

**THE OPERATIONAL CONCEPT IMPLEMENTED BY THE MTQ AND  
THE SOFTWARE PACKAGE DEVELOPED TO SUPPORT DECISION-MAKING  
REGARDING SUMMER ROAD MAINTENANCE**

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for winter and summer road maintenance

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## Summary

Since 2000, the context of budgetary constraint combined with several internal discussions and exchanges with France's Ministère de l'Équipement, des Transports et du Logement have led the managers of the ministère des Transports du Québec to implement the concept of "road network operation".

This new concept has resulted in the introduction of an extensive operational improvement initiative by the Ministère to implement new tools and work methods within the territorial units, with the objective of supporting decision-making by first-level managers, and also, optimizing interventions carried out on the different road infrastructure components.

As the basis for the development of a new operational software package, different management concepts have been defined to develop an architecture for the future software package that would meet the new needs of the ministère des Transports du Québec. It therefore seems important to share with other road authorities the ministerial management process that was developed and implemented for everyday and periodic summer maintenance. In addition, as the basis for management data, a product and service (P/S) list was developed to allow the measurement of corporate efforts by P/S, among other things. All these concepts have to be defined before developing a management system.

Significant investments of several million dollars were required to carry out the parametrization of an operational software package, a project which took a few years to complete. The main functionalities of the software package, their respective objectives, and the benefits associated with their use will also be shared. The ministère des Transports du Québec implemented its decision-making support system for summer road maintenance within all its territorial units in 2006.

The ministère des Transports du Québec invests nearly \$300 million on an annual basis for the operation of the road network under its jurisdiction, which spans approximately 30,000 km. This operation results in the delivery of four ministerial products/services (P/S), i.e., road network monitoring, highway corridor management, everyday and periodic maintenance, and winter viability.

While this amount seems significant, the majority—close to \$200 million—is associated with a single P/S: winter viability. The remaining amounts, which are adjusted from year to year, must therefore be efficiently managed by the Ministère's service centres so that human, financial and physical resources may be used to carry out priority interventions with regard to user safety and asset management.

## **PROCESS IMPLEMENTED FOR NETWORK OPERATIONS**

The Ministère was faced with the challenge of maintaining in good condition a maturing road network of 30,000 km that required an increasing number of interventions and investments for its rejuvenation, with reduced financial resources and a considerable reduction in its operational personnel. In 1999, the Ministère therefore decided to formalize a work process for operational products and services. Like any other good management process, the Ministère's process consists of a complete cycle, from the identification of needs to the collection of feedback on interventions, including the planning, preparation and execution of interventions, monitoring, etc.

The Ministère was relying on this solution to modernize its work processes, improve its productivity and optimize each dollar invested in the road network. More specifically, the preferred solution had to respond to the following concerns:

- Different work processes in the 58 service centres throughout the territory;
- Lack of formal work processes that are standardized, documented and consistently applied;
- Individual knowledge on the road network and its problems not entered into the systems and databases;
- Difficulty ensuring the replacement and mobility of employees;
- Number of support activities compared to operational activities;
- Lack of appropriate management indicators for objective decision-making.

The following figure details the developed process.

