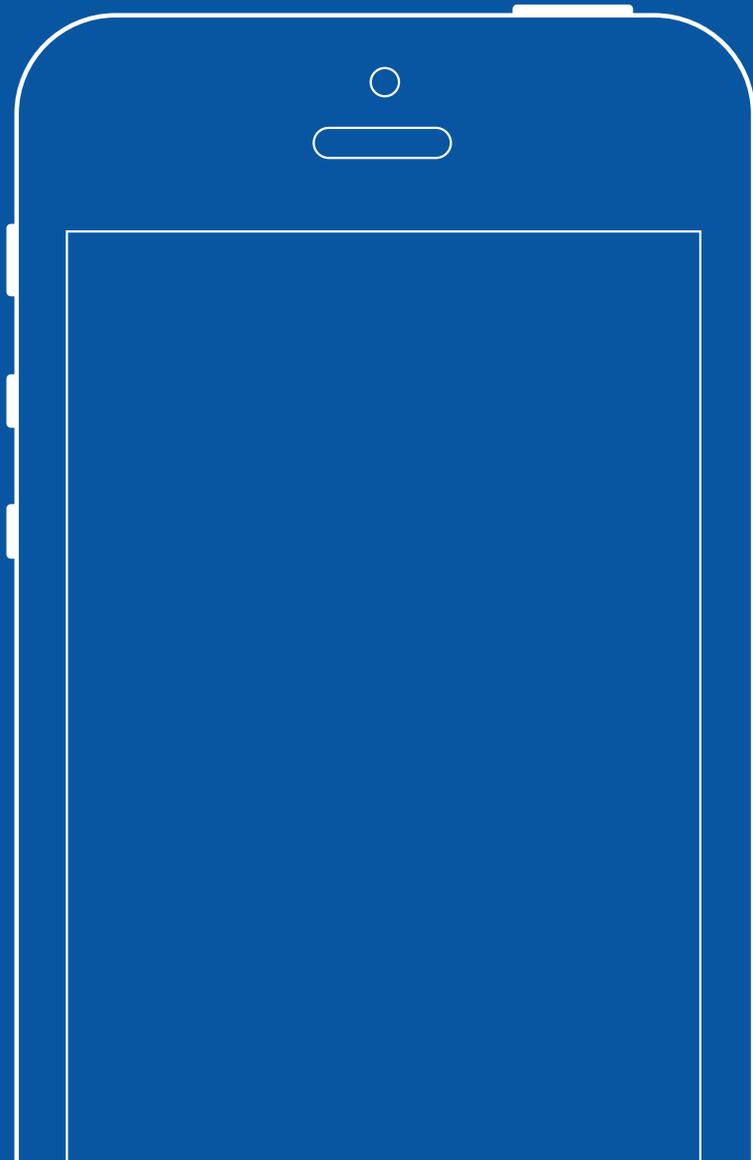# Transforming Property Assessment

A whitepaper that shows how Roll by 2015 revolutionized North America's largest property assessment jurisdiction and international valuation practice.

axilogic

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AUTHOR
Michael C. Chettleburgh

EDITOR
Robin Chettleburgh

CONTRIBUTORS
Antoni Wisniowski, MPAC
John Psihos, Axilogic Inc.
Dr. Robert Schaffer, Schaffer Consulting

CONTACT
Axilogic Assessment Corporation
100 Via Renzo Drive, Suite 304
Richmond Hill, Ontario, CANADA, L4S0B8
info@axilogic.com

A Word From The Author

On behalf of Axilogic Inc. and Axilogic Assessment Corporation, I am pleased to welcome you to the first in what will become several informative whitepapers on the international property assessment and valuation industry and its intersection with emerging advanced technologies including cloud computing, artificial intelligence, advanced analytics and more.

Axilogic Assessment Corporation is a wholly owned subsidiary of Axilogic Inc., an international technology acquisition, licensing and merchant banking holding company established to represent transformative technologies in international markets and emerging countries. Axilogic Assessment Corporation was established in 2017 as a result of the execution of an international commercialization agreement with the Municipal Property Assessment Corporation (MPAC), the world's leading and most sophisticated property assessment jurisdiction. Together, Axilogic and MPAC offer a comprehensive array of property classification, assessment, valuation, taxation and supporting solutions to jurisdictions around the world, including the patented and highly transformative Valuation as a Service (VaaS) offering.

Under the terms of this agreement, Axilogic Assessment Corporation will be responsible for global business development, client engagement, solution design and delivery and supplemental technology creation, with MPAC supplying its VaaS engine, valuation modelling expertise and world-class technical know-how in property assessment.

