wide selection of book titles available at public libraries or most bookstores; these books will tell the readers what the Internet is and how it can be accessed and used in general. Introductory courses are available through public libraries and community colleges. Once renovators are connected to the Internet, they can experiment with the various search engines to explore topics of interest and to get some practical hands-on experience. Sites such as those of the Canadian Home Builders' Association, Association Provinciale des Constructeurs d'Habitation du Quebec, and Canada Mortgage and Housing Corporation provide mines of valuable information about renovation and serve as worthwhile starting points for renovators wanting more information through the links provided to other web-sites.

Organizations like CHBA, APCHQ, and CMHC can provide a useful service to renovators interested in pursuing more focused and intensive searches into topics of concern mainly to renovators. These organizations could offer courses and instructional materials on accessing topics and sites on the Internet that focus on new technology, government regulations and standards, communications methods (e.g., e-mail and discussion groups and forms usage) and advertising (i.e., web-sites and listings in various online professional construction directories). These organizations might consider hosting seminars which include renovators and new home builders who are successfully using the Internet and who can provide valuable examples and suggestions to non-users.

Community colleges which offer building sciences courses and programs and organizations (e.g., construction unions and construction companies) which participate in apprenticeship programs could greatly contribute to their trainees' ability to manage technological change by including training in the use of the Internet as part of their overall computer training.

The Internet is constantly being updated and expanded and modified as to the services and information which are made available. Not everything

that renovators want may be available now; they may need to use traditional means to fill in the gaps. Depending on the access times and download speeds of their equipment and servers, renovators may find it takes longer than they would prefer to use the Internet.

Renovators wanting to use the Internet effectively will have to invest in training and equipment. Also, if they plan to use the Internet to promote their business, they need to have a well thought out advertising concept and the expertise necessary to set up an effective professional-looking web-site.
Renovators can obtain this expertise in web-site creation by hiring professional consultants or by taking training courses so that they can become their own web-masters.

SUMMARY
Renovators can continue to learn about and use new technology more effectively in the future if the means of access to this information are improved, if the skill levels of renovators, sub-contractors and trades are regularly upgraded, and if they use the power and accessibility of the Internet to facilitate, to communicate, and to market their services. Renovators need to become better informed about the proposed changes in the National Building Code and about the valuable products, services and information offered by various private and governmental organizations involved with the renovation industry. Because technological change in this industry is evolutionary and gradual, renovators should be able to keep up with the new technology providing they devote a reasonable amount of time and resources to learning about new technology and its application and to upgrading their technical and managerial skills.

CHAPTER 9— CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This chapter will reiterate the main findings of the Survey as presented in Chapter 8 and put them into the context of the information gathered in the literature search and contacts with various organizations involved with renovations.

This study has looked at the part of the technological change process over which renovators have direct control, namely learning about new technology, acquiring it and getting it correctly installed in their projects. While most renovators interviewed are generally satisfied with the technology transfer process and the nature of technological change in the industry, there are some who would like to see changes in the process and improvements in the technology itself. Renovators can influence both how this process operates and what new technology is produced by utilizing all of the communications media available now (e.g., Internet e-mail and discussion groups) to contact manufacturers and technology developers and by their purchases (directly or indirectly through suggestions to clients). The associations to which the renovators belong can also be a major influence in this effort.

Recommendations

The main recommendations centre around three topics:

- improving access for renovators to information about new technology,
- upgrading the technical skills of trades, sub-contractors and renovators, and
- encouraging renovators to investigate the benefits of using the Internet in their business operations to research new technology, to market their services, and to broaden their communications base.

Access to Information

- Manufacturers, developers, suppliers and review organizations should clearly identify items of new technology in their publicized

materials and provide an up-to-date quarterly or annual catalogue of this new technology. As much information as possible should be provided, including uses of the product, local distributors, availability, technical specifications, installation instructions, and cost/benefit data.

- Magazines or product directories should have separate sections devoted solely to new technology with links to the manufacturer and the manufacturer's existing products. This can be done for print or online media, although the Internet has the advantages of quicker information transfer and the inclusion of video and sound imaging.
- All organizations providing services and information about technology to renovators in particular and about general industry issues as well should regularly assess how effective their communication policies and practices are.

Upgrading Skills

- Renovators should regularly keep informed about new technology and its correct usage and installation as a general function of good business practice and professionalism. This can be done by attending training courses, going to trade shows, studying product information, and participating in hands-on demonstrations.
- Renovators should encourage their trades and sub-contractors to upgrade their skills and their knowledge of new technology through their own example and by rewarding them for upgrading by continuing to give them work.
- Manufacturers should regularly assess their instructional materials accompanying their products and their promotional materials to ensure that they are as clear and effective as possible. Before new products are introduced into the marketplace, the installation instructions and usage criteria should be test- marketed with renovators and builders along with the product itself. Translations of instructions accompanying imported products should be similarly test- marketed. Manufacturers should place a high priority on putting on hands-on demonstrations for renovators and making presentations to renovators and builders at the local home builders' association meetings.
- Suppliers should inform renovators about new technology through a

bulletin board or newsletter. The upgrading of staff skills to include training specifically on new items of new technology should significantly increase diffusion rates for new technology.

More Use of the Internet

- Renovators should give serious consideration to using the Internet as a vehicle for locating information about new technology and other business news, communicating and marketing.
- Organizations and associations connected with the renovation industry should do likewise.
- CHBA (and its provincial and local affiliates) and APCHQ should fully inform their members about the advantages in using the Internet and actively encourage them to acquire a working knowledge of the Internet. This may include offering basic training courses and seminars at the local level. These organizations should also consider preparing a reviewed guide to the top sites for various technical and business topics to aid renovators in their research.
- CMHC should consider including a training module on Internet usage in their training courses for renovators.
- community colleges and apprenticeship programs should offer those students who are training to enter the renovation industry a working knowledge of the use of the Internet as part of their computer education.