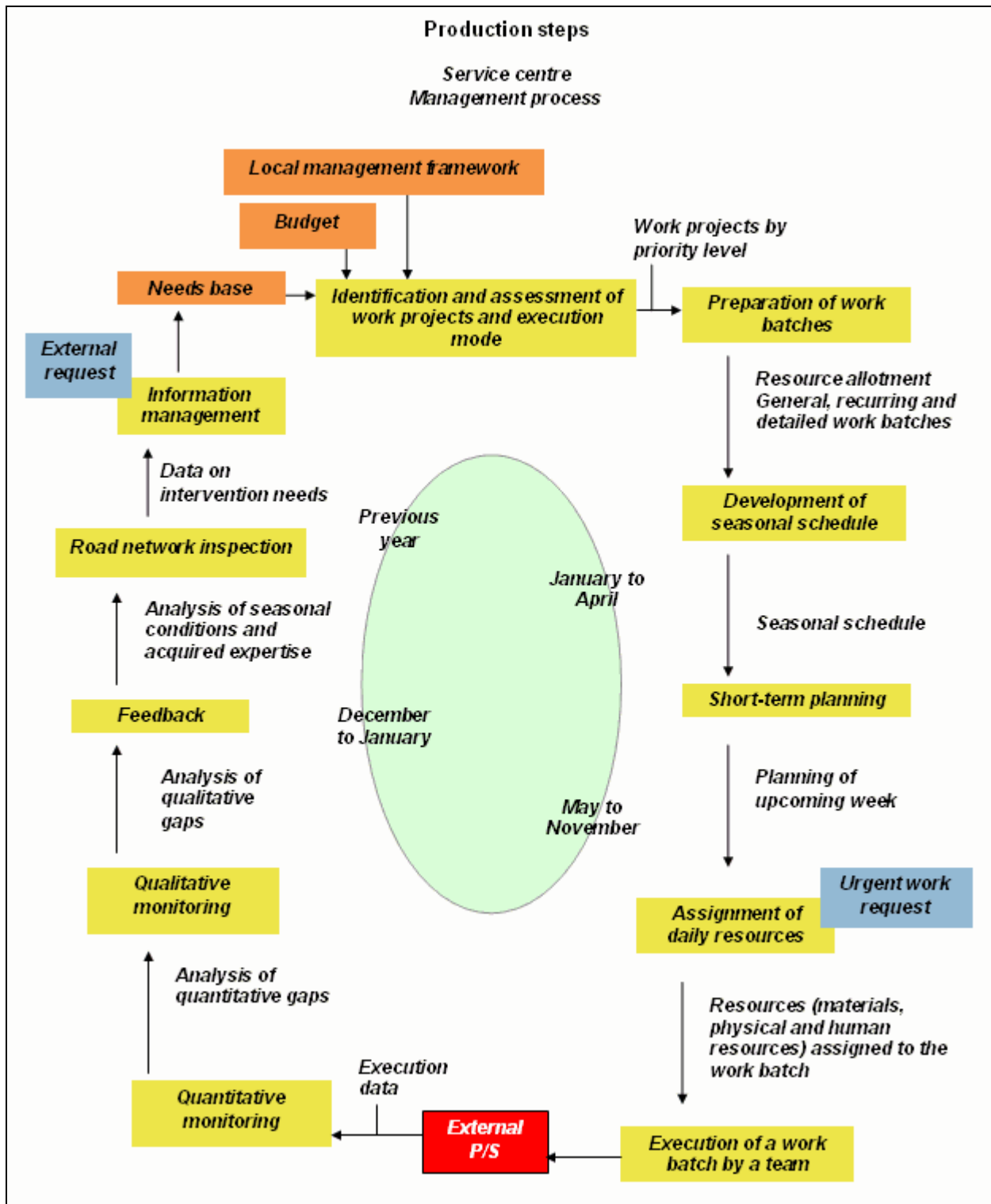


Figure 1: Operational process

To ensure a certain consistency in the application of this process and its acceptance by the largest number possible of actors, the Ministère undertook an operational improvement initiative to support the actions in progress. Among other things, positions within the administrative units in charge of operations—the service centres—were dedicated exclusively to this area. In addition, reference documents (guides and manuals) were produced, training modules were developed and distributed, and an exchange group as well as a steering committee were established exclusively for operations.

The need to have a well-adapted list of operational products and services was soon felt, so that information may be attached to the corresponding P/S at all steps of the process.

Operational products/services were therefore defined in relation to the infrastructure component on which interventions are carried out (e.g., “Maintenance of safety devices” and “Maintenance of flexible and rigid road surfaces”), while giving some leeway to service centres to define more detailed “P/S types”. The experience gained with this list over five years has demonstrated that the accuracy level of collected data was insufficient to support the entire operations management process. For instance, with regard to the maintenance of safety devices, we noted that interventions carried out on semi-rigid or rigid guardrails have different unit costs, and require different equipment and materials. The list was therefore reviewed to define activities based on resource utilization monitoring at the local and corporate levels. However, to allow the necessary adaptations for this new type of monitoring, only a few of the activities (there are over 200 in total) must be entered into the system. For all other activities, general activities were created for each P/S, thereby allowing the agglomeration of data on specific activities for each P/S.

