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In reply please quote:
REF.: 04-AD#6(14)

October 4, 2004

BOARD OF HEALTH:

Subject: Administration Committee Report 6, Clause 14
Report on Mobile and Wireless Application Development

City Council on September 28, 29, 30 and October 1, 2004, considered this Clause, and a copy is attached for the Board's information.

for City Clerk

M. Toft/csb

Attachment

Sent to: Commissioner of Corporate Services
Commissioner of Urban Development Services
Acting Commissioner of Works and Emergency Services
Commissioner of Economic Development, Culture and Tourism
Commissioner of Community and Neighbourhood Services
Chief Financial Officer and Treasurer
Medical Officer of Health
Board of Health
All Interested Parties

c: Director, Purchasing and Materials Management
Executive Director, Information and Technology

Secretary, e-City Committee

CITY CLERK

Consolidated Clause in Administration Committee Report 6, which was considered by City Council on September 28, 29, 30 and October 1, 2004.

14

Report on Mobile and Wireless Application Development

City Council on September 28, 29, 30 and October 1, 2004, adopted this Clause without amendment.

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The Administration Committee recommends that City Council adopt the recommendations of the e-City Committee contained in the communication (July 7, 2004) from the e-City Committee, subject to adding the following additional recommendation (6):

"(6) the appropriate City Officials be authorized and directed to take the necessary action to give effect thereto."

The Administration Committee submits the communication (July 7, 2004) from the e-City Committee.

Recommendation:

The e-City Committee recommended to the Administration Committee that City Council adopt the staff recommendations in the Recommendations Section of the report (June 22, 2004) from the Commissioner, Corporate Services subject to amending Recommendation (1) by striking out all of the words beginning with "to further validate…", and substitute with the words "within the context of an overall wireless strategy for the City of Toronto, such overall wireless strategy to be presented to the e-City Committee at a future date", so that the report's recommendations now read:

"It is recommended that:

(1) future wireless and mobile projects in departments be conducted and supported by the Corporate I&T division within the context of an overall wireless strategy for the City of Toronto, such overall wireless strategy to be presented to the e-City Committee at a future date;

(2) Corporate I&T division provide the common process and templates for development of future wireless and mobile projects in order to improve the potential to duplicate successes and transfer best practices between the Public Health Restaurant Inspection Mobile Project and other future mobile and wireless projects

(3) departments that are interested in conducting future wireless and mobile projects be required to submit a business case to the Corporate I&T division for approval and that the scope of these projects include a full business process review, a detailed risk analysis, and the impact on the Corporate wireless infrastructure

(4) any future implementation of a standard corporate or departmental application be subject to the general tendering process; and

(5) this report be referred to the Board of Health for information."

Background:

The e-City Committee on July 7, 2004, considered the following:

(i) report (June 22, 2004) from the Commissioner of Corporate Services and the Acting Medical Officer of Health, providing an overview of the strategic direction for the deployment and use of mobile worker technologies within City departments. Conclusions are based on the results of the Public Health Restaurant Inspection application project resulting from RFP #9155-01-7660 - Core Business and Enterprise Systems, Products and Services to Enable Access to Corporate Applications and Data by Mobile and Wireless Devices, awarded in April 2002.

Recommendations:

It is recommended that:

(1) future wireless and mobile projects in departments be conducted and supported by the Corporate I&T division to further validate the results of the Public Health Restaurant Inspection Mobile Project and verify that these results hold true in other departments;

(2) Corporate I&T division provide the common process and templates for development of future wireless and mobile projects in order to improve the potential to duplicate successes and transfer best practices between the Public Health Restaurant Inspection Mobile Project and other future mobile and wireless projects;

(3) departments that are interested in conducting future wireless and mobile projects be required to submit a business case to the Corporate I&T division for approval and that the scope of these projects include a full business process review, a detailed risk analysis, and the impact on the Corporate wireless infrastructure;

(4) any future implementation of a standard corporate or departmental application be subject to the general tendering process; and

(5) this report be referred to the Board of Health for information.

(ii) PowerPoint presentation, entitled Wireless and Mobile Pilot Project".

Peter Oliver, Manager, Information and Technology, Public Health, and Judy Sheridan, Coordinator, Services Integration, Public Health gave a PowerPoint presentation on the report.

