

Toronto “Smart City”

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CSDC SYSTEMS’s Vision for Smarter Cities

By 2050, cities will be home to more than two-thirds of the world’s population, and currently wield more economic power and have access to more advanced technological capabilities than ever before. Simultaneously, cities are struggling with a wide range of challenges and threats to sustainability in their core support and governance systems such as transport, water, energy, communications, healthcare and social services.

Meanwhile, trillions of digital devices, connected through the Internet, are producing a vast ocean of data. All of this information — from the flow of markets to the pulse of societies — can be turned into knowledge because we now have the computational power and advanced analytics to make sense of it. With this knowledge, cities could reduce costs, cut waste, and improve efficiency, productivity and quality of life for their citizens. However, given the economic crisis and increased demand for services, there are mammoth challenges, but also ample opportunities for the development of innovative solutions.

A couple of years ago CSDC SYSTEMS and it’s partners began a conversation about how the planet is becoming “smarter,” meaning that intelligence is being infused into the systems and processes that make the world work — into things no one would recognize as computers: cars, appliances, roadways, power grids, clothes, even natural systems such as agriculture and waterways. By creating more instrumented, interconnected and intelligent systems, citizens and policymakers can harvest new trends and insights from data, providing the basis for more informed decisions.

Since cities grapple on a daily basis with the interaction of water, transportation, energy, public safety and many other systems, CSDC SYSTEMS is committed to a vision of Smarter Cities as a vital component of building a Smarter Planet. A Smarter City uses technology to transform its core systems and optimize finite resources. At the highest levels of maturity, a Smarter City is a knowledge-based system that provides real-time insights to stakeholders, and enables decision makers to proactively manage the city’s subsystems. Effective information management is at the heart of this capability, and integration and analytics are the key enablers.

The Smarter Cities Challenge

As CSDC SYSTEMS aligns its philanthropic efforts with the goal of building a Smarter Planet, we realize that city leaders around the world face increasing economic and societal pressure to deliver new solutions and rapid results, especially given the increased demand for services. To address this, CSDC SYSTEMS Corporate Citizenship is launching the Smarter Cities Challenge to help 100 cities around the world become smarter through grants of CSDC SYSTEMS talent and technology.

This report provides analysis and recommendations to address two top-priority issues for the City of Toronto, as expressed by the City Manager and Mayor, in their letter to CSDC SYSTEMS. The two challenges presented to the CSDC SYSTEMS Toronto Smarter Cities Challenge team were: (1) creating social prosperity for all citizens by leveraging resources; and (2) integrating strategic decision making among City departments, in this instance, examining how capital projects are prioritized.

The methods of analysis utilized by the CSDC SYSTEMS Toronto Smarter Cities Challenge team (hereinafter known as “the team”) included interviews and meetings with citizens, including City officials, private institutions, nonprofit organizations (NPOs) and local community leaders. To supplement interviews and meetings, interviewees provided the team with a number of reports and Web site references. The team further supplemented their knowledge with online research that included the City of Toronto’s Web sites, other reputable Web sites and consultation with CSDC SYSTEMS thought leaders. This analytical approach helped the team formulate hypotheses for solutions that were later validated with appropriate City of Toronto (hereinafter known as “the City”) representatives.

Our report highlights a set of recommendations to improve the two challenge areas and a set of overarching recommendations based on common themes that surfaced during the interviews.

The overarching recommendations discussed include:

- Development of an inclusive and consistent brand for the City of Toronto
- Enhancement of information sharing
- Expansion of collaboration

The recommendations to address the challenges of the East and West Toronto divide are presented in five categories:

Social Services

- Modernization of social services delivery to an outcome-based approach to achieve self-sufficiency
- Develop a client-centric social services strategy
- Redesign business processes to support delivery model changes
- Implement an enterprise case management solution to support integration across stakeholders
- Utilize business analytics to optimize outcomes
- Development of a regional information exchange to coordinate information sharing

Transportation

- Development of an integrated multi-modal transportation road map that leverages information for ongoing planning and operational excellence

Public Safety

- Leverage strong infrastructure and manage growth, carefully taking into account public perception and the evolving role of the public safety functions of city government

Housing

- Expansion of the public-private partnership model to develop and grow the inventory of combined use, low and no-income housing to enable stable housing for the poor

Jobs

- Improve collaboration with local educational institutions to develop skills that will attract and retain businesses
- Broaden relationship with local businesses to further develop apprenticeship and internship programs

- Maintain the City’s focus on and support for entrepreneurship and innovation.