Below are excerpts from lists produced in 1999 and 2005 that demonstrate the evolution described above.

In 1999, the P/S labelled “Restraining device maintenance” was not detailed:

3. EVERYDAY AND PERIODIC MAINTENANCE	1. Security systems	<ol style="list-style-type: none"> <li>1. Maintenance of small signage</li> <li>2. Maintenance of large signage</li> <li>3. Maintenance of longitudinal markings</li> <li>4. Maintenance of intermittent markings</li> <li>5. Maintenance of lighting systems</li> <li>6. Maintenance of light signals</li> <li>7. Maintenance of restraining devices</li> </ol>
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Since 2005, the P/S labelled “Restraining devices” includes the following activities:

63 Road network operation/Ongoing and periodic infrastructure maintenance	1 Safety systems	7 Restraining devices	0 Operation of restraining devices (general)
			1 Maintenance of semi-rigid guardrails
			2 Maintenance of rigid guardrails
			3 Maintenance of flexible guardrails
			4 Maintenance of impact attenuators
		5 Maintenance of arrester beds	
		0 Operation of traffic management systems (general)	
		1 Maintenance of variable message signs	

## MANAGEMENT SYSTEM FOR THE OPERATION OF TRANSPORT INFRASTRUCTURES - EIT-6037

In parallel with the review of the list, a project was underway for the parametrization of a new computer management system (software package) dedicated to the operation of transport infrastructures (EIT-6037). The existing system at the time of the implementation of the operations management process was administrative in nature (accounting), and could not support all the steps of the implemented operational process.

Considerable efforts, time and money were invested in this project for nearly four years, until the full implementation of the system in 2006 by the numerous users involved, as well as the systems development teams and the project management team.

The project had the following initial objectives:

- Improve the annual, seasonal and daily planning of maintenance work;
- Increase the presence and productivity of field personnel; the reduction of efforts dedicated to administrative support in the field will contribute to this objective;

- Increase efforts dedicated to preventive maintenance as opposed to corrective maintenance; among other things, the systematic assessment of completed interventions will serve as a basis for preventive actions;
- Improve communications with the Ministère's staff, as well as its clients and partners;
- Define relevant management indicators (operational scorecard);
- Obtain a quick and accurate graphical and descriptive vision of the road network and the associated needs and conditions.

Today, the EIT-6037 system mainly supports the process for planning, preparing and carrying out the everyday and periodic summer maintenance activities on transport infrastructures. The computer system is also used to build databanks on maintenance intervention needs, to support budget planning, to select annual projects to be carried out, to create work batches and execution schedules, and to compile management information related to costs and quantities. Activities related to other ministerial products/services (monitoring, highway corridor management, and winter viability) can also be managed with the system.