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(Report dated June 22, 2004 from the Commissioner of Corporate Services
and the Acting Medical Officer of Health addressed
to the e-City Committee)

Purpose:

The purpose of this report is to provide an overview of the strategic direction for the deployment and use of mobile worker technologies within City departments. Conclusions are based on the results of the Public Health Restaurant Inspection application project resulting from RFP #9155-01-7660 - Core Business and Enterprise Systems, Products and Services to Enable Access to Corporate Applications and Data by Mobile and Wireless Devices, awarded in April 2002

Financial Implications and Impact Statement:

There are no financial implications directly resulting from this report.

Recommendations:

It is recommended that:

(1) future wireless and mobile projects in departments be conducted and supported by the Corporate I&T division to further validate the results of the Public Health Restaurant Inspection Mobile Project and verify that these results hold true in other departments

(2) Corporate I&T division provide the common process and templates for development of future wireless and mobile projects in order to improve the potential to duplicate successes and transfer best practices between the Public Health Restaurant Inspection Mobile Project and other future mobile and wireless projects

(3) departments that are interested in conducting future wireless and mobile projects be required to submit a business case to the Corporate I&T division for approval and that the scope of these projects include a full business process review, a detailed risk analysis, and the impact on the Corporate wireless infrastructure

(4) any future implementation of a standard corporate or departmental application be subject to the general tendering process; and

(5) this report be referred to the Board of Health for information.

Background:

Many Departmental operations employ staff whose primary role involves working outside of a traditional office, while requiring regular access to data from electronic systems located in or currently only accessible from the office. Staff are required to physically return to the office daily to undertake records and documentation work. Productivity is affected and physical space dedicated for field staff in City office facilities is not utilised most of the day. Operations where some or most duties take place outside a normal office environment, particularly inspections, have the potential to benefit from wireless technologies that allow field staff secure remote access to their business systems.

A Request for Proposal #9155-01-7660 - Core Business and Enterprise Systems, Products and Services to Enable Access to Corporate Applications and Data by Mobile and Wireless Devices, was issued by the Purchasing and Materials Management Division of the Finance Department in September 2001. The tender focused on the supply of software, development and consulting services for the Toronto Health Environments Information System (THEIS) project. The tender also served as a basis for the evaluation of the technologies that might be required for wireless service as part of the city-wide infrastructure. The tender was presented and reported to the Administration Committee in April 2002, recommending the award to MobileQ Canada Inc.

The outcome of this project is a system for the THEIS Project of Public Health, Healthy Environments group. THEIS is used by Public Health to document and process inspections of premises by city staff. The new application utilises an electronic PDA or laptops equipped with a cellular modem to record and immediately transmit the results back to the city network.

Public Health has now completed the pilot stage for the Restaurant Inspection application, based on field testing over several months. Users were selected from each of the Healthy Environments offices. As well, all staff located in one particular office were part of the pilot so that results were representative of the entire operation. The main testing of the developed application began in October 2002 with full field trials beginning in February of 2003.

This report outlines the results of the pilot stage of the Restaurant Inspection application project.

Comments:

Current inspection activities are time-consuming and labour-intensive in part due to the paper-based processes involved. Factors contributing to the end-to-end time for inspections (beginning with identifying the need to inspect and ending with updating records after final inspection) in the current method of inspections include:

(1) inspectors visit regional offices to deliver and retrieve files and review inspection priorities on a daily basis;

(2) information on previous visits is not available in the field, unless paper files are requested and copied at the office prior to going into the field;

(3) inspectors manually complete inspection reports in the field using non-recyclable pre-printed multi-part forms filled out by hand;

(4) back office support staff are used for data entry of the inspection results into the THEIS system for processing, generally on the following working day;

Utilizing the approach of electronic field data entry and near real-time remote connectivity, the following benefits can be achieved:

(1) retrieval of inspection-related histories in the field, eliminating unnecessary travel time to the office and time to conduct file searches;

(2) data entry of inspection results can be made secure, and submitted in real-time directly to the THEIS systems from the field. This eliminates the need for manual data entry and provides a level of automated error control;

(3) utilization of pre-defined pick lists reduces the number of errors, and improves consistency in documentation and the focus of the inspection;

(4) immediate posting of records to THEIS for review and processing;

(5) printing of documents and infraction reports/notices, reducing the need to manually prepare these documents;

(6) reduction in the time needed for making critical data available to management and the public;

(7) posting of results to the DineSafe web-site within a shorter timeframe (24-48 hours earlier);

(8) direct tracking of staff utilization, activities and other performance metrics to provide more accurate resource management; and

(9) potential to streamline the field tasks to better conform to business best practices or create additional efficiencies within the operations (through standardized “scripting” of the task or by combining formerly separate tasks).