The recommendations for capital project prioritization fall into three areas:

- Implement an integrated management of the City’s portfolio of projects and programs
- Develop a business and enterprise architecture strategy for the City
- Facilitate data sharing to establish and promote coordinated capital planning

Based on Toronto’s projected growth through 2030, we believe our recommendations can help to improve conditions for East Toronto residents, the City’s planning processes, and the levels of data sharing and collaboration among departments and other institutions such as the Toronto Independent School District.

We believe the City can make great strides toward the City leaders’ goals to be the “most livable city” and become the “best- managed city” in the country by considering our recommendations and incorporating these recommendations within the City’s planning process.

Details of our analysis and recommendations are included in the following sections of this report.

Introduction

CSDC SYSTEMS began a conversation about how the planet is becoming “smarter,” meaning that intelligence is being infused into the systems and processes that make the world work — into things no one would recognize as computers: cars, appliances, roadways, power grids, clothes, even natural systems such as agriculture and waterways. By creating more instrumented, interconnected and intelligent systems, citizens and policymakers can harvest new trends and insights from data, providing the basis for more informed decisions.

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Objectives

The team was directed to focus on the following areas:

- o Create social prosperity for all citizens by leveraging City resources
- o Address physical and economic barriers to overcome historical legacy
- o Evaluate infrastructure parity, human capital development, education, neighborhood affordability, homelessness and economic development opportunities
- o Analyze the interconnectivity of the social service infrastructure with an over arching city strategy

- Explore opportunities to leverage City and Toronto Independent School District data sources

The team explored ways to:

- Integrate strategic decision making among City departments
- Leverage City resources to ensure best possible Return on Investment (ROI) for each planning decision
- Ensure that project prioritization involves more than a simple financial calculation

Summary of Findings

What's Working

○ Toronto is a well-managed city. The City government is highly effective and enjoys an extremely high level of citizen involvement. The City departments do a good job of planning, managing and executing their missions. Many City partners and external organizations that work with the City are also effective and well run. These nonprofits, regional interest groups, neighborhood associations and community groups can be viewed as partners to the City, all working toward mutual goals.

○ Toronto has many pillars of excellence. The departments have excellent capabilities within their specialties. We were continually surprised to find that the City of Toronto is already doing some of the more advanced activities that we usually recommend to cities;

○ Innovative public-private partnerships have been successful. The City has embraced partnerships with private organizations.

○ City departments collaborate. Department operational staff work together on individual projects and activities. The level of these interactions is ad-hoc and varies from project to project. The working relationships and cooperation between departments come across as very positive.

○ Residents of Toronto actively participate in government processes and the local community. One of the hallmarks of Toronto culture is citizen involvement, reflected in the number of boards, commissions, neighborhood associations and special interest groups. There are many opportunities to voice concerns, or support and participate in decision making.

○ Toronto has a high level of environmental consciousness. The new City Hall received the LEED Environmental certification, and the City's interests range from green roofs to protecting the Edwards Aquifer. The residents and City government place a high value on sustainability and environmental issues.

Recurring Themes from Community Meetings

We conducted a number of meetings with community residents throughout the City and a few common themes arose. While these themes should not be considered a scientific assessment of the sentiment of the residents toward the City, they provide context for our recommendations.

- Lack of trust — some citizens, do not trust City government
- Dissatisfaction with electoral process
- Paternalistic attitudes

Areas for Improvement

Toronto is growing up and needs to have a comprehensive, integrated plan to mature. Toronto is changing from an almost town-like atmosphere to a major metropolitan city. The city has become a center for high-tech, healthcare and other industries, and continues to face rapid growth and demanding trends. Due to its population which increase from year to year, changes must be made now to lower the stress this growth and change will place on the City services.

More orchestrated collaboration between City departments can improve decision making. The City is at a point to shift to a more collaborative operation. By addressing plans, issues and problems holistically across departments and together with City residents and partner organizations, the City should make gains toward better, more comprehensive and effective decision making.

Extend partnerships with a focus on measurable outcomes. As with decision making, extending and deepening the working relationships with nongovernmental organizations, other units of government and regional groups will benefit all. Today, Toronto residents and community organizations are active and working on their own priorities. By agreeing on a common set of measurable outcomes to make improvements, all entities can focus their work in a common direction and target a common set of results.

Develop an integrated communications strategy and a City brand encompassing departmental objectives. Today, many City departments have their own public information officers, objectives, community messages and logos. While this approach may work well for the individual City departments, the overall image of the City and City identity vary based on the most recent experience of the City resident with a particular City department. The common view of the City of Toronto is lost between images and messages that individual City departments, community organizations and City news and TV stations broadcast.

