New Models of Collaboration
A Guide for Managers

Cadastre Reengineering Project
Natural Resources Ministry, Quebec Government

Carole Maziade
Lise Préfontaine
University of Quebec at Montreal

Centre Francophone d'Informatisation des Organizations (CEFRIO)
900, René-Lévesque Blvd. East,
Suite 717
Québec City (Quebec) G1R 2B5
Tel: (418) 523-3746
Fax: (418) 523-2329
http://www.cefrio.qc.ca/english/indexAccueil.cfm

Abstract

As part of the research endeavor "New Models of Collaboration for Delivering Public Services," selected projects have been studied in the US, Canada, and Europe. Researchers conducted an analysis of the collaboration models and management frameworks adopted, and identified critical success factors. The "cadastre reengineering project," initiated by the Quebec Ministry of Natural Resources in 1992 is one of the innovative projects studied. This report provides a summary of the project and describes the integration contract carried out by the private company DMR for the Cadastre Reengineering Program adopted by the Ministry of Natural Resources. The case study was conducted and written in 2001 by Carole Maziade, Researcher and Lise Préfontaine, Ph.D. from the University of Quebec at Montreal.

Project Context

Historical Context

A brief historical background is necessary in order to understand the scope and challenges associated with the 1993 cadastre reengineering project. Quebec cadastre[1] was initiated in the second half of the 19th century, in the midst of the organization of the territory in municipalities and parishes. The 1860 Law on the registration of real estate properties mandated uniformity in the practices of registration of real estate properties and graphical representation of properties on a map. Thus, from 1866 to 1900, a vast cadastral operation took place during which about 1500 maps representing cadastres for parishes, villages, counties, cities, etc. were created, representing about 700,000 parcels of land. Each parcel of land is assigned a number, which provides the description of the parcel and its association with property titles. This number is used to identify property rights associated with the real estate.

The cadastral unit has three components: a map, a reference book, and an index of real estate properties. The map is a graphical representation of all real estate properties located on a given territory; each is assigned a plot number.[2] Each map is accompanied by a reference book that contains a brief description of the plot, its measurements, its owner, and neighboring plot numbers.[3] The index is a real estate card filed by the plot number. The card contains information on all transactions regarding the plot, in particular, it includes information on property. Actually, the real estate index is a document allowing a quick search on all the deeds concerning a plot.

In order to correct errors or to modify plots' information by subdivisions or mergers, owners must provide the exact map and reference book of the modifications and take into consideration the numbers of the official cadastre. These update procedures have generated an archive of about 330,000 parcel maps with their reference books. These maps correspond to the division of

[1] The term "cadastre" refers to an official register of the quantity, value, and ownership of real estate used in apportioning taxes.
[2] Most public places, streets, roads, etc. are represented without being assigned a number.
[3] Although many surveyors included measurements on the plans, no law required this practice either on the plan or in the reference book.

about 1.8 million plots. In addition, according to the Ministry of Natural Resources, of all 3.3 million real estate properties in Quebec, 850,000 properties have not been surveyed and registered in the cadastre, 750,000 have errors, and 1.7 million are correctly registered! [4]

Strategic Context

Difficulties in updating the maps, identifying parcels of land and their subdivisions, recording ownership rights as well as managing all the information led to a consensus to review the cadastral infrastructure in 1985. The Ministry of Natural Resources[5] developed a cadastre reengineering program that would span 20 years. The program began after the passage of the *Law for Quebec Cadastral Reform* in June 1985. This law showed the intention of the legislator to get an accurate and up-to-date record of the division of the territory.

The cadastral system is extremely important since it is closely linked to the system of property rights information dissemination which is under the Ministry of Justice jurisdiction. In addition, the cadastre is a tool that the recording system uses in order to fulfill its mission of property rights information dissemination which includes information delivery to the real estate taxes system. In Quebec, there are 73 recording divisions (real estate property information agencies) encompassing 1,449 cadastres[6] which cover 8 to 10% of Quebec territory (the rest of the lands being public).