The Public Health goal for the project is to improve the overall delivery of inspection tasks. The potential resulting impacts or benefits to the operations of the department are:

(1) increased staff time available to actually carry out field inspections, through the reduction of in-office administrative work and travel time;

(2) noticeable improvement in the accuracy and timeliness of inspection data since the information is captured at the source and is not subject to misinterpretation during later data entry and validation;

(3) reduction or elimination of the manual data entry requirements and resources. This efficiency will allow for the potential re-deployment of resources to other front line service areas in addition to the potential to increase actual inspections per day; and

(4) potential reduction in the requirement for physical office space, as staff will spend more time in the field performing their core business functions.

The Corporate Systems Infrastructure also benefited from the development in the following ways:

(1) creation of a framework for the development and support of mobile and remote access to City data;

(2) integration of the piloted systems, including development and maintenance, into the existing Information and Technology electronic service delivery infrastructure;

(3) training of city staff as developers and administrators of the proposed solution. This training will help lower the reliance on outside consultants or contractors for normal operations and support of the systems;

(4) a review of the business processes, wireless carriers and devices for the establishment of guidelines to transfer paper-based processes to electronic-based on near real-time wireless communications;

(5) the design, development and implementation of the Public Health Restaurant Inspection application, based on the guidelines and processes established as part of the overall review; and

(6) the creation of a maintenance and infrastructure support program for the systems and application that meets city standards.

Currently, Corporate I&T is migrating the application front-end from the pilot infrastructure to the main electronic service delivery (ESD) infrastructure. This production system will sustain the THEIS project field operations.

The THEIS project will proceed with the development of business cases and project documentation to identify areas of growth and additional opportunities for efficiencies through applying the lessons learned from this project to a broader range of their regular field operations. The initiatives will include ongoing improvements to the Restaurant Inspection application through the introduction of additional functionality and the development of support for a broader range of mobile devices.

As part of the project, it was deemed critical that the City not develop multiple independent solutions for the use of wireless applications. Processes, resources and existing infrastructure should be utilized in the most cost-efficient way possible. The intent is to develop an overall mobile/wireless infrastructure that can provide a single, consistent and secure technology solution for wireless services and that is able to leverage the investments that the City has

already made in technology. One of the goals of the project was to implement systems that will work seamlessly across a range of mobile devices, carrier networks and applications. Major considerations for support of devices, capability of carrier networks and application compatibility were also assessed. Wireless systems must deal with the many user interfaces and protocol issues inherent to the mobile communications field.

The Information and Technology Division of the Corporate Services Department will now be pursuing additional pilot application opportunities with other client departments and continue to develop and evaluate mobile and wireless working strategies within the corporation. The intent is to validate whether or not the positive results from the Public Health pilot can be reproduced in other applications. The Division will also gain knowledge and experience in deploying and supporting such applications.

Additional projects targeted for development will be reviewed against the "best practices" resulting from the pilot in order to assess suitability for wireless use in other business units. Only where client departments have developed a comprehensive business case and are able to assign the suitable resources for development and field operations, will a pilot be considered. Where a pilot application can not be implemented on the City's existing production environment, then the normal procurement process will be followed to purchase an appropriate system for the pilot implementation.

One of the project objectives was to evaluate various methods of capturing information in the field electronically and the technology/mechanics of transferring the data back to the business systems. Costs that must be factored as part of a total cost of ownership (TCO) analysis must include cost of mobile devices, monthly service charges for providing access and the resources required for sustaining the solution.

With electronic data collection, the value attached to the immediacy of data access must be assessed against the security issues and costs of providing that access. Wireless applications can provide a cascading range of functionality depending on business requirements, including:

(1) Basic level: Electronic collection and storage only

- (a) static electronic forms for basic information entry;
- (b) no service fees for wireless access;
- (c) simpler device and lower cost of acquisition;
- (d) simpler user and device support requirements;
- (e) data is synchronised on a period basis (daily or weekly when the staff are in the office);
- (f) changes to available data or updates to the application can only be made when the user brings the device into the office;
- (g) data collected can be lost if the device fails, is lost or stolen before the data has been synchronised to City systems; and
- (h) there is no capability of accessing other Corporate or public data via the device other than what has been synchronized to it.