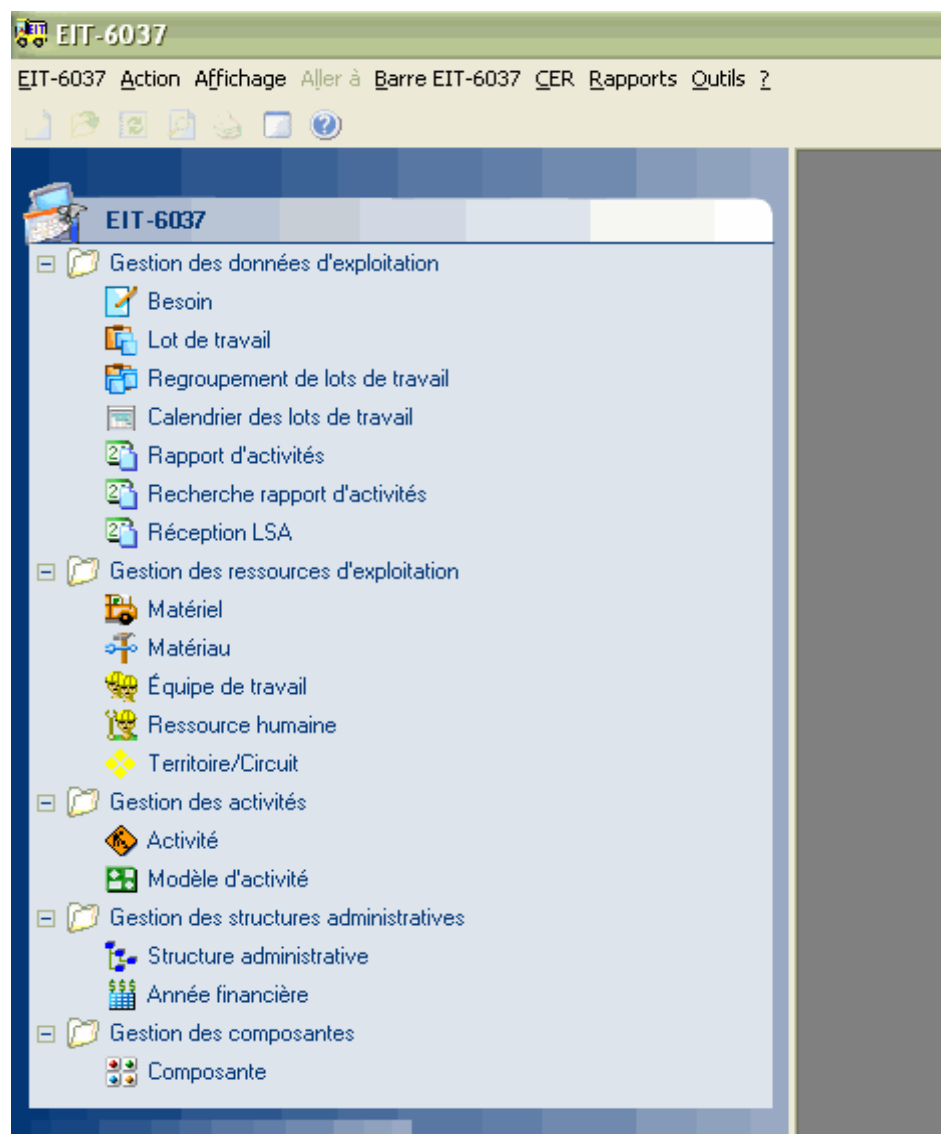
Service centre (SC) managers (SC leaders and supervisors), public works technicians and team leaders are the main users of the system functionalities dedicated to the planning and execution of maintenance work. Managers and professionals at all levels of the organization and administrative technicians are the main users of the functionalities dedicated to the input and manipulation of management data.

The new system allows the different levels of actors to input the information available to them at each step, and to process all data quickly and efficiently.

A large part of the objectives set were therefore achieved.

## System functionalities

As demonstrated by the following image, which shows the menu of the EIT system, users can manage operational data at three levels: needs, work batches and activity reports.



**Figure 2: Menu of the EIT-6037 system**

Following an inspection carried out in the field, or upon the receipt of external requests, intervention needs are created. At this stage, a number of useful information elements for operational management are already available in the system, such as the responsible unit, the specific activity involved, the targeted network component and its location, the estimated costs and quantities, the intervention's priority level, the planned year of execution, etc. The image below shows the content of the needs screen.



Besoin

Besoin Action Aller à ?

Évaluation... Localisation... Besoins sur la composante...