In summary, the cadastre reengineering consists of three elements:

- The creation of a single cadastre for Quebec territory;
- The assignment of a unique and specific id number for each parcel of land;
- The use of GIS maps for graphical representations and measurements

Institutional and Legal Context

Several events have had an impact on the definition and implementation of the program. Here is a brief summary:

- The program was launched with the passage of the *Law for Quebec Cadastre*
- *Reform* in 1985. A preliminary analysis, done in 1986 by the company DMR, revealed two major technological difficulties related to the archiving and dissemination of the information. The project was suspended in 1988 due to technological as well as financial considerations. The cost was higher than predicted. In addition, the structure of the Ministry was not

[4] Rivest, Le Cadastre, l'Arpenteur-géomètre et l'éthique. Available at http://bornage.qc.ca/pub/Acfasv2.htm

[5] The name Ministry of Natural Resources was changed from Ministry of Energy and Resources in the 1990s.

[6] The 1449 cadastres included: 56 cities and suburbs cadastres, 410 churches cadastres, 116 villages cadastres, 794 town cadastres, 10 municipalities cadastres, 9 seigneureries cadastres, 23 cadastres without specific designation, 1 cadastre for the North West territory of the New Quebec, and 30 miscellaneous cadastres (Islands, ponds, fiefs, etc.) (Grondin, p. 41).

adequate for the management of such a project, and the 1985 Law did not apply to nonconventional real estate property uses.[7]

- In 1989, the program bases were changed and the involvement of DMR increased with the allocation of a second contract to the company, which would cover organizational aspects of the project. A new team at the direction of the cadastre allowed a redefinition of the cadastre reengeneering program. They adopted a new organizational structure and proceeded to do a preliminary analysis of the management system of cadastral data. At the same time, they initiated the process which would lead to necessary legislative modifications to correct some lacunae of the initial program launched in 1985.

- The passage of the *Law Modifying the Law for Quebec Cadastre Reform* in 1992 and the implementation of the new Quebec Civil Code (Common Law) (1991) on January 1, 1994, substantially modified cadastre practices and ownership records. In addition, increased use of Information Technology (IT) in organizations and the development of GIS opened new perspectives for processing cadastral information.

- On July 6,1992, the cadastre direction issued a Request for Proposals (RFP) for a "Contract of Integration of Goods and Services for the Implementation and Management of the Cadastre Reengineering Information Systems." They were looking for a provider who would take responsibility for the implementation of the integration and its results. In December 1992, the company DMR was awarded the contract in the amount of C$ 27.2 million. "It is the first time that the Quebec government chooses an integration project that delegates the implementation of GIS development for cadastre reengineering to a private company."[8]

- In January 1993, the Ministry of Natural Resources (MNR) restarted the cadastre reengineering program now reevaluated at C$ 500 million and spanning a period of 13 years, from 1993 to 2006. In addition to the integration project allocated to DMR, the program allocated more than 1,500 contracts to surveyors, to remodel about 4 million plots.

In the framework of this program, MNR must acquire information systems adapted to the management of cadastral data and their graphical representation (GIS), take care of the remodeling contracts, and ensure self-financing of its operations via the establishment of a fund. The cadastre reengineering funds are generated by the sale of cadastre data and maps, as well by a fee imposed on all real estate transactions made in the offices of real estate property services. (85% of total costs).

[7] Grondin, p.40.
[8] Garon, "Cadastre Reform: Impossible without GIS," *Les Affaires*, October 9, 1993, p. 34.