As Axilogic and MPAC continue to engage with diverse international assessment jurisdictions including in developed and developing nations around the world, we know that we will uncover unique needs and circumstances that will demand innovative technical, policy, business process and human capital developement solutions. As we accelerate the state-of-the-art in property assessment with our solutions, we will be sure to share our insights, research findings and stories from the field, as these may add value in your jurisdiction. Axilogic and MPAC thank you for your interest in our work and look forward to establishing a dialogue soon. Please be sure to check us out at www.axilogic. com, as well as MPAC at www.mpac.ca.

Michael C. Chettleburgh
President, Axilogic Inc.
www.axilogic.com

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Harnessing the Power of an Audacious Goal

How Roll by 2015 transformed both North America's largest property assessment jurisdiction and international valuation practice.

PRIOR TO 1997 IN ONTARIO, CANADA, THE PROVINCIAL MINISTRY OF FINANCE HAD RESPONSIBILITY FOR PROPERTY ASSESSMENT AND GAVE MUNICIPALITIES DISCRETION TO CLASSIFY, VALUE AND TAX PROPERTIES. THE DECENTRALIZED NATURE OF PROPERTY ASSESS-MENT – COMMON TODAY IN MANY JURISDICTIONS AROUND THE WORLD WHERE CITIES, MUNICIPALITIES OR DISTRICT COUNCILS MANAGE THEIR OWN VALUATION – WAS FOUND TO PRODUCE SIG-NIFICANT INEFFICIENCIES AND INEQUITIES IN VALUATION ACROSS ONTARIO.

Arising from these challenges, in 1997, the Municipal Property Assessment Corporation or MPAC (formerly the Ontario Property Assessment Corporation) came into existence with the MPAC Act, with the Government of Ontario on December 31, 1998 formally transferring responsibility for property assessment from the Ministry of Finance to MPAC, while maintaining city/municipality discretion to set tax rates and collect property taxes. By consolidating the property assessment function under the aegis of MPAC, the province sought to enhance taxpayer satisfaction and trust in property assessment, achieve operational cost economies, enhance the quality, equity and transparency of property valuation, add assessment growth to municipal rolls, and create the world's most progressive property assessment jurisdiction.

From 1999 onwards, MPAC made exceptional progress on these key objectives such that by their 2012 assessment update, MPAC had emerged as North America's largest assessment jurisdiction with annual revenue of $200 million, assessing and classifying approximately five million properties with an estimated total value of $2.2 trillion.

Despite the growth and success of MPAC, the organization was asked to do more with less and contribute to Ontario's effort to reform public services. The Commission on the Reform of Ontario's Public Services, better known as the "Drummond Commission," was struck in 2011 to examine the ways government delivers services to people, focusing on eliminating or redesigning programs that no longer serve their intended purposes, eliminating areas of duplication and providing greater return for taxpayer dollars. Guided by the recommendations found in the Drummond Commission report as well as others (e.g., Ontario Ombudsman's Report, Auditor General's Report), in 2013 MPAC launched their four-year 2013-2016 Strategic Plan, which encompassed eight key outcomes

A key component of the MPAC 2013-2016 strategic plan was the bold idea of preparing values on all of Ontario's 5 million-plus properties by December 2015, fully one year prior to their statutory assessment update due date in December 2016. In contrast to previous assessments where property values and assessment rolls were published in a "just-in-time" fashion at their due date every four years, MPAC leadership believed it could achieve substantial quality improvement, stakeholder satisfaction and workload normalization gains if it could generate values one year early. Branded internally as the Roll by 2015 project, MPAC's goal was to utilize that 12-month period to perform expanded quality assurance measures and take the time necessary to properly socialize taxpayers, municipalities and other stakeholders to both the new values established by MPAC, and as important, how they were derived. To the extent that MPAC could produce the best, most quality assured and transparent roll possible, time consuming and expensive appeals and requests for reconsideration would be reduced and MPAC would operate more efficiently after the roll was published in 2016.
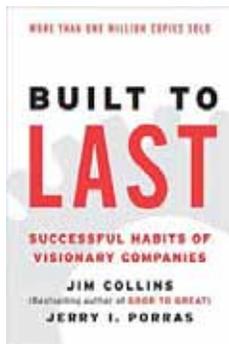
Borrowing author Jim Collins' parlance in his bestselling management book Built to Last: Successful Habits of Visionary Companies, Roll by 2015 was by all accounts a "Big, hairy, audacious goal" (BHAG), especially for North America's largest assessment jurisdiction and their 1,700 person strong public sector organization:

A true BHAG is clear and compelling, serves as a unifying focal point of effort, and acts as a clear catalyst for team spirit. It has a clear finish line, so the organization can know when it has achieved the goal; people like to shoot for finish lines.