ENDNOTES

1.At the time the list of names to be included was being compiled contact was made by telephone and fax with the local and provincial associations and names were identified and frequently faxed through. By the time of the writing of this report, many of these associations had established websites and listed the names and addresses of their members who are renovators. This latest development is a great advantage to researchers of the renovation industry and to potential customers and suppliers.

2.Reid/ Foster Associates, Towards Healthy House Renovations , Canada Mortgage and Housing Corp., Ottawa, 1997, p.16.

3.Manufacturer Representative on CHBA National Renovators Council.

4.Manager, Canadian Construction Materials Centre.

5.Technical Officer, Canada Mortgage and Housing Corporation, Ottawa.

6.Editor, Builder Online (Remodeller).

7.Seventy percent. of renovators working in the indoor air quality and ventilation field said they were very interested in keeping informed about new renovation products and technologies. (Reid/Foster Associates, "Towards Healthy House Renovations", CMHC, Ottawa, 1997, p. 23).

8.The renovators interviewed think that most of the non-professional renovators are mainly concerned about doing the job quickly and getting paid— they do not have the time, resources, inclination, or possibly the technical base to learn about and use new technology.

9.In their study on indoor air quality and ventilation renovators, Reid/Foster Associates ("Towards Healthy House Renovations", CMHC, Ottawa, 1997, p.22) reveal that building supply dealers, manufacturers, product instructions, trade/technical publications, and other contractors were the most important sources of information about renovation technologies and products (in descending order of importance, with the last three sources being tied in third place). Satisfaction levels were high for all sources (by more than 80% of all renovators).
When renovators wanted to obtain additional technical and product information, the three main sources were: trade publication and magazines (74%), Pamphlets and fact sheets (69%), and trade shows (50%)(p.23).

10.Similar findings were discovered for renovators (remodellers) in United States through discussions with the National Remodellers Council, Builder Online, and Journal of Light Construction. The Internet is becoming an important source of information in the United States; its use by renovators may be growing faster in the United States than in Canada.

11.Less than a quarter of the respondents to the Survey included sub-contractors as a source of information about new technology when asked the open-ended question about sources of information about new technology. The proportion increased when they were asked specifically about sub-contractors.

12.Builders who responded to the CHBA Pulse Survey of Canadian Homebuilders in Winter 1996/1997 said that the three most important types of information they would like to obtain from the CHBA web-site were: building product information (83%), market analysis (79%), and technical research (78%).

13.The product evaluations conducted by the Canadian Construction Materials Centre provide valuable technical information about construction materials.

14. Read/Foster Associates, "Towards Healthy House Renovations" (CMHC, Ottawa, 1997), Appendix B, p.12. These percentages are probably applicable to other renovation specialities as well.

15. The findings for this section of the report were based on interviews with the staff of the carpentry, electrical, and mechanical studies.

16. In the report entitled Towards Healthy House Renovations, by Reid Foster Associates (Canada Mortgage and Housing Corporation, Ottawa, 1997), it is mentioned that renovators who were knowledgeable about the science and technology of indoor air quality and ventilation were able to use this advantage in getting renovation contracts (p.25) and in getting "related add-on sales" (p.27).

17.Institute for Research in Construction, "Objective-based Codes: A New Approach for Canada", Ottawa, February, 1996, p.1.

18.Institute for Research in Construction, "Objective-based Codes: A New Approach for Canada", Ottawa, February, 1996, p.2.

19.Based on discussion with the Manager of the Canadian Codes Centre and reading the information available on the IRC website about objective based codes.

20. CMHC ranks low as a source of information about new technology among the renovators interviewed in the Survey. Less than 5% of these renovators listed CMHC as a one of their sources in an open-ended question as to sources of information about new technology. See Chapter 3 for more information on these sources.

APPENDICES A-D

APPENDIX A

Appendix A includes a copy of the telephone interview schedule(the first stage of the Survey of Renovators). This is an open-ended questionnaire/discussion guide. Depending on the respondent and time constraints, any issue could be targeted for clarification or elaboration.

Revised 12/VI/1997

Renovation Technology Questionnaire (telephone survey)

--Project Description: Management of New Technology by Renovators of single family detached & semi-detached owner-occupied houses

--Two phases: Telephone Interview and Mail-out of main findings for confirmation

Section 1. Main Trends in Technology

1. What are the main trends in new renovation technology you see today and for the next five to eight years? Please give some specific examples.

2. What impact is the new technology having
- on the building process?

- on the way renovators run their business?

- on the relationship between renovators and their sub- contractors?

3. Which new technologies will you be using ?
   3a. Why?
   3b. Why will you not be using the others?

Section 2. Learning about New Technology

1. How do you find out
-about new technology?

-about the benefits of the new technology?

-about how to use and install the new technology?

(Mention " contact with sub-contractors", if not mentioned by interviewee.)

2. How effective do you consider your efforts are to learn
-about new technology?

-about the benefits of new technology?

-about how to use and install the new technology?

3. Do you schedule your firm's operations to include the time and resources to learn about new technology? Yes No

3a. If yes, how do you do this scheduling to learn about new technology?

4. What problems do you face in learning
-about new technology?

-about the use of new technology?

5. What changes would you like to see happen so that you could learn better about the introduction of new technology?

Section 3, Installing New Technology

1. Who installs new technology in your renovations? Please indicate technology type.
-sub-contractors

-individual trades

-own trades

2. How do you find a) sub-contractors and b) trades capable of installing new technology ?
a) sub-contractors
b) trades

3. Do you usually use the same group of sub-contractors and trades for all of your jobs?
Yes No

4. Are you having any problems in finding sub-contractors and trades capable of installing new technology? Yes No
If yes, for what technologies?
If yes, for what trades?

5. Do you find that the majority of sub-contractors and trades are knowledgeable and capable regarding the use of new technology? Yes No

6. What improvements would you suggest to help you acquire (or continue to acquire) sub-contractors and trades capable of installing new technology?

Section 4. Strategies for Managing New Technology

1.What strategies do you use to maximize the advantages that the use of new technology can bring to your renovation firm?