The Cadastre Reengineering project

The contract

The first three years of the five-year contract were be used for applications development; the last two years for the operation and maintenance of the systems. The DMR contract "consisted of the development of a technological solution for the integration of geospatial numerical data and the alphanumeric descriptions of the properties. It also included the establishment of an information system infrastructure to support such a high volume of information, as well as to ensure the training of staff and the maintenance of the system."[9] Among the eight components identified, the main challenges were the development and implementation of four management systems:

- Cadastral data management
- Cadastral reform management
- Cadastral reform funds management
- Systems pilots

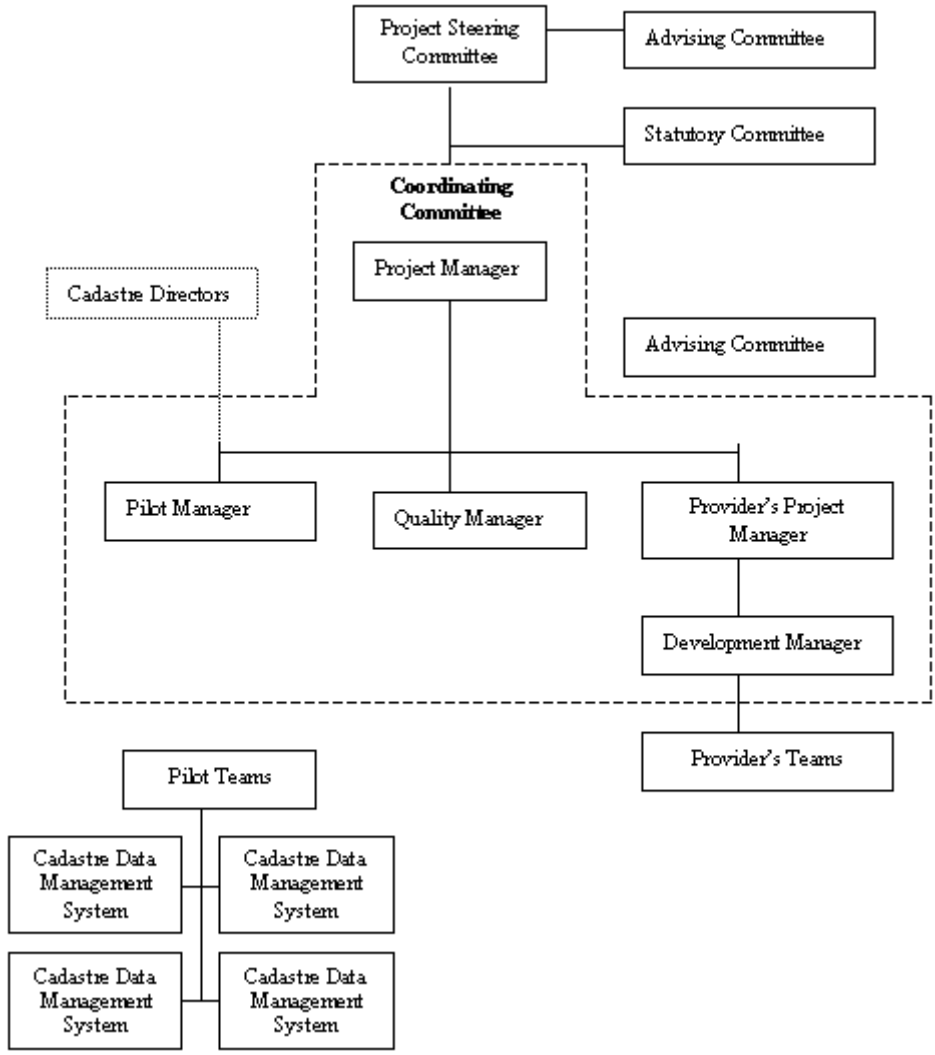
The deliverables and the management framework

DMR established a precise development and implementation schedule for the five deliverables identified at the beginning of the project: first deliverable due 12 months after the beginning of the project; third deliverable due 24 months after the beginning of the project; and last deliverable due 36 months after the beginning of the project. The third deliverable was identified as being the most crucial since it implied the operationalization and the beginning of cadastral data processing.

This very tight schedule, associated with severe penalties in case of noncompliance, came from the general plan adopted by the Ministry of Natural Resources for the implementation of the cadastre reengineering project. As soon as 1994, the first renovation contracts were awarded to the surveyors who then had 24 months to implement them. Hence the different management systems had to become functional quickly in order to manage the operations and collect the cadastral data.