**Identification**

Besoin : 366928 Rapiéçage manuel à la transition ponc 1354-1 Année de réalisation prévue : 2007

DG DT CS SC prop. : 56-66-10-00 CS de Laurier-Station - Lévis

Activité : 6325-2 Rapiéçage manuel des chaussées avec un enrobé bitumineux

Type de composante : Voie de circulation (chaussée) - Principale (route)

Composante : 00132-08-020-000C Route

Localisation (résumé) :  
 CEP : Chutes-de-la-Chaudière  
 Municipalité : Lévis (V)  
 Arrondissement : Les Chutes-de-la-Chaudière-Ouest  
 Route : 00132

Commentaire :  
 4+926

**Estimé**

Quantité : 50,00 Tonne (1000 kg)  Unité de mesure de l'activité modifiée

Coûts : total : 17 000,00 \$

unitaire : 340,00 \$ Durée : heures

**Général** Item de mesure Exécution Information complémentaire

Statut : En attente Responsable du besoin : 5093-66 FORTIER, PIERRE

P/S : Entretien courant et périodiqu... Territoire/Circuit :

Priorité : Prioritaire DG DT CS SC réalisatrice : 56-66-10-00 CS de Laurier-Station - Lévis

Date de création : 2007-02-22

Localisation modifiée par un utilisateur  Évaluation avec sous-modèle

Localisation de la composante modifiée depuis la création du besoin  Évaluation modifiée par un utilisateur

Évaluation ajustée par le sous-modèle

**Figure 3: Content of the needs screen**

With regard to work batches, they are a key element for the planning, preparation and execution of activities. At this stage of the process, a decision has been made as to whether or not an intervention will be carried out to respond to an identified need. In addition to specifying elements such as planning and execution dates, quantities and costs, users can assign detailed information on required resources to carry out the activity, and can monitor its execution via the work batch.

**Lot de travail (Avec besoins)**

Lgt de travail Action Aller à Rapports ?

Identification		Dates de planification
Lot de travail :	BA5 Balayages prioritaires/cédulés/imprévus 6610	Début : 2007-04-01
DG DT CS SC :	56-66-10-00 CS de Laurier-Station - Lévis	Fin : 2008-03-31
Activité :	6321-1 Balayage et ramassage des débris sur les voies de circulation	
Statut :	En exécution Coût estimé : 37 800,00 \$	
Resp. terrain :	5092-66 PATRICK HOULE	Dates d'exécution
Regroupement :	H) CHAUSSÉE Chaussée	Première : 2007-04-23
		Dernière : 2007-05-22

**Général** | Besoin | Bordereau | Assignation | Suivi

Général		Dates du système
Commentaire :		Création : 2007-02-22
P/S :	Entretien courant et périodique - infras...	Fermeture :
Type :	Récurrent	
Resp. administratif :	2059-66 DENISE CARON	
Compte :	0850 1556610 524010 100 10131 1542330 154077015	
Particularité :	Aucune	
Indicateur de conformité :		
Commentaire conformité :		
Année financière :	2007	Saisi par : FORTIER, PIERRE

**Figure 4: Content of the work batch screen**

Activity reports are used to update information on human, physical and financial resources associated with a work batch.

Among the other functionalities available, users can produce an execution schedule for work batches, manage resources (create a list of physical and human resources, and create work teams), and manage activities (manage the activity list for their unit, and create activity models).

Below are examples of a work batch schedule and of an activity model.



## **IMPLEMENTATION OF THE EIT-6037 SYSTEM AND CHANGE MANAGEMENT**

To ensure the successful implementation of a system of this magnitude, considerable mobilization efforts are required. The system's utilization level and the quality of entered data will be determinant for its success. In our case, members of the project's management team had to convince several managers—mainly directors, unit chiefs and operational chiefs—that substantial benefits directly related to operations management would be achieved through the system's use. They did this by organizing well-targeted informational and awareness-building activities, and by demonstrating that users' needs were the basis for decisions made throughout the project.

In addition, it was necessary to convince about 600 other users of the benefits for their daily tasks, and ensure that they were provided with the required training and support for the implementation. At this level, a key success factor was an effective training program that was tailored to the targeted users. In the field, this led to two different three-day training sessions being held in the Ministère's 14 territorial units. One session dealt with the administrative component, while the other session focused on the technical component.

## **CONCLUSION**

Today, we are in a position to state that the overall initiative was a success. The steps of the operational process are now part of the daily activities of the teams in charge of the network's operation, and the use of the EIT-6037 system has risen to a very satisfactory level that keeps growing. The Ministère's authorities have also demonstrated their confidence in the system by communicating specific expectations with regard to its use.