2. Are you satisfied that you are using new technology to the best advantage in the operation of your firm? Yes No

2a). If you are satisfied, what strategies do you feel have been the most beneficial?

2b) If you are not satisfied, what would you like to do differently?

3. Are you satisfied that you are using new technology to the best advantage of your clients?

Yes No

3a) If you are satisfied, what strategies do you feel have been the most beneficial?

3b. If you are not satisfied, what would you like to do differently?

Section 5. Building Code Changes

1. What impacts do you anticipate the changes in the philosophy of the National Building and Fire Codes to include objective-based and performance criteria in addition to prescriptive ones will have on (a) you yourself as a renovator and on (b) renovators in general in the use of new technology?

a) you yourself

b) renovators in general

2. What effects do you foresee these changes will have on your use of new technology?

3. What effects do you think these changes will have on your use of existing technology?

Section 6, Developing a Consensus

1. Do you believe that renovators are committed to learning more effectively about the existence, use and installation of new technology?

Yes_____, If yes, why?

If yes, what suggestions do you have for improving the situation?

No_____, If no, why not?

2. What role(s) do you see the following organizations performing in the promotion of new technology for housing renovators:

CMHC?
CHBA and its provincial and local counterparts? APCHQ?
Institute for Research in Construction?
Building inspectors?
Manufacturers of renovation technology?
Building supply distributors?
Building equipment distributors?
Others?

--

In comparison with the other renovators in your area, how typical are you in your use and knowledge of new technology ?

Thank you for participating in this phase of the survey. You will be receiving a copy of the second phase of the survey in the mail shortly.

APPENDIX B

Appendix B displays a copy of the mail questionnaire sent to the renovators who had already participated in the telephone portion of the Survey. This section of the survey was designed to determine how strongly the participants agreed or disagreed with the main national findings of the first stage of the Survey and to develop a national consensus on issues regarding the use of new technology by home renovators. These findings were presented in expanded form in a covering letter and this elaboration appears as Table 8-1 in the body of the Report.

Renovation Technology Survey Response Card **(Please check ✓ appropriate response)**

Main FindingS (national)	Agree Strongly	Agree	Neither	Disagree	Disagree Strongly	No Response
1 Tech. change is gradual; large number of new products introduced annually						
2 Amount of use of new tech. determined by clients & by business strategy of renovator						
3 Professional renovators want to keep aware of new tech. & use it whenever feasible						
4 Tech. transfer process for professional renovators is generally successful						
5 One stop source of information about new technology would be of great benefit to renovators who rely on the use of new technology as a major business strategy						
6 More on-site hands-on demonstrations by manufacturers of their new products would encourage renovators to try new technology						
7 Renovators interviewed in this survey were generally satisfied with their trades and subs, but were concerned that a large percentage of the trades and subs in their area needed upgrading and a more positive attitude to new technology						
8 Renovators need more information about the concept and implications of objective based criteria in the new National Building Code						
9 A leading role for CMHC, a communications/advisory role for CHBA, & a more active presence of manufacturers / suppliers are needed to better the tech. transfer process						
10 The internet has good information on the existence and installation of new tech., but training is needed for renovators to use this medium effectively						

APPENDIX C

Appendix C includes a list of some of the main sources of information used in the preparation of this study.

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1. Internet Websites Visited

- Canada Mortgage and Housing Corp.(CMHC)
- Institute for Research in Construction (IRC)
- Natural Resources Canada
- Human Resources Development Canada (HRDC)
- Association Provinciale des Constructeurs d'Habitations du Quèbec (APCHQ)
- Canadian Home Builders' Association (CHBA)
- CHBA of British Columbia
- Canadian Wood Council
- Builder Online
- Remodeling Online
- Building Material Retailer Magazine
- Construction & Computer Newsletter
- Design Cost & Data Magazine
- Glass Magazine
- Good Cents
- Renovations Online
- Roofer Magazine
- Traditional Building
- Walls and Ceilings Magazine
- Construction Site Canada
- Canadian Technology Centre Atlantic
- Reseau Architecture and Construction
- Building Online
- BuilderNet
- Building and Remodeling Resources
- Sweet's Group Online
- BuilderWeb
- AEC InfoCenter's Building Product Library
- Building Materials Directory
- Specifications Online
- Wood TrussPros
- Arriscraft
- Dashwood
- Pella Windows

- Lennox
- CGC
- Home Depot
- Beaver Lumber
- Moen
- Black & Decker
- Makita
- Benjamin Moore

2. Interviews with Representatives from government, industry, media and manufacturers involved with renovation technology

- Design of telephone interview questionnaires targeted to particular interviewees
- Conduct of interviews with representatives of the following organizations:

Canada Mortgage and Housing Corp.
Canadian Construction Materials Centre (Institute for Research in Construction)
Canadian Codes Centre (Institute for Research in Construction)— Building & Fire Codes
Canadian Home Builders' Assoc. — Renovators' Council (Manufacturers' rep.)
Canadian Home Builders' Assoc.
National Association of Homebuilders (NAHB) (US) & NAHB Remodelers' Council
Association Provinciale des Constructeurs d'Habitations du Quèbec
Journal of Light Construction (US)
Builder Online (US)
Carpentry Sector Study (Industrial Adjustment Service Labour Market Study)
Electrical Sector Study (Industrial Adjustment Service Labour Market Study)

3. Literature Search

Search of resources of the following:

- Canadian Housing Information Centre
- US Library of Congress
- University of California Library System

4. Analysis of Forecasted Technology by Trade from Tardif Study

Data collected by Tardif Consultants in their study, **Technical Change in Construction and their Effects on the Construction Trade Labour Market** (1993) was analyzed by trade and for all trades combined which work in residential low-rise construction.

APPENDIX D

DETAILED TABLES FROM THE TELEPHONE SURVEY OF RENOVATORS GIVING PROVINCIAL AND NATIONAL RESPONSES

NOTES to Tables In Appendix D

The total number of respondents for each of the tables is 50, except for Table D4. 2 (49 respondents were eligible to answer this question).