[9] Garon "Cadastre Reegineering: Impossible without GIS," *Les Affaires*, October 9, 1993, p. 34.

Project Management Structure



In order to ensure the smooth flow of the project, the cadastre management team adopted a well-documented project management structure. It comprised two levels: the management level and the implementation level. The management structure dealt with the implementation of the contract, client–provider relationships, as well as with the planning of activities, and systems production and delivery.

The grounds/steps for this organizational infrastructure are included in the call for proposal[10] and are refined in the document entitled "Management Framework for the Project Related to the Implementation of Cadastre Systems,"[11]. This document was created in collaboration with DMR in the first phase of the project.

[10] Schedule of Conditions, Call for Proposal

[11] Management framework for the project related to the implementation of cadastre systems, Initiation and implementation phases

The first months of the contract were dedicated to the implementation of the project management part—to the improvement of the administrative and financial structures. From the start, MNR showed an extreme rigor in all points of view in order to "stay in control" of the implementation of the contract, in regard to the schedule, costs, or quality expected.

With the assistance of MRN, the project started with specifying and finalizing expectations and responsibilities. Six management mechanisms were established: (1) project planning; (2) project follow up and management indicators; (3) troubleshooting revision management; (4) deadlock management; (5) change management; and (6) documents management process.

Each deliverable followed the steps of quality. There was a series of treatment units' tests followed by the MNR trial test. The architect explained to the testers the deliverable and provided them with the functional file for approval. They had ten days to answer, and DMR had five days to make the corrections. After that, five days were provided for approvals and two days for integration.

When the deliverable was rejected, a negotiation stage occurred between the analyst and the testers. If the problem continued, negotiation involved the architect and the tester manager, the DMR deliverables manager, the MNR deliverables manager, the DMR project manager, and the overall project manager. In case of a lawsuit, a review and deliverables management process was put in place.

Similarly, during the trial phase of a deliverable, if a request for a change was considered outside the adopted contract, change management procedure was followed. In order to respect the schedule and the costs, the MNR project management team accepted only requests crucial to the integrity of the system.

Implementation of the integration contract

In order to honor the contract, DMR had to put in place a team in the offices of MNR. It began its activities with a planning stage, which ended after a year in order to begin with the implementation of the architecture, deliverable 1.

Although choices concerning equipment, servers, implementation system, and platform went smoothly, problems increased with the use of software which was new on the market. The technological challenge came from the large number of components which had to be to put in place. This deliverable involved about 65 treatment units each with multiple components. Several anomalies were detected in the software, which implied a continuous reexamination of the different components. For example, the calculation of surfaces from angles measured by surveyors led to major slowdowns.

The system of division of the reengineering contracts developed by DMR turned out to be very inefficient. The system was difficult to implement and often stalled. This led to operation problems, unpredictable and recurring errors. The lack of experience and expertise in the software led to very low response times. DMR had to hire specialized companies to set up the

software and develop the necessary expertise. During this time, 105 external resources were working at the Ministry.

MNR had doubts regarding DMR's performance, and an environment of distrust and suspicion prevailed. There was much tension. As DMR was committed to honor the contract, it had to prove that it could do it.

Deliverable #1 was approved 1 ½ years after the beginning of the contract. MNR thought that the results were not bad but that there was room for improvement. DMR made the changes. When it came to deliverable #3[12], the most strategic deliverable for MNR which had been identified as the "keystone of the business plan," DMR hired subcontractors in order to ensure the success of this stage. Tests demonstrated to MNR that everything was fine and a trust environment started to develop between the two partners.

Deliverable #3 was approved on time, and DMR completely restored its credibility vis à vis its client. The following deliverables, mainly reports and change requests, were intense production periods, but they went smoother.

All the participants at DMR were unanimous in saying that they faced very difficult integration situation. In addition to problems related to the implementation of management systems and to the respect of the schedule, the management of staff delegated to the project required enormous work. During one of the most intense times, 125 people from DMR were working on the project in the offices of MNR when only a team of 75 people had been planned initially. As a comparison, the MNR provided a team of 25 people.