(2) Medium level: Near real-time access

(a) static electronic forms for basic information entry;
(b) minimal or reduced service fees for wireless transmission of "batched" updates;
(c) simpler device but higher cost of acquisition due to the addition of "wireless" capabilities;
(d) increased user and device support requirements due to the more complex technology involved;
(e) data is synchronised on an as needed or scheduled basis (once or multiple times a day based on application settings);
(f) changes to available data or updates to the application can be included as part of normal batch transmissions with little impact on the user's daily routine;
(g) data entered and stored on the device is transmitted and validated as part of the batch transmission, which reduces exposure to risks due to device failure or loss; and
(h) there is the potential for staff to access other Corporate or public data via the wireless communications where it is of benefit to the work.

(3) Advanced level: Real-time wireless communication

(a) dynamic forms for advanced information entry and processing;
(b) increased service fees for wireless transmission due to immediate query/response for each update;
(c) more powerful/complex device with a higher cost of acquisition, but significantly higher capabilities;
(d) increased user and device support due to the higher complexity of technology involved;
(e) data is updated in "real-time" as the update is finalised on the device
(f) changes to available data can impact or actually direct what next process or step needs to be taken with the data;
(g) data entered is only stored on the device for as long as it takes to finalise and transmit the results; which minimises exposure to risks due to device failure or loss;
(h) In the field, the use of forms must be intelligent so that where reception for wireless communications are not available, the device is capable of performing the core functions on its own until reception is again available; and
(i) the power of the device and wireless communications capabilities provide the ability to access a wider range information and resources (i.e.: email, office network file shares, documentation stored on Corporate systems).

Not all applications will have the same business processes or needs. The level of service required to meet operational needs may fall into one of the preceding levels or may require a combination to be cost-effective. For example, a customer survey may be stored on the device for later download, while an inspection application will be transmitted in real-time upon completion.

Due to the security issues and the timeliness with which of when the data collected needs to be shared, the Public Health Restaurant Inspection application is designed as a near real-time application (Medium level above). The application is constrained by the need to meet mandated inspection rates and the need to use the format of the existing paper form provided to restaurant owners. The functionality is restricted to the basic tasks necessary for performing inspections and simplified access to office resources like GroupWise email. This restriction allowed the evaluation of the pilot to focus on the areas determined by the department to be the most critical.

Additionally, not all applications and business needs will have the same impact on the Corporate technical wireless infrastructure. For example, applications that support the delivery of health related services to individuals will pose an additional demand and require that the City's infrastructure be enhanced to accommodate enhanced security and protection of individual health record information.

Summary of Project Analysis:

1. Anticipated Benefits

Public Health wished to assess the degree to which the pilot could achieve the following anticipated benefits:

2. Productivity

(a) allow staff to spend more time in the field instead of the office, thereby allowing them to complete more inspections;

(b) save time in selecting common data from a picklist, instead of looking up and transcribing deficiencies;

(c) print documents, reports and orders in the field, eliminating the need to manually prepare and copy them; and

(d) there is a reduced capability for error due to misinterpretation or miskeying during data entry since the data is entered at the source thus improving data quality.

3. Costs

(a) eliminate back-end data entry functions; and

(b) possible reduction in office space for field staff if all work functions are addressed by the mobile solution.

4. Customer Service

(a) provide faster turnaround time on submission of data and results for review by the department or other users of the collected data;

(b) provide more readable documents to recipents in the field, instead of hand-written copies; and

(c) retrieve task related information and file histories on site when they are needed.

5. Identified Benefits of the Pilot

As a consequence of the design constraints placed on the Public Health application, as well as both human and technological issues, not all of the above named anticipated benefits could be validated under the context of the pilot application. The anticipated benefits, listed above, that were specifically validated through the pilot are:

(a) save time in selecting common data from a picklist, instead of looking up and transcribing deficiencies;

(b) print documents (specifically inspection sheets) in the field, eliminating the need to manually prepare and copy them;

(c) there is a reduced capability for error due to misinterpretation or miskeying during data entry since the data is entered at the source thus improving data quality;

(d) the potential to eliminate backend data entry and thereby reassign staff to other duties is viable;

(e) provide faster turnaround time on submission of data and results for review by the department or other users of the collected data since data were submitted in near real-time; and

(f) retrieve task related information and file histories on site when they are needed.

In addition, the following benefits were identified:

(a) the service supports a consistent reinforcement of adherence to policy and procedures by field staff through controlling the process and format of data entered into the forms; and

(b) incremental savings and efficiencies can be seen in the use of electronic forms.