The calculation of percentages for each of the tables is as follows:

For questions when only one answer is possible, the divisor is 50 representing all the respondents to the Survey. This applies to Tables 1.1, 1.2, 3.3, 3.6, 3.8, 3.9, 4.1, 4.4, and 7.1a-7.6e.

For questions where multiple answers are possible and the percentages are based on the total number of responses not the total number of respondents, the divisor is the total number of responses. This applies to Tables 2.1, 3.10, 3.11, and 4.5.

For questions where multiple answers are possible and the percentages are based on the total number of respondents not the total number of responses, the divisor is the total number of respondents (50,except for 49 in Table D4 .2). This applies to Tables 2.1, 3.1, 3.2, 3.4, 3.5, 3.7, 3.12, 4.2, 4.3, and 5.1.

TABLE D1.1

Number and Affiliation of Renovators Interviewed in the Survey												
	PROVINCES										CANADA	
Affiliation	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
CHBA /APCHQ Member	5	5	4	4	8	4	4	4	2	4	44	88
Not CHBA /APCHQ Member	1	1	0	0	1	2	0	1	0	0	6	12
TOTAL INTERVIEWEES	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D1.2

In Comparison with other Renovators in their Area, Renovators Evaluation of Themselves as to Their Knowledge and Use of New Technology												
Self-ranking	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Technology Leader	2	0	0	0	2	1	0	1	0	2	8	16
One of the Leaders	1	1	0	0	4	0	1	0	1	1	9	18
Above Average	2	3	3	3	2	3	3	4	1	1	25	50
Average or Typical	1	2	1	1	1	2	0	0	0	0	8	16
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D2.1

Major Trends in New Renovation Technology

	PROVINCES										CANADA		
Type of Technology	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*	PERCENT**
HVAC	7	2	2	0	12	4	2	7	0	5	41	25	82
Energy Efficiency Products	5	6	3	5	9	3	3	2	0	4	40	24	80
Engineered Wood	4	3	2	1	8	2	0	4	1	3	28	17	56
Power Tools	0	0	0	0	2	0	0	1	0	0	3	2	6
Finishes	1	2	0	0	3	2	0	0	0	0	8	5	16
Exterior Claddings/Finishes	2	2	0	0	0	1	0	0	0	0	5	3	10
Plumbing	0	3	0	1	2	0	0	0	0	0	6	4	12
Flooring (hardwood)	0	2	0	0	0	0	0	1	0	0	3	2	6
R2000 Concept	2	0	0	0	3	5	6	1	0	0	17	10	34
Other	3	2	0	1	3	1	1	3	0	2	16	10	32
TOTAL	24	22	7	8	42	18	12	19	1	14	167	100	100
Windows (Most common)	3	5	2	2	5	0	1	1	0	2	21	13	42
*of all responses													
**of all 50 renovators													

TABLE D3.1

Renovators Evaluation of Whether Renovators in Their Area are Committed to Learning About New Technology												
Response	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
Yes but professionals only	4	4	4	3	6	1	1	0	1	3	27	54
No	5	2	2	2	7	6	3	5	1	2	35	70
*of 50 renovators in Survey												

TABLE D3.2

Renovators' Sources of Information about New Technology

Sources of Information	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
Trade Magazines	3	4	2	2	6	6	1	3	0	4	31	62
Trade Association Meetings	5	4	3	1	5	2	2	3	0	3	28	56
Suppliers	2	3	2	3	3	0	2	2	1	0	18	36
Trade Shows	1	3	0	0	4	3	2	2	0	1	16	32
Manufacturers	1	3	2	2	3	1	0	0	1	0	13	26
Pamphlets and Flyers	1	0	1	2	1	1	1	1	1	0	9	18
Clients	1	1	1	1	2	0	0	0	1	0	7	14
Internet	1	0	1	0	3	0	0	0	0	1	6	12
Other Builders	1	0	1	1	0	0	0	1	0	1	5	10
CMHC	0	0	1	0	0	1	0	1	0	1	4	8
Newspapers	2	0	0	0	0	1	0	0	0	0	3	6
Television (Renovation Shows	0	0	0	0	0	0	0	0	0	1	1	2
Sub-contractors**	4	4	3	3	9	5	4	3	0	2	37	74

* of all 50 Interviewees

**specifically asked, if not raised spontaneously by interviewees

TABLE D3.3

Renovators' Evaluation of Their Own Effectiveness in Learning about the Existence of New Technology												
	PROVINCES										CANADA	
Degree of Effectiveness	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Good	0	1	0	0	4	0	3	2	0	1	11	22
Good	2	3	2	0	3	5	1	1	2	2	21	42
Fair	4	2	1	3	2	1	0	2	0	1	16	32
Poor	0	0	0	1	0	0	0	0	0	0	1	2
Not Considered Yet	0	0	1	0	0	0	0	0	0	0	1	2
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D3.4

How Renovators Learn about New Technology												
					PROVINCES						CANADA	
Sources of Information	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
Manuals & Brochures	6	4	2	2	4	2	3	3	1	4	31	62
Manufacturers & Suppliers	0	3	1	2	1	2	3	0	0	0	12	24
Lets Subs/Trades Do It	0	3	2	0	2	0	0	0	0	0	7	14
Seminars/Demonstrations	1	0	0	1	2	0	2	0	1	0	7	14
Training "when available"	0	1	1	0	0	0	1	0	0	0	3	6
Contacts TRC	0	0	0	0	0	0	0	0	0	1	1	2
Trial and Error	0	0	0	0	1	0	0	0	0	0	1	2
Other	0	0	0	0	0	0	0	1	0	0	1	2
TOTAL	7	11	6	5	10	4	9	4	2	5	63	100
*of 50 renovators interviewed												