The MNR management team sympathized with the situation. They understood that this project, which was innovative and used new technology, served as a pilot for software not yet on the market.

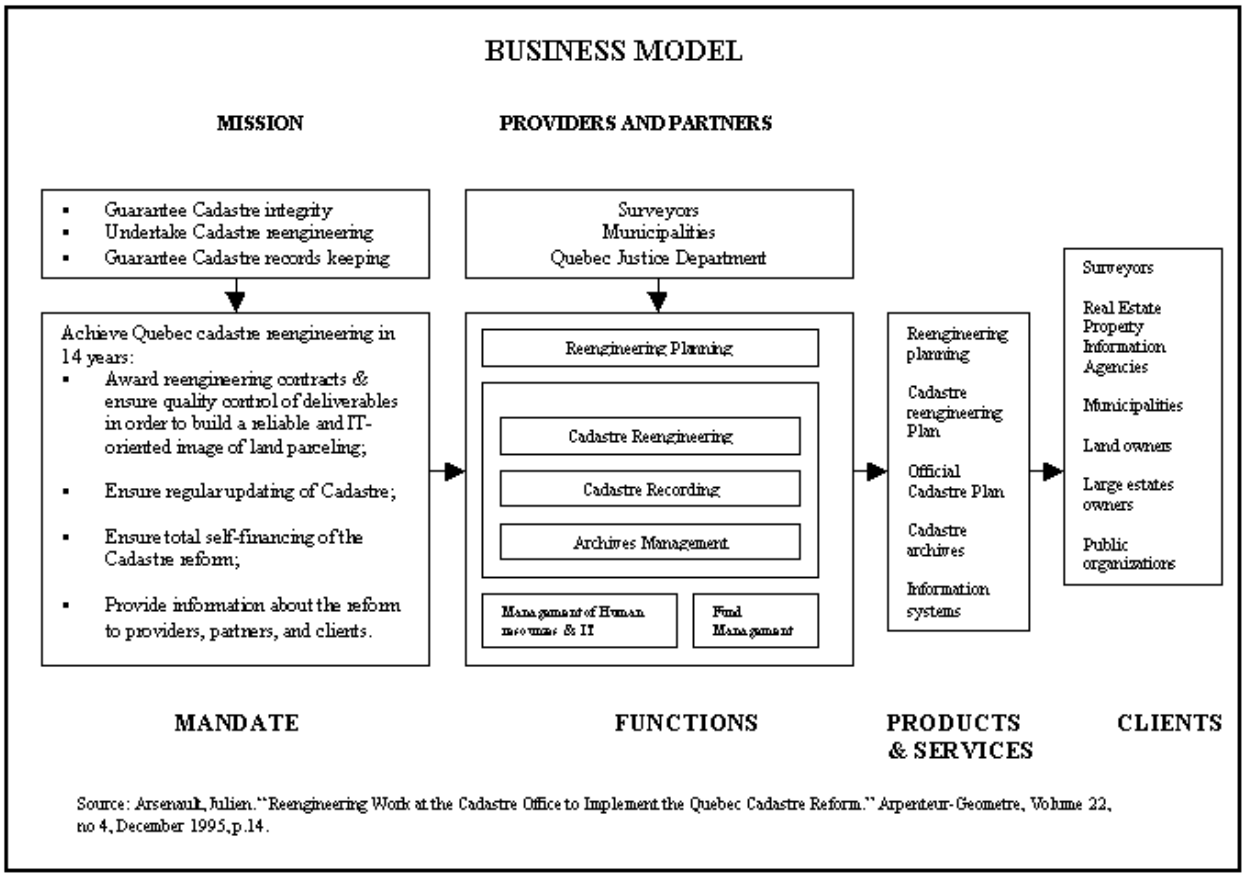
Project Partners

The MNR

The Ministry put in place a project management team consisting of the following persons: a very experienced manager brought in 1990 to the cadastre direction, a pilot manager who later became the project manager and, a few years later a system administrator in charge of quality control. A fourth person responsible for monitoring the 1985 cadastre reengineering program also joined the team.