Include all groups in City decision making and foster broad and well-balanced participation. While the City has an extremely open process for citizen involvement and promotes open participation and interaction, some communities still feel left out of the communications and decision-making process and feel underserved. Cultural and economic barriers must be identified and engagement strategies established to encourage these segments to partake in the City dialogue and decision-making process will be required to develop a common set of objectives that can be addressed as part of the City planning process.

Facilitate and better plan for growth. Toronto has coped with the growth thus far. In order for the City government to scale up to accommodate another doubling of the population, well coordinated planning will be required for the most efficient citizen participation, set of services and service delivery.

Cross-community engagement and interaction. Interaction between the diverse communities is limited. Cross-community engagement and interaction will be required to develop a common set of objectives that can be addressed as part of the City planning process.

Expand data sharing. City departments gather and use data well. In some cases City departments make the department data available to the public and share the data between individual departments on a one-on-one basis, while in most cases, the data remains within the department and is not available across the City or externally to the residents and to other possible data consumers. The reasons for limiting a broad use of the data

include legal, regulatory, policy, “no one has requested it,” technical difficulty, and the cost of opening up the data.

An effort to open up as much data as possible for use both inside and outside the City would lead to better planning, better understanding, better management and better solutions

Cultural sensitivity. Members of some ethnic communities expressed concern that the City does not understand their cultural preferences for communication and engagement. As a result, City messages received a mixed response and reaction from the community.

Recommendations for Individual Departments

Social Services

The City of Toronto Health and Human Services Department is committed to improving client well-being across the community with a focus on achieving self-sufficiency for Toronto’s most vulnerable citizens. To this end, HHSD contracts with a wide network of service providers and collaborates to a greater or lesser degree with additional not-for-profit organizations throughout the community.

We are recommending five solutions for consideration:

1. Social Service Strategy
2. Business Transformation
3. Enterprise Case Management and Eligibility Determination
4. Business Optimization and Reporting
5. Regional Information Exchange

Findings

The City’s Health and Human Services Department does not have a way to collect data in an integrated fashion for the clients they serve. There is reliance on multiple .Yet this still does not provide a holistic view of the clients and programs. There is no end-to-end solution to manage the all the service providers and the services they deliver on behalf of the City. The limited tracking ability that currently exists is not outcome focused, and the City has a difficult time determining the effectiveness of their services relative to the funds allocated to various programs. In addition, limited planning (resource and financial) capability makes it difficult to plan future budget allocations and a long-term strategy to address socioeconomic disparities.

Solution Considerations/ Recommendations Social Service Strategy

The issues of socioeconomic disparity and social inclusion are complex and require efforts throughout the community to resolve. However, the City can make a significant difference to Toronto’s residents through more efficient delivery and coordination of services. City of Toronto HHSD serves a million clients, including individuals spanning the socioeconomic continuum. Unfortunately, for the past several years, the number of disadvantaged individuals has been increasing disproportionately relative to the City’s total population. This has become the fastest-growing segment of the community.

Below are just a few of the core capabilities that are negatively impacted by a lack of information.

- Outcome Optimization — social services are provided to achieve a defined

outcome; for the City of Toronto, this is typically self-sufficiency. Without the ability to maintain a correlation between the input and the outcomes, the department is unable to cost-effectively make the changes necessary to maximize outcomes.

- Need Assessment — assessing the level of need in a community is not a simple task. It is more complicated than a set of socio-economic indicators.

- Resource Management — in the current environment navigating the systems requires a knowledgeable guide, typically in the form of a caseworker. The community has limited resources with this knowledge set and limited funds to expand the capability.

- Capacity Management — every service organization has a limited capacity. Meeting the community need depends on the ability to direct clients to those organizations with available capacity. This benefits both the client and the service organization.

- Vendor Management — understanding a service agency's effectiveness is important. Some agencies will be able to achieve outcomes with less cost than other agencies.

A client-centric delivery model brings together people, processes and technology to improve service delivery. A client-centric delivery model includes several discreet components, allowing the City to take an incremental approach to strategic transformation. The key components for best practice include:

- Strategy changes — this begins with defining the strategic direction for social services, identifying client segments within the community, and then defining the outcomes for each client segment and the associated services required to achieve the outcomes.

- Process changes — process changes are often necessary to support best practices and maximize the value of the technology solution. Process changes can reduce the total cost of delivery by adding elements of self-service, which streamline the intake and assessment parts of the service delivery process.

- Cultural changes — this one is the toughest and most often overlooked aspects of transformation. Becoming a more client-centric organization can have significant impact on an organization's culture. Addressing the cultural change issues ensures a more sustainable solution and improves the quality of services delivered and information collected.