TABLE D3.5

The Quality and Characteristics of Information Available on How to Install New Technology												
	PROVINCES										CANADA	
Comments	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
Manufacturers' Info Very Good	4	6	4	3	7	1	3	2	2	4	36	72
Manufacturers' Info Good	1	0	0	0	0	1	0	0	0	0	2	4
Manufacturers' Info Fair	0	0	0	0	0	0	1	3	0	0	4	8
Manufacturers' Info Poor	1	0	0	1	2	0	0	0	0	0	4	8
Need More Demos	0	0	0	1	1	0	0	2	0	0	4	8
Info Easy to Get	0	0	1	1	1	0	0	0	0	0	3	6
Have to Ask for Info	0	0	0	0	0	0	0	0	1	1	2	4
Some Info Hard to Understand	0	0	0	1	1	0	0	0	0	0	2	4
Takes Time to Learn	1	0	0	0	0	0	1	0	0	0	2	4
Wary to be First to Try Tech.	1	0	1	0	0	0	0	0	0	0	2	4
Installers Don't Read Info	0	0	0	0	0	0	0	0	0	0	1	2
TOTAL	8	6	6	7	12	2	5	7	3	5	61	
*of 50 renovators interviewed												

TABLE D3.6

Renovators' Evaluation of Their Own Effectiveness in Learning How to Install New Technoology

	PROVINCES										CANADA	
Degree of Effectiveness	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Good	0	1	0	0	3	0	2	1	0	1	**8**	**16**
Good	2	4	2	1	4	6	2	2	2	2	**27**	**54**
Fair	4	1	1	3	2	0	0	2	0	1	**14**	**28**
Poor	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Not Considered Yet	0	0	1	0	0	0	0	0	0	0	**1**	**2**
TOTAL	6	6	4	4	9	6	4	5	2	4	**50**	**100**

TABLE D3.7

How Renovators Discover the Economic Costs and Benefits of Using New Technology												
	PROVINCES										CANADA	
Methods	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Do Own Research	4	4	3	4	0	2	4	4	0	3	**28**	**56**
Get Info. From Manufacturer	2	3	1	2	5	2	2	0	2	3	**22**	**44**
Unsure of Manufacturers' Info.	0	1	1	1	2	4	1	2	0	1	**13**	**26**
Get Customer Feed Back	0	2	1	2	0	0	0	1	0	0	**6**	**12**
CMHC/CSA Sticker	0	1	0	0	2	0	0	0	0	0	**3**	**6**
Other	3	1	0	0	0	0	0	1	0	1	**6**	**12**
TOTAL	9	12	6	9	9	8	7	8	2	8	**78**	**100**

TABLE D3.8

Renovators' Evaluation of Their Own Effectiveness in Learning about the Economic Costs snd Benefits of New Technology												
					PROVINCES						CANADA	
Degree of Effectiveness	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Good	0	1	0	0	3	0	2	1	0	1	**8**	**16**
Good	2	2	2	1	4	5	2	3	2	2	**25**	**50**
Fair	4	3	1	3	2	1	0	1	0	1	**16**	**32**
Not Considered Yet	0	0	1	0	0	0	0	0	0	0	**1**	**2**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D3.9

Number of Renovators Who Allocate Time to Learn About New Technology												
Allocate Time	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Yes	4	5	3	4	7	5	4	5	1	3	**41**	**82**
No	2	1	1	0	2	1	0	0	1	1	**9**	**18**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D3.10

How Renovators Allocate their Time and Resources to Learn About New Technology												
Learning Activities					PROVINCES						CANADA	
:specific tasks done:	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Attend seminars/courses	3	1	2	0	5	3	1	2	0	1	**18**	**22**
Read magazines/reports	0	1	1	4	1	3	1	1	0	0	**12**	**15**
Attend manufacturers' demos	1	1	0	1	2	1	2	3	0	0	**11**	**14**
Train staff on new technology	1	0	0	0	1	1	2	3	0	0	**8**	**10**
Attend trade shows	0	0	0	0	3	2	1	1	0	0	**7**	**9**
CHBA/APCHQ meetings	1	0	1	1	2	0	0	0	0	1	**6**	**7**
Research client requests	0	1	1	1	1	0	0	0	0	1	**5**	**6**
Talk to subs/suppliers	0	0	0	2	1	0	1	0	0	0	**4**	**5**
Ensure good bldg. science	0	1	0	0	1	0	1	0	0	0	**3**	**4**
Do general research	1	0	1	0	0	1	0	0	0	0	**3**	**4**
Research in winter or slowtime	0	1	0	0	0	0	0	0	0	1	**2**	**2**
Monitor the Internet	0	0	1	0	0	0	1	0	0	0	**2**	**2**
TOTAL	**7**	**6**	**7**	**9**	**17**	**11**	**10**	**10**	**0**	**4**	**81**	**100**

TABLE D3.11

Problems Encountered by Renovators in Learning About New Technology												
Problems Encountered	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Too little time to do research	3	4	1	4	4	3	2	2	0	2	**25**	**32**
Too little manufacturer's info.	2	2	0	1	2	1	2	2	0	1	**13**	**17**
Too little supplier's info	1	1	0	2	1	0	0	2	0	0	**7**	**9**
Not enough hands-on info,	1	0	0	0	1	2	1	0	0	1	**6**	**8**
Product availability?	0	1	1	0	1	0	1	0	0	1	**5**	**6**
Courses too expensive	0	1	0	0	0	0	0	2	1	1	**5**	**6**
Courses not at good time	1	1	1	0	1	0	0	0	0	0	**4**	**5**
More time to absorb tech. info.	2	0	0	0	2	0	0	0	0	0	**4**	**5**
Hesitant to accept new tech.	0	1	0	0	1	0	0	1	0	0	**3**	**4**
Other	0	2	0	2	0	0	1	0	0	0	**5**	**6**
TOTAL	**10**	**13**	**3**	**9**	**13**	**6**	**7**	**9**	**1**	**6**	**77**	**100**

TABLE D3.12

Changes Recommended by Renovators to Help Them Become Better Informed about New Technology