Immediately after starting, the director redefined the technological and organizational dimensions of the cadastre reengineering program, and created a business plan for the project (see figure below). The solutions were then presented to the General Office of Budget.

[12] Deliverable 2 occurred simultaneously with Deliverable 1 and 3. After Deliverable 3, Deliverables 4 and 5 were divided to form Deliverables 4 to 9.



Source: Arsenault, Julien. "Reengineering Work at the Cadastre Office to Implement the Quebec Cadastre Reform." Arpenteur-Geometre, Volume 22, no 4, December 1995, p.14.

However, in order to meet the objectives of the program, the Ministry had to acquire an IT infrastructure, train the staff, and ensure transfer of expertise while running its current operations. As MNR did not have the internal resources to do that, the solution chosen for launching the program was to hire a provider in charge of the whole enterprise.

The direction at MNR had enormous pressure since it was dealing with the "relaunching" of the program. The director was known to be "very rigorous," and she demanded that costs, schedule, and quality be strictly respected which became the leitmotif for all the participants in the project. Internally, everything had to be planned, structured, and well organized. The managers were liable; self-financing of the activities had to be maintained, and a SME-styled management was put in place. The success of the integration contract was closely tied to the implementation of the business plan that was result-oriented.

DMR

DMR developed an interest in Geographic Information Systems (GIS) as early as 1982. Invited to help the government develop a vision on localization data, DMR remarked that no technology to support this type of data existed and decided to invest in research in this domain. DMR was known to the MNR for its involvement in strategic planning in the field of lands; therefore before

getting the big contract in 1992, DMR was awarded two contracts (1985-86 and 1989) by the Cadastral direction for preliminary studies.

DMR saw in this contract an opportunity to position itself on the market by introducing the client-server concept and the combination of spatial and database technology. However, DMR also took huge technological and financial risks with this contract for which the technological solutions did not exist on the market and which at this time represented a big portion of its business revenues.

DMR went through a dark period. IT integration and operation development problems combined with financial problems put the implementation of the contract in question. The company also experienced difficulties regarding the schedule as failure to deliver on time implied penalties. The company, that invested so much in this project, could not back out despite the lack of financial incentive (the contract clauses established that the payment would be made only upon delivery). At the same time, DMR was experiencing a major corporate crisis. Internal pressures and financial problems led to DMR being bought by Amdhal in 1995.

Despite the difficulties, the company developed strategic expertise in the field. There was a strategic advantage to be gained in the markets. Cadastral management includes the management of a cadastral plan and the territory it covers, as well as the management of real property. Such management then became a taxation instrument and a potentially interesting market product. The cadastral reengineering contract introduced a window of opportunity for other contracts for DMR, which eventually did happen.

Other Stakeholders

Three groups expressed an interest in the project and were consulted, although they were little involved in the project: (1) the Ministry of Justice, the main customer of MNR because it is the main user of the cadastral maps, (2) municipalities; (3) surveyors, represented by their professional association and by the surveyors' offices that would implement the cadastre reengineering in the field. From the beginning, MNR included surveyors in its project team. These surveyors were "lent to the Ministry" for the duration of the project; they acted as pilots to define the systems functionality and then tested them.

The Collaboration Process

The collaboration process occurred in the project management structure although we are talking about a client-provider kind of relationship. Collaboration with DMR to write the project management handbook created rules that guided relationships between the partners.

The involvement of DMR in the redefinition of the cadastre reengineering project as a consultant in 1985 and 1989 played a role in the collaboration process. The first study contained the roots of the project later implemented, and the second one included its organizational aspects. The partners knew each other and shared the same understanding of the cadastre reengineering program objectives.