By their very nature, audacious goals require transformative thinking, not simply incremental change to existing operational processes. To achieve the promise of Roll by 2015 and deliver the hypothesized benefits to stakeholders, MPAC knew that that very nature of the valuation process had to be significantly transformed, and not simply tweaked.

The need for material alteration in the valuation process was illustrated when MPAC considered findings from the post-mortem of their 2012 valuation update. An important finding from this review was that a significant proportion of valuations were "direct market entered", that is, values were derived outside of a centralized system or overwritten following adjustment by valuation and assessment staff after application of mass appraisal models. To meet Roll by 2015 quality enhancement objectives, including improved ability on the part of staff to explain and defend a valuation after a mass appraisal, MPAC knew that it had to improve the traceability of values, achieve more consistency in how the values were produced and create better tools to localize values in a structured fashion.

But improving valuation traceability was no simple matter in an assessment jurisdiction as large and complicated as Ontario, Canada. In 2012 at MPAC, there was no single, centralized system responsible for assessing all properties. MPAC employed one system for valuing residential and farm properties. Another system was responsible for costing industrial properties and yet another for income properties. Selected special purpose properties were valued within Excel spreadsheets, and others using dated Lotus 1-2-3 spreadsheets, Clipper applications and Access databases. As problematic, across all these systems, land parcels were being valued differently, leading to poor consistency in valuation practice. These various and sundry systems produced a value, which was then lodged into MPAC's custom Integrated Property System (IPS), which then produced a roll and property assessment notices. Once lodged in IPS, however, MPAC did not have the data lineage underlying the valuation and therefore there was low valuation traceability.

This scenario, as described, is not uncommon in larger assessment jurisdictions. Seldom does one commercial software system perform optimally across all valuation methods including cost, income and direct comparison approaches, nor across the diverse spectrum of properties encountered in a larger jurisdiction. For some methods, a multitude of technical approaches are needed to produce a value. MPAC's valuation models circa 2012, for instance, consisted of complicated C++ programs, macros in spreadsheets, and SPSS syntax converted into Oracle procedural language, resulting in no single way to represent the valuation or achieve the goal of ensuring consistency in nomenclature when describing the valuation.

To achieve the promise of Roll by 2015, MPAC needed to establish several development principles to guide the way it would transform valuation. The first was the tried and true enterprise data warehousing concept of One Version of the Truth (OVOT). As applied to the property valuation domain, OVOT means that within a system there is one version of the truth for state and condition data just as there is one version of the truth for valuation data. If an MPAC valuation professional wanted to identify, on a specific date, the state and condition of a property, its precise valuation and the manner and methods in which that value was derived (its traceability), it was proposed that there should be no difficulty or delay in finding it. Since achieving OVOT was essentially impossible in the MPAC environment of multiple legacy systems, MPAC concluded that a single valuation solution was required.

Since no commercial Computer Aided Mass Appraisal (CAMA) or dedicated valuation systems of sufficient power or affordability to handle MPAC's requirements were available, MPAC chose to add a second development principle to the Roll by 2015 program: the new solution must use open source and cloud computing technologies to perform the entirety of their valuations. To test this proposition, MPAC conducted a bake-off of cloud-based statistical analysis technologies, pitting SAS Analytics against SPSS and a relative newcomer in the statistical analytics space, Revolution Analytics' R product, an open source programming language and software environment for statistical computing. While SAS and SPSS performed suitably in the cloud, the cost of their adoption was deemed too high and inconsistent with a supplemental objective to drive down the cost of IT licenses throughout the enterprise.

R performed exceptionally well, so MPAC elected to create a pilot program where they would load the residential data from one mid-sized jurisdiction (Belleville, Ontario), create new residential models in the cloud in an R aware environment, and test the resulting values. The pilot demonstrated

the power, efficiency and accuracy of R, so additional models (land models, fair market rent models and the C++ cost model) were converted to R scripts and tested accordingly. Each successive test demonstrated that each model could indeed be converted to R syntax, providing sufficient proof to the MPAC IT and valuation teams that all property valuation models could be loaded into an R aware cloud platform. These tests were the foundation of what has since grown to become the patented and exceptionally innovative Valuation as a Service (VaaS) platform, which will be examined further here.