	PROVINCES										CANADA	
Changes	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
More Hands-on Demos	1	2	0	2	3	2	1	3	1	2	**17**	**34**
More Manufacturers' Info	3	4	0	1	3	0	2	1	1	0	**15**	**30**
More Info. on Internet	1	0	0	2	2	2	1	1	0	3	**12**	**24**
More Seminars	2	1	0	0	1	1	0	2	0	1	**8**	**16**
More Courses	1	0	0	0	1	2	1	1	2	0	**8**	**16**
More Time	3	0	0	1	1	1	0	1	0	1	**8**	**16**
More Info. from Supplier	1	1	1	1	2	0	0	1	0	0	**7**	**14**
More Test Reports	1	1	0	1	2	0	0	0	0	1	**6**	**12**
More Magazines	2	0	0	2	0	0	1	0	0	0	**5**	**10**
Better Informed Bldg. Depts.	3	0	1	0	1	0	0	0	0	0	**5**	**10**
No Changes Needed	0	0	1	0	1	1	0	0	1	0	**4**	**8**
Better Access to Info.	0	0	1	0	1	1	0	0	0	0	**3**	**6**
Other	1	0	0	0	0	1	0	1	0	1	**4**	**8**
TOTAL	**19**	**9**	**4**	**10**	**18**	**11**	**6**	**11**	**5**	**9**	**102**	**100**

* of 50 renovators interviewed

TABLE D4.1

Use of Sub-contractors by Renovators (includes Use of New Technology)												
Use of Sub-contractors	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
All of installations	2	1	1	0	1	1	0	1	0	1	8	16
Some installations	4	5	3	4	7	5	4	4	2	3	41	82
No installations (do own work)	0	0	0	0	1	0	0	0	0	0	1	2
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D4.2

Types of Sub-contractors Used by Renovators in Their Projects												
Types of Sub-contractors	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
Mechanical, HVAC, Plumb.	2	2	2	2	5	4	3	4	2	3	**29**	**59**
Electrical	2	2	2	2	4	3	4	4	2	3	**28**	**57**
Roofing	0	0	0	1	1	2	0	0	0	1	**5**	**10**
Concrete	0	0	0	1	1	0	0	0	0	1	**3**	**6**
Drywall	0	0	0	0	0	2	1	0	0	0	**3**	**6**
Carpentry	1	0	0	0	0	0	1	0	0	0	**2**	**4**
Others	1	0	0	0	0	2	1	3	0	0	**7**	**14**
TOTAL	**6**	**4**	**4**	**6**	**11**	**13**	**10**	**11**	**4**	**8**		
* Of Those Renovators Using Subs (N=49)												

TABLE D4.3

Renovators' Evaluation of the Impact of New Technology on the Relationship between Renovators and Their Sub-Contractors												
Type of Impact	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
Same as before-- no change	2	1	3	1	2	3	1	3	2	0	**18**	**36**
More supervision needed	1	3	1	1	4	4	1	1	0	2	**18**	**36**
Better communication	3	2	0	1	6	2	1	0	0	0	**15**	**30**
Must know as much as subs	0	3	0	1	4	0	0	1	0	1	**10**	**20**
Require subs to upgrade	0	0	1	0	1	0	3	0	0	3	**8**	**16**
Set expected standards	0	1	1	2	1	0	2	0	0	0	**7**	**14**
Get detailed quotes form subs	0	1	0	0	1	0	0	0	0	0	**2**	**4**
Other impacts	1	0	1	0	0	1	0	0	0	0	**3**	**6**
* of 50 renovators in Survey												

TABLE D4.4

Renovators' Evalaluation of the Capability and Knowledge of Local Subs and Trades in the Use of New Technology*												
Response	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Majority are Capable	1	5	3	3	5	2	1	0	1	4	**25**	**50**
Majority are Not Capable	3	0	0	0	3	2	1	3	1	0	**13**	**26**
Half are Capable	2	1	1	0	1	2	2	2	0	0	**11**	**22**
Not Applicable	0	0	0	1	0	0	0	0	0	0	**1**	**2**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**
*renovators said that their own subs and trades were usually capable and knowledgeable												

TABLE D4.5

Improvements Suggested by Renovators to Help Trades and Sub-Contractors Keep Current with the Introduction of New Technology												
Suggestions	PROVINCES										CANADA	
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Upgrading Courses & Demos*	5	4	4	4	9	4	5	4	0	3	**42**	**40**
Courses More Available**	4	2	0	1	3	2	0	0	1	1	**14**	**13**
Certification/Min. Standards	2	1	0	0	2	1	1	3	0	1	**11**	**11**
Market Demand to Upgrade	1	4	1	1	0	0	0	0	0	0	**7**	**7**
On-site Demos	2	1	0	0	1	1	0	0	0	0	**5**	**5**
Better Apprentice System	1	0	0	1	1	0	1	0	0	0	**4**	**4**
More Motivation	0	0	0	0	1	1	0	0	1	0	**3**	**3**
Health & Safety Education	0	0	0	0	0	1	0	1	0	0	**2**	**2**
Price Deterrents for New Tech	0	0	0	0	3	0	0	0	0	0	**3**	**3**
More Info From Mfg/Suppliers	1	0	0	0	1	0	0	1	0	0	**3**	**3**
Other	0	1	3	1	1	1	1	0	1	1	**10**	**10**
TOTAL	**16**	**13**	**8**	**8**	**22**	**11**	**8**	**9**	**3**	**6**	**104**	**100**
* Includes mention of courses, literature,demonstrations,seminars (each counted as a separate entry)												
** Includes mention of costs of courses and subsidies, distances, and scheduling (each counted as a separate entry												