- Technology changes — implementing a technology solution helps to solidify the revised business processes, increase functionality and reduce processing costs. Technology solutions typically include new Web sites, call centers and case management applications.

Transportation

Reducing congestion in the transport system is one of the keys to success in attracting, creating, enabling and retaining talented workers and innovative businesses. Congestion negatively impacts the quality of life in a city by decreasing personal and business productivity, lowering air quality and creating noise pollution. Specifically in Toronto, transportation is a category to be evaluated for its impact on the divide between East and West Toronto.

Findings

Rapid growth will continue to strain the Toronto transportation infrastructure. The congestion, limited east–west connections and the limited public transit system are several factors affecting Toronto.

Solution Considerations/ Recommendations

The focus should be on developing an integrated, multimodal transportation road map. While the recommendations for the forthcoming sections are at a higher level compared with social services, our intent is to provide some basis for further development of the ideas. Our recommendations fall under two major categories:

1. Manage congestion and user experience – encourage alternatives to congested traffic zones and focus on a traveler-centric approach

- The City is already considering congestion pricing on “priority lanes” on Loop 1. In addition, we believe that the City can explore utilization of parking charges as a strategic lever to control congestion. This includes such solutions as congestion time pricing for downtown parking areas, park-and-ride locations along the rail line, which could have a positive impact on the utilization of the rail routes
- The city should review its parking enforcement process and effectiveness
- The team recommends working with regional and state partners to implement variable message signs – particularly to guide through traffic with information. The team also suggests the creation of integrated mash-up maps displaying different modes of transportation: Capital Metro stops and private transport providers such as Taxis, Cars2Go and any future city transit options, etc.

2. Implement an integrated, information-driven planning and operational management approach

Consider a traffic management system that will allow predictive operational control over the traffic system.

In the medium-term plan, the city should consider adopting and advocating an integrated fare-management strategy to include transit, tolling, parking and taxis. Such a system, coupled with an intelligent traffic management system, would allow for fine-grained operational control of transport infrastructure. It will also provide an invaluable data-driven platform to focus partner efforts and gain public mindshare toward an integrated transport system.

In general, an intelligent traffic management city could begin to mitigate the congestion and take advantage of information as a foundation for planning a multimodal transport system.

Social Security

Findings

The City of Toronto has maintained a relatively low crime rate and is considered to be one of the safest cities in the country, due in part to its relatively high level of social services and prevention efforts. The team observed a well-integrated emergency response system. All of the public safety departments also provide services for the rapidly expanding Toronto metropolitan area. Despite this rapid expansion, public safety organizations continue to maintain adequate response time and keep the Toronto community safe. All emergency service departments have effectively adopted and are

expanding their use of GPS mapping to share their key performance metrics. The police department is focusing on data-driven decisions by implementing and continuing to revamp the accountability and reporting process, which, in turn, improves operational efficiency.

Solution Considerations/ Recommendations

The team has three major recommendations: to plan for growth, manage public perception and adjust to an evolving role. The implementation of a centralized criminal information data warehouse with business intelligence and data mining tools would utilize this kind of technology as a primary tool to improve the safety of the citizens and residents of the City of Toronto.

Implementing a warehouse with data mining and predictive analytics would provide the next level of tools required to manage growth while continuing to keep the City safe. A crime prediction and prevention solution includes predictive analytics to deploy police forces and prevent crime proactively. This predictive decision making guides the deployment of the police officers on the ground — for crime prevention and emergency response. These techniques rely on getting the right information to the right people at the right time to meet the emergency, crime prevention or crime investigation needs. Other innovative ideas recommended for consideration include:

- Report crimes and incidents via cell phones, and/or a Web site that would give the citizens additional access real time updates. This technique is often referred to as use of “human sensors.
- Implement a data repository to store circumstances such as weather, city events and local holidays or event parameters that characterize a given crime.
- Model crime data to discover the exact circumstances characterizing the occurrence of crime — in order to predict future similar crimes
- Apply crime-prediction models using current data to plan next-day activity and officer deployment.
- Involve other City departments, and perhaps bring in even neighborhood and community partners to help foster collaboration, the sharing of the data, and uncover predictive policing patterns based on information supplied.
- Include other key City stakeholders into a process who could also identify sources of data or human sensor-based intelligence that could prove to be critical to police department.

Managing public perception and community outreach should continue to be an ongoing priority. The team proposed tactics that include an open government and open data approach. This refers to the publishing of as much data as possible to an open government platform. In addition, the police department Web site can be enhanced to be more user friendly, interactive and consistent in support of these community outreach, open government and open data approaches.