Building the VaaS Ecosystem

The robust needs of MPAC required more than a valuation engine. To advance the proposition of a fully transformed valuation process, the embryonic VaaS required a database and other data management componentry, so MPAC embarked upon building a highly tuned and cloud based data warehouse housed by Amazon Data Services. MPAC developed a data repository known as Hindsight to store data required for the valuation process, but its development of the Valuation Tree, later included in their international patent, is another exemplary example of valuation innovation and transformation.

Valuation Tree embodies the idea that each property passes through a valuation "pipeline". Each property has a geographical context in which it must be seated (e.g., province or state, markets, economic market models, neighbourhoods, etc.), so too does a valuation model. Valuation Tree manages the way models interact with a property, ensuring that each property knows it's path to its model. While some properties have association to only one model, others may have association to multiple models and modelling approaches. In cases where multiple models have some association to a property, Valuation Tree can establish prioritization amongst the competing models to produce the best, most equitable valuation. Under this process, modellers have the flexibility to produce a value using direct comparison, income and cost approaches, then select the optimum model for that property, all the while having their analytical "working papers" recorded in the system to ensure the valuation lineage is maintained.

With this early stage selection of cloud based valuation technologies assembled, by the end of the first year of the Roll by 2015 project (end of 2013) there was an increasing awareness within MPAC that a sophisticated valuation service was emerging that could, if properly productized, serve both MPAC's needs and those of other jurisdictions wishing to modernize the way they did valuations. Another

important realization, however, was that an assessment jurisdiction the size of MPAC could not decommission all other legacy CAMA components (e.g., data entry, inventory management and workflow management applications) in exchange for newly created, open source applications hosted in the VaaS ecosystem before their 2016 assessment update. While at face value this realization may have appeared as a project challenge, as it turned out it became an important differentiating feature of VaaS. By decoupling the valuation component from other CAMA components, MPAC could leverage their existing CAMA investments, yet incorporate a high-powered valuation engine which arguably is the most essential responsibility of the organization. This decoupling of valuation from CAMA components does not exist in the marketplace and challenges the monolithic orientation of CAMA vendors who seek to tie valuation agencies to one closed system. With VaaS, assessment jurisdictions can maintain their CAMA platforms, yet swap out their closed valuation tools for the high performance VaaS engine.

In order to achieve the Roll by 2015 objective, MPAC continued to push the functionality of VaaS by incorporating sophisticated decomposition tools. For most complex properties, each will have multiple components which must be valued differently and separately. VaaS was engineered to value components separately, and then reassemble the components to arrive at an aggregate value for a property, rather than try to assemble values within a model. These development efforts led to the further realization that the more one could extract the various valuation pieces at the atomic level, one could then reassemble and refactor them for other valuation purposes and contexts, further strengthening the commercialization potential of VaaS.

Reducing Reliance on IT Department

The third development principle was that processes and technologies had to be investigated, developed and implemented to self-enable the valuation department and reduce their reliance on MPAC's information technology (IT) department. Prior to the creation of VaaS, several data management processes essential to the valuation function were performed by IT staff under the direction of the valuation department. For instance, when using the direct comparison approach to value residential properties, valuation staff would request a sales data extract from the IT department, with turnaround times of 3 to 5 days not being uncommon due to the performance and scalability limitations of the legacy CAMA system and the work-load of the IT department. Similarly, valuation staff had to previously rely on the IT department to take their SPSS routines and have their programmers convert them into procedural

language, a process that also introduced time lags in their valuation work flow.

Data manipulation tools were developed inside VaaS to allow R competent modellers to handle all their own data transformation, free of IT department involvement. The interpreted, object-oriented, high-level programming language Python was introduced within the VaaS environment to allow valuation staff to assemble individual data elements into attributes that models would understand, thereby reducing reliance on IT programming expertise. Valuation sand boxes were created with data extraction tools to allow modellers to access the data they needed immediately, without IT intervention. By promoting self-sufficiency and empowering the modelling department to handle their own data management requirements, the performance and creativity of the valuation department increased substantially. With data at the ready and tools in place to rapidly crystallize their work, the modelling department could create, iteratively test and implement new methods of valuation, raising quality accordingly. For instance, in 2013 MPAC introduced a new costing system for farm structures and acquired a license to use the third-party Douglas Agricultural Cost Guide. With these new-found data extraction, manipulation and scripting tools at their disposal, MPAC modellers could test new cost models and valuation results using the Douglas Agricultural Cost Guide and valuation results more iteratively and rapidly.