TABLE D5.1

Benefits Achieved by Renovators when they use New Technology												
					PROVINCES						CANADA	
Benefits Achieved	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT*
Marketing (sales) Gains	5	5	3	4	9	5	4	4	1	4	**44**	**88**
Productivity Improvements	4	2	3	3	6	5	2	3	0	3	**31**	**62**
Exceed Client Knowledge	1	2	2	3	6	1	3	2	1	1	**22**	**44**
Better Quality Control	1	1	1	1	2	4	2	3	0	0	**15**	**30**
Better Solutions to Problems	1	1	1	3	1	5	1	0	0	0	**13**	**26**
Improved Cost Control	0	0	0	1	5	1	1	0	2	1	**11**	**22**
Better Customer Satisfaction	0	1	2	0	3	0	1	3	0	0	**10**	**20**
Be First in Market	2	0	0	0	0	0	2	3	0	1	**8**	**16**
Desirable End Product	2	0	1	0	2	0	0	0	0	0	**5**	**10**
More Efficient Officework	0	1	0	3	0	0	0	0	0	0	**4**	**8**
Better Design Innovation	0	1	0	0	1	0	0	1	0	0	**3**	**6**
Other	0	0	0	0	0	1	0	0	0	0	**1**	**2**
TOTAL	**16**	**14**	**13**	**18**	**35**	**22**	**16**	**19**	**4**	**10**	**167**	**100**
* of 50 renovators												

TABLE D7.1a

Renovators' Evaluation of the Degree of Importance of CMHC in the Promotion of New Technology

	PROVINCES										CANADA	
Degree of Importance	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Important	1	3	1	1	4	2	2	3	2	4	23	46
Important	4	1	1	1	5	4	2	1	0	0	19	38
Moderately Important	0	1	0	1	0	0	0	0	0	0	2	4
Not Important	1	1	0	1	0	0	0	0	0	0	3	6
Not Concerned About It	0	0	1	0	0	0	0	0	0	0	1	2
Don't Know About Organiz.	0	0	1	0	0	0	0	1	0	0	2	4
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.1b

Renovators' Evaluation of the Current Activities of CMHC in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Good	4	5	2	2	8	6	2	3	2	4	38	76
Poor	2	1	2	2	1	0	2	2	0	0	12	24
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.1c

Renovators' Evaluation of the Current Level of Activity of CMHC in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
High	3	3	0	0	6	4	2	2	1	4	**25**	**50**
Moderate	1	2	0	1	1	2	0	1	1	0	**9**	**18**
Low	2	1	4	3	2	0	2	2	0	0	**16**	**32**
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.1d

Renovators' Evaluation of the Preferred Level of Activity Of CMHC in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
More	3	5	3	4	9	3	2	4	1	0	**34**	**68**
Same	3	1	1	0	0	3	2	2	0	4	**16**	**32**
Less	0	0	0	0	0	0	0	0	0	0	**0**	**0**
TOTAL	6	6	4	4	9	6	4	6	1	4	50	100

TABLE D7.1e

Renovators' Evaluation of the Direction of Activity of CMHC in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Active Role	5	6	2	3	8	6	2	3	2	4	**41**	**82**
Passive Role	1	0	2	1	1	0	2	2	0	0	**9**	**18**
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.2a

Renovators' Evaluation of the Degree of Importance of CHBA/APCHQ in the Promotion of New Technology

	PROVINCES										CANADA	
Degree of Importance	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Important	1	2	1	0	1	1	2	2	0	4	**14**	**28**
Important	4	1	1	3	4	2	2	1	2	0	**20**	**40**
Moderately Important	0	3	1	1	4	2	0	1	0	0	**12**	**24**
Not Important	1	0	0	0	0	0	0	1	0	0	**2**	**4**
Not Concerned About It	0	0	1	0	0	0	0	0	0	0	**1**	**2**
Don't Know About Organiz.	0	0	0	0	0	1	0	0	0	0	**1**	**2**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.2b

Renovators' Evaluation of the Current Activities of CHBA/APCHQ in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Good	5	6	3	1	8	5	4	3	1	4	**40**	**80**
Poor	1	0	1	3	1	1	0	2	1	0	**10**	**20**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.2c

Renovators' Evaluation of the Current Level of Activity of CHBA/APCHQ in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
High	2	2	3	0	2	3	2	2	0	2	18	36
Moderate	2	3	0	1	6	2	2	1	1	1	19	38
Low	2	1	1	3	1	1	0	2	1	1	13	26
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.2d

Renovators' Evaluation of the Preferred Level of Activity of CHBA/APCHQ in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
More	5	4	0	4	8	2	2	2	2	3	32	64
Same	1	2	4	0	1	4	2	3	0	1	18	36
Less	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.2e

Renovators' Evaluation of the Direction of Activity of CHBA/APCHQ in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Active	5	6	4	3	9	5	4	3	1	4	44	88
Passive	1	0	0	1	0	1	0	2	1	0	6	12
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.3a

Renovators' Evalauation of the Degree of Importance of the Institute for Research in Construction in the Promotion of New Technology

	PROVINCES										CANADA	
Degree of Importance	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Important	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Important	0	1	0	0	2	0	1	0	0	2	**6**	**12**
Moderately Important	0	0	1	0	2	1	1	2	1	0	**8**	**16**
Not Important	0	0	1	0	0	0	0	0	0	0	**1**	**2**
Not Concerned About It	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Don't Know About Organiz.	6	5	2	4	5	5	2	3	1	2	**35**	**70**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.3b

Renovators' Evaluation of the Current Activities of the Institute for Research in Construction in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Good	0	1	1	1	5	0	0	1	0	2	**11**	**22**
Poor	6	5	3	3	4	6	4	4	2	2	**39**	**78**
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.3c

Renovators' Evaluation of the Current Level of Activity of the Institute for Research in Construction in Promoting New Technology												
					PROVINCES						CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
High	0	1	0	0	1	0	0	0	0	0	2	4
Moderate	0	0	1	0	3	1	0	1	0	2	8	16
Low	6	5	3	4	5	5	4	4	2	2	40	80
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.3d

Renovators' Evaluation of the Preferred Level of Activity of the Institute for Research in Construction in Promoting New Technology												
					PROVINCES						CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
More	6	6	4	4	7	6	4	5	2	4	48	96
Same	0	0	0	0	2	0	0	0	0	0	2	4
Less	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.3e