6. Identified Areas That Impacted the Results of the Pilot

1. Managing Workload

While the application meets the primary requirements for Restaurant Inspections, additional functionality can address areas where the pilot showed some weakness or deficiencies. Areas for improved functionality identified included the need for:

(a) improved in-form data search;
(b) additional input validation;

(c) greater capability in the event of loss of wireless communication;
(d) more full featured access to office tools such as GroupWise, and
(e) access to office documents in Microsoft Word and Excel formats.

2. Changes in Technology

Rapid development and change in the mobile devices market impacted the choice of a suitable device for the Public Health application. Existing devices that were evaluated became obsolete before a selection was made and a more suitable class of alternative device was not yet available for purchase in time for the project schedule. The device that was selected attempted to address the majority of requirements, but in use proved overly restrictive and addressed only the basic requirements with no room for future growth. Currently, there are numerous devices available that can address the expanded requirements resulting from the Public Health Pilot.

3. Infrastructure

Changes and enhancements to the city's ESD infrastructure at a key interval resulted in a more positive gain in service delivery, but delayed the functional requirement and design phases of the project. A compatibility issue between security mechanisms on the device and the corporate network arose and needed to be addressed prior to proceeding. This issue was addressed.

4. Performance Measures and Change Management

(a) staff acceptance and work demands outside of the scope of the pilot impacted the ability of all the targeted users to take full advantage of the device;

(b) since the pilot application was not envisioned or designed to fully address every work task, and where the application did not address the task, the inspector reverted to the paper process;

(c) users were required to participate in troubleshooting and additional training or evaluation exercises. This impacted the amount of time available for higher priority inspection tasks;

(d) while some users were able to fully maximise their use of the technology, others did not show the same kind of benefits in terms of total numbers or reduced time required for inspections. A fuller set of features in the application would address these issues by reducing the need to "fall back" on the manual paper process;

(e) changes to the work environment and how staff are expected to be managed outside the traditional office is another issue that must be given a greater importance in future projects. The project feedback from Public Health users indicated that the greatest resistance to change was around the issue of not reporting to the office on a daily basis. Conversely, this is the area that has the greatest potential for productivity gains and cost savings. Departments will need to develop strategies to maintain and facilitate the daily informal information exchange and peer mentoring that takes place among staff in the current centralized, non-wireless, environment; and

(f) since a key goal was to increase the time spent out of the office and in the field performing primary job duties, a strategy must be developed as part of the base business plan that addresses that goal. Departments must understand and address the impacts resulting from the decrease of social and business-related interaction between staff who will no longer see each other on a daily basis. New opportunities for staff development through peer mentoring and exchange must be considered. A more independent approach to service delivery is needed to fully utilize mobile technology. Information must be available when needed and both task and operational information must be made available through established team communication protocols that are understood by all affected staff.

Conclusions:

The results of the Public Health Restaurant Inspections mobile and wireless pilot have shown that the technology has the potential to provide benefits to operating departments if appropriately deployed. Future projects for other departments can further validate the results and verify whether they hold true in other deployments.

Providing to departments a common process and template for development will improve the potential to duplicate successes and transfer best practices between projects. To ensure success in future projects, interested departments must be able to demonstrate a clear understanding of the impacts and issues in relation to mobile/wireless applications before resources can be allocated for these projects. User support, inter-departmental relationships and project dependencies are all key issues that must be identified and addressed.

Preparation of an appropriate business case that includes a full business process review, a detailed risk analysis, and impact on the Corporate wireless infrastructure is required prior to proceeding with further pilots. With the high level of interdependence between Information and Technology resources and the client departments, the commitment of resources must be discussed, agreed to and documented via a project charter and appropriate service level agreements. Generally Corporate I&T is responsible for covering Corporate infrastructure costs and departments are responsible for covering the costs of the application and devices. These agreements will create an environment where the “best practices” evolving from past projects can be applied. As part of future projects, use should be made of the documentation, practices and applications developed during the Public Health Restaurant Inspection project.

Any future implementation of a standard corporate or department application should be subject to a general tendering process to ensure that the most suitable solution that specifically meets the application requirements is purchased. This tendering approach ensures that advances in the industry can be incorporated in the application and that no undue advantage is provided to current vendors.

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(A copy of the Powerpoint Presentation given to the e-City Committee, appended to this communication is on file in the City Clerk's Office, City Hall.)