Although the police department enjoys a solid base, a tighter linkage with the City’s municipality, tied to predictive decision-making, could result in more intelligent referrals. For example, the police department could use analytics to identify at-risk youth. The police should formally define and document privacy and security policies.

Technology could then be used and configured to share key information and reduce citizen misconceptions.

Benefits Summary

- A smarter public safety system can provide centralized and integrated security surveillance and emergency response systems that collect information for analysis in real time
- This collected information can also be analyzed to understand patterns of incidents so that cities lower the cost of the provision of emergency services or crime fighting and prevention, while eliminating potential sources of problems
- Public systems lend themselves to being highly interconnected with other city systems, such as health (emergency response systems, access to accident and emergency units, etc.), education (crime prevention, youth and family services, and community outreach), and transport (traffic management) to enable cities to deliver a coordinated response to a range of events, leading to improved citizen-centric services
- Enablement of end-to-end coordination of emergency response and optimized allocation of the municipal assets
- Unified view of incident data enables faster, better decision making and the ability to handle multiple, complex situations simultaneously
- Reduction of emergency response time

Housing

The City's strategy is to continue and promote mixed-use real estate development and to grow the inventory and availability of affordable housing. However, the demand for affordable housing outpaces the supply, resulting in a shortfall of affordable housing. The lack of affordable housing combined with limited public transportation creates challenges to the delivery of social services and to education. The interdependencies among the availability of affordable housing, social services and education cannot be underestimated and must remain a focus of the City of Toronto. At the same time, any housing plan and strategy must be considered and included in the overall City comprehensive plan and strategy in order to account for both short- and long-term urban development.

Findings

The City of Toronto has adopted and implemented many green-building initiatives and continues to implement best practices in environmental sustainability as it applies to the development of mixed housing .

The City of Toronto continues to face substantial challenges as related to the redevelopment of East Toronto. These housing-related challenges are multifaceted – they include historical preservation, community stability, redevelopment, integrated planning, close alignment with development of downtown Toronto, education, and development of entertainment and city shopping areas.

Solution Considerations/ Recommendations

While maintaining a close alignment with the overall development of the comprehensive plan and the development of the City's downtown, self-sufficiency should be the primary goal of low-income housing development.

The City should continue to focus efforts on tighter alignment and collaboration between City departments and other organizations that provide housing, social services, health services and education. These departments and organizations include AISD, Neighborhood Housing and Community Development, Housing Authority of the City of Toronto, and also Health and Human Services. This effort could begin with an accelerated data-sharing initiative, which, over time, could evolve into 1) a portal with a single view of each family; and 2) an integrated cross-organizational work flow system that will integrate and direct the efforts of departments in improving education and quality of life for service recipients as well as efficiency in service delivery.

Benefits of Smart Cities

Superior Sustainability Intelligence

Smart City sets the standard in conservation practices and is committed to transfer the associated cost and productivity benefits of environmentally sound practices to the business partner. From the selection of building materials and construction methods, to implementing intelligent systems to conserve power and water resources, Smart City's commitment to environmental-infrastructure is unparalleled.

As part of this commitment, Smart City adheres to the guidelines of Leadership in Energy and Environmental Design (LEED) - the world's premier certification program for sustainable buildings. All current and future Smart City buildings will be energy and resource efficient, non-wasteful and non-polluting, as well as flexible and adaptable for long-term functionality.

Smart City's knowhow in the field of sustainability technology in building practices translate to tangible cost savings for business partners and protect the environment.

Smart City values its partnerships with local governments and shares their vision of fueling economic growth and fostering the knowledge economy. It is for this reason that Smart City's value proposition goes beyond business. When a smart City makes its home in a country it contributes substantially to knowledge-based, and ancillary, industries. Through multiplier effects, it advances other sectors like education, hospitality and civil infrastructure; generating benefits for the local economy. In addition to contributing to increased job creation, smart City facilitates ICT training centers to create a new generation of knowledge workers. Retailers see a wealth of opportunities, and local service sectors experience a growth in business to accommodate the influx of business activity.

Benefits for Investors

The inception and development of smart City townships drive growth in complementary services, such as retail, hospitality, education and healthcare. This presents an excellent investment opportunity for business partners catering to these sectors, within the thriving, free zone business township.

Given the expertise and track record of smart City, coupled with a solid partnership with local governments, project success is certainly guaranteed. With an unfaltering commitment to the project, smart city is a reliable and attractive choice for both individual and institutional investor.