Again, the power of the audacious Roll by 2015 goal was evident, as it provided an easy to understand and compelling aspirational goal by which to frame development priorities. New technical innovations within the VaaS ambit had to be fully aligned with goal achievement, ensuring scarce developmental work was not misdirected. Legacy systems could float within the MPAC technical environment but no additional investment was made with them other than that required to allow them to liaise with and support the VaaS ecosystem (e.g., development of triggering systems that enabled the flow of data into VaaS).

In 2014, development work continued apace within the VaaS ecosystem to further empower the valuation unit to meet the 2015 goal. Additional streams of work were initiated to expose an increasing set of tools to the modelling department, including the MPAC visualization portal and a new reporting toolbox called ReportR, that allowed the modelling department to execute their own reports including ratio studies, extreme value reports, equity studies and more. New tuning systems were established in support of both MPAC's mass appraisal mode (HyperR) as well as their single execute thread mode. An extensive amount of tuning work was directed to memory management to speed processing, in addition to compression techniques to speed data transfer from the data warehouse into the

VaaS is a high performance, internationally patented cloud-based valuation engine that supports all approaches to value. Co-exists with any 3rd party CAMA system or can function independently to drive massive productivity and cost savings.
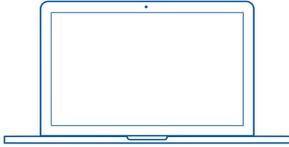
50 to 50M+
Properties VaaS can process

3 to 5x
Increase in modeller productivity

10,000%
Increase in computing efficiency for models in VaaS

$
$1,700,000
Annual savings, hardware and software licensing costs

VaaS modeling engine, especially important when valuing complex properties that sometimes have thousands of structures on them.

Throughout these concurrent development processes, the notion of valuation portfolios surfaced, which led to additional transformation and evidence of the commercial viability of VaaS outside Ontario. While MPAC is responsible for valuing all properties in Ontario, it essentially deals with multiple jurisdictions (and multiple property types). In fact, 444 individual municipalities in the province. Within these diverse jurisdictions, however, there are common properties which can be aggregated into a portfolio, upon which additional analysis within VaaS can be conducted to assess the quality and consistency of valuations.

For instance, the international home improvement big box chain Home Depot has a large presence in Ontario with a total of 88 stores currently in operation in Ontario within their 182-store national roster. Since MPAC has data on all 88 stores in their portfolio, with VaaS MPAC can provide an analytical quality assurance solution to Home Depot to demonstrate that valuations are well localized and equitable which, in turn, may help reduce appeals that are commonplace for large income producing properties. On a broader scale, this means that VaaS can be used as a quality assurance solution for those agencies that receive valuation data from across a variety of municipalities, such as in the case in many commonwealth countries where a national Valuer General is required to certify the assessment roll using data supplied by individual municipalities, including those that outsource valuation to private sector service providers.

Significant Investment Renders Significant Results

MPAC's development of VaaS continued in 2014 and 2015 and indeed, continues to the present day as it refines the VaaS ecosystem to support both their international commercialization agreement with Axilogic as well as the ever-evolving needs within Ontario. It is instructive to set aside a discussion of technical transformation, however, and focus on outcomes generated due to the pursuit of the Roll by 2015 program.

By creating a cloud-based environment for VaaS and all existing legacy solutions, MPAC could dispense with its managed services agreement with HP Canada, resulting in an annual cost saving of $700,000. Now running S3 with Amazon Redshift, R Analytics and Python, MPAC was further able to reduce annual Oracle licensing costs by approximately $1,000,000. IT cost savings for any assessment jurisdiction are important so that the overall cost to municipalities for the provision of the valuation service and assessment roll is likewise reduced, but human capital efficiency gains and resulting quality improvements are equally valued and important. At the micro level, VaaS and its ability to rapidly deliver data along with superior data transformation and analytical tools to modellers allowed for approximately 3 to 5 times the volume of model iterations and tests in the same period as before when one model was created and tested.