Renovators' Evaluation of the Direction of Activity of the Institute for Research in Construction in Promoting New Technology												
					PROVINCES						CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Active	2	2	2	1	1	2	0	1	0	3	14	28
Passive	4	4	2	3	8	4	4	4	2	1	36	72
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.4a

Renovators' Evaluation of the Degree of Importance of Building Inspectors in the Promotion of New Technology

	PROVINCES										CANADA	
Degree of Importance	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Important	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Important	0	1	0	0	0	0	0	0	0	0	**1**	**2**
Moderately Important	2	1	1	2	0	0	0	0	0	2	**8**	**16**
Not Important	4	4	3	2	8	6	4	5	2	2	**40**	**80**
Not Concerned About It	0	0	0	0	1	0	0	0	0	0	**1**	**2**
Don't Know About Organiz.	0	0	0	0	0	0	0	0	0	0	**0**	**0**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.4b

Renovators' Evaluation of the Current Activities of Building Inspectors in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Good	0	0	0	0	1	0	0	1	0	1	**3**	**6**
Poor	6	6	4	4	8	6	4	4	2	3	**47**	**94**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.4c

Renovators' Evaluation of the Current Level of Activity of Building Inspectors in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
High	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Moderate	0	1	0	0	2	0	0	1	1	2	**7**	**14**
Low	6	5	4	4	7	6	4	4	1	2	**43**	**86**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.4d

Renovators' Evaluation of the Preferred Level of Activity of Building Inspectors in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
More	6	6	4	4	9	6	4	5	2	4	**50**	**100**
Same	0	0	0	0	0	0	0	0	0	0	**0**	**0**
Less	0	0	0	0	0	0	0	0	0	0	**0**	**0**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.4e

Renovators' Evaluation of the Direction of Activity of Building Inspectors in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Active	0	0	0	0	0	0	0	1	0	1	**2**	**4**
Passive	6	6	4	4	9	6	4	4	2	3	**48**	**96**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.5a

Renovators' Evaluation of the Degree of Importance of Manufacturers of Renovation Technology in the Promotion of New Technology

	PROVINCES										CANADA	
Degree of Importance	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Important	1	0	0	0	1	0	0	0	1	0	3	6
Important	2	1	1	1	5	1	3	2	0	2	18	36
Moderately Important	3	5	3	3	2	5	1	2	1	2	27	54
Not Important	0	0	0	0	0	0	0	1	0	0	1	2
Not Concerned About It	0	0	0	0	0	0	0	0	0	0	0	0
Don't Know About Organiz.	0	0	0	0	1	0	0	0	0	0	1	2
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.5b

Renovators' Evaluation of the Current Activities of Manufacturers in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Good	4	4	4	1	7	6	2	4	2	4	38	76
Poor	2	2	0	3	2	0	2	1	0	0	12	24
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.5c

Renovators' Evaluation of the Current Level of Activity of Manufacturers in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
High	1	0	3	0	4	2	2	1	1	2	**16**	**32**
Moderate	4	4	1	0	4	4	1	3	1	2	**24**	**48**
Low	1	2	0	4	1	0	1	1	0	0	**10**	**20**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.5d

Renovators' Evaluation of the Preferred Level of Activity of Manufacturers in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
More	6	6	3	4	7	6	3	4	1	3	**43**	**86**
Same	0	0	1	0	2	0	1	1	1	1	**7**	**14**
Less	0	0	0	0	0	0	0	0	0	0	**0**	**0**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.5e

Renovators' Evaluation of the Direction of Activity of Manufacturers in Promoting New Technology

	PROVINCES										CANADA	
Responses	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Active	5	6	4	4	7	6	3	4	2	4	**45**	**90**
Passive	1	0	0	0	2	0	1	1	0	0	**5**	**10**
TOTAL	**6**	**6**	**4**	**4**	**9**	**6**	**4**	**5**	**2**	**4**	**50**	**100**

TABLE D7.6a

Renovators' Evaluation of the Degree of Importance of Building Suppliers and Equipment Distributors in the Promotion of New Technology

	PROVINCES										CANADA	
Degree of Importance	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Very Important	0	0	1	0	1	0	0	0	1	0	3	6
Important	2	1	1	0	1	1	3	2	1	1	13	26
Moderately Important	4	5	2	4	5	4	1	3	0	3	31	62
Not Important	0	0	0	0	1	1	0	0	0	0	2	4
Not Concerned About It	0	0	0	0	1	0	0	0	0	0	1	2
Don't Know About Organiz.	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.6b

Renovators' Evaluation of the Current Activities of Suppliers in Promoting New Technology

	PROVINCES										CANADA	
Response	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Good	4	5	2	2	8	6	2	3	2	4	38	76
Poor	2	1	2	2	1	0	2	2	0	0	12	24
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.6c

Renovators' Evaluation of the Current Level of Activity of Suppliers in Promoting New Technology

	PROVINCES										CANADA	
Response	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
High	3	3	0	0	6	4	2	2	1	4	**25**	**50**
Moderate	1	2	0	1	1	2	0	1	1	0	**9**	**18**
Low	2	1	4	3	2	0	2	2	0	0	**16**	**32**
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.6d

Renovators' Evaluation of the Preferred Level of Activity of Suppliers in Promoting New Technology

	PROVINCES										CANADA	
Response	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
More	3	5	3	4	9	3	2	4	1	0	**34**	**68**
Same	3	1	1	0	0	3	2	1	1	4	**16**	**32**
Less	0	0	0	0	0	0	0	0	0	0	**0**	**0**
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100

TABLE D7.6e

Renovators' Evaluation of the Direction of Activity of Suppliers in Promoting New Technology

	PROVINCES										CANADA	
Response	BC	AB	SK	MB	ON	QC	NB	NS	PE	NF	NUMBER	PERCENT
Active	1	0	2	1	1	0	2	2	0	0	**9**	**18**
Pasive	5	6	2	3	8	6	2	3	2	4	**41**	**82**
TOTAL	6	6	4	4	9	6	4	5	2	4	50	100