There was a similarity in the way the two partners, DMR and MNR, worked as they used the same project management handbooks[13]. They spoke the same language, graduated from the same universities, most of them had an IT background and some of them were colleagues before. They reacted to problems the same way. For example, in some situations, they did not hesitate to hire consultants to fill the gaps of their respective weaknesses.

Internally, everything was well organized: the planning, monitoring, contracts management, quality control, schedules, but it does not mean that the collaboration process did not encounter difficulties in the implementation of the contract. The integrator was responsible for delivering the results and tensions became very high, almost unfathomable, especially during the testing periods when the systems showed operation problems.

There were other tensions and divergence of opinions when modification requests did not receive the approval of DMR or MNR. The main source of conflict came from the discussions about the implementation of the contract.

Although the work of the DMR team was made in parallel to the activities of the Ministry, the two teams shared the same working space. This physical proximity made the collaboration easier but also amplified the conflicts. The deliverables periods created an atmosphere of tension. However, as soon as the deliverables were approved, there was improvement in the relations between MNR and DMR, and a trust relationship was established. Success led to a feeling of mutual respect and satisfaction.

For example, at the beginning of the contract, an understanding took place between the DMR manager and the MNR manager responsible for the billing. The rules were clear, they shared the same rigor, they disseminated the same information. When the DMR encountered financial difficulties, a collaboration spirit emerged. The MNR realized the importance of the resources provided by its provider and offered a mode of payment that was taking into account not only the deliverables but also the investments that were made. As a matter of fact, the risk of penalties created an incentive to respect the schedules.

In the long term, the intensive work performed by the two teams developed a mutual understanding, a spirit of collaboration, and the sharing of a common vision. Differences between public and private sectors disappeared in front of the common objective to reach. There was even mobility of staff between the two organizations.

[13] Especially DMR Productivity Handbook adopted by the MNR. Mentioned in the Call for Proposal.

Performance

Performance of the project and of the collaboration

For a project of this scope involving crucial operational stakes, strict planning was essential. The goal of the cadastre reengineering was never modified, the objective never changed, and the program implementation happened as predicted. All the participants in the project unanimously associated the project performance to the management mechanisms put in place to ensure smooth development. Nothing was left to chance!

The MNR associated the success to the rigor in costs, quality and schedule control as well as to quality insurance which was very well developed, very structured, formal, and which channeled energies to the right places without wasting time in terms of procedures. From the beginning, the roles and responsibilities of everyone were clearly specified, as were the processes. Regarding the product, the critical criterion was the integrity of the databases.

Some MNR staff associated the performance of the project to the client-provider formula that allowed MNR to have access to an expertise complementary to its own. However, participants emphasized that the government environment does not allow much flexibility in getting expert resources from the private sector.

For DMR, it was the management tools they put in place to efficiently manage the deliverables and their quality that accounted for the success. The scope of the work and staff involved allowed the improvement of the operation and management methods. They adopted electronic management indicators, applications to manage predictions (cost/time) that were automated by the deliverable and team. For them the integrity of the system quickly became a priority.

By integrating the deliverable strategy to the business plan, the “nice to haves” were put aside if they compromised the schedule. For MNR, the priority was to get a functioning system that did the work in the times and costs established. DMR delivered. With unanimity and great pride, all the participants agreed that this project is a great success.

Impacts of the project

The challenges in the implementation of this project, which required “to successfully integrate a product that did not yet exist with a system” mobilized the participants around the operational aspects of the project. Participants talked about the success of a team where everybody worked for the same objective.

For MNR, this project is a success in terms of the scope of the project, the respect of the criteria established, as well as of the planning and schedule. This success also strengthens the solution, the cadastre reengineering program business plan, and reestablishes the notoriety of the Ministry. The expertise developed internally at MNR allowed the implementation of the second stage of the project with the ministry’s internal resources.

For DMR, the impacts are interesting. The consulting firm developed an expertise in project management and GIS that it can now market not only on the Quebec markets but also on the international markets, including Russia and South America. DMR developed a recognized expertise in Oracle, and its

reputation as a project integration specialist allowed the company to position itself very well for other projects to come.