On a macro level, MPAC achieved its Roll by 2015 objective, giving modellers a year to scrutinize, test, adjust and quality assure the valuations from across the province and across all property classes. More than 2.9 million data checks were completed to ensure quality and accuracy of assessment data. With the underlying data, analytical lineage and evidence set memorialized within VaaS, MPAC was then able to provide advance disclosure to taxpayers across all taxpayer

Rapid Results Approach

Before embarking upon the Roll by 2015 program, MPAC considered the use of various project management approaches to ensure the best chance of success. Among the several considered, MPAC decided to test the Rapid Results Approach, created by the organizational development expert Dr. Robert Schaffer. The Rapid Results Approach (RRA) is a set of management tools, processes, and skills that help leaders in organizations use a series of short-term projects to translate long term goals into concrete actions, results and impact. The engine of the Approach is the Rapid Results Initiative (RRI) – a 100-day project designed to unleash the capacity and creativity of teams in pursuit of a strategically critical goal that delivers a real impact, and that ties directly to the long-term plans and objectives of the organization. Each of these RRIs becomes a vehicle for achievement, learning, and the advancement of long term goals. Over the entire course of the Roll by 2015 program, MPAC created and implemented 17 different 100-day Rapid Results Initiatives, many of them running concurrently in the 2013 to 2015 period as the aggregate Roll by 2015 program was decomposed into smaller parts. While the scope of the Roll by 2015 objective was exceptionally motivating to MPAC staff, the use of the Rapid Results framework built confidence, team cohesion, and a sense of urgency required to effect transformative change.

classes of the derivation of the value (models, analytics and methodologies employed), ensuring for the first time a fully transparent process of disclosure.

Requests for reconsideration and formal appeals filed with Ontario's Assessment Review Board (ARB) are key indicators of assessment quality and property owners' acceptance of their assessment. The quality assurance impacts associated with Roll by 2015 were substantial, with the volume of requests for reconsideration and appeals experiencing material reductions between 2013 and 2016. In 2016 for residential and farm properties, requests for reconsideration (first stage objections) dropped by 33%, from a 2013 high of 98,000 to just over 66,000; for non-residential properties in the same period, formal appeals dropped also 33% from 33,000 to 22,000; for multi-residential properties, the number of appeals expected were 9,000 but only 2,000 were filed. Across all classes of properties, requests for reconsideration and ARB appeals from 2013 to 2016 dropped from 147,548 (2.99% of all properties in Ontario) to 86,963 (1.70% of all properties), a reduction of some 41% overall. The economic impact of reduced appeals arising from the 2016 assessment will be quantified as appeals are addressed beginning in 2016 and throughout the period leading up to the next assessment update in 2020. The potential economic impact is significant as MPAC estimates that current staff, legal and other costs to support the appeals process range between $20,000,000 and $30,000,000 annually. And since an entire suite of evidence underlying the determination of the valuation resides within VaaS, MPAC can rapidly fulfill its statutory disclosure requirements, therefore compressing the request for reconsideration and appeal timeframe.

Assessment roll quality in relation to the International Association of Assessing Officers (IAAO) standard was also measured by MPAC's independent Quality Service Commissioner. Two internationally-recognized criteria used to measure assessment roll quality and accuracy include Assessment-to-Sale Ratio or ASR, which measures the relationship between the assessed value and selling price of a property that sold during the base year and Coefficient of Dispersion or COD, which represents how tightly ASRs are clustered around their median. MPAC's performance in 2016 met IAAO standards using both criteria across all property portfolios (residential, farm, multi-residential, commercial and industrial). In the case of MPAC's over 4.65 million residential properties MPAC was able to achieve a median ASR of 99% (acceptable range is between 90% and 110%) and COD +/- 7.9% (acceptable range is between 5% and 10%).

The benefits of early availability, testing and disclosure of mass valuation data cannot be overstated. An interesting case in point on how MPAC leveraged Roll by 2015 to enhance quality, improve transparency, reduce appeals and proactively engage an important stakeholder group is seen with their investigative work on multi-residential property valuations. With VaaS and the newfound power to test and iterate different approaches to valuation, MPAC investigated the impact of switching from a Gross Income Multiplier (GIM) approach which had been MPAC's historic approach to date, to a Capitalization of Net Operating Income (NOI) approach for multi-residential properties that was supported by both MPAC and industry, specifically the Federation of Rental Housing Providers of Ontario (FRPO). By running one method against the other, the MPAC valuation team could produce differential statistics showing the consistency in values, which were shared with FRPO and government and which led to the adoption of NOI for this class of property. Because of this effort, appeals dropped considerably and MPAC transformed the nature of their relationship with FRPO from a sometimes adversarial one to a cooperative one, guided by the principles of complete and early disclosure of values and their derivation. FRPO has com-

mented publicly that the "process was incredibly transparent". The lift on brand equity is difficult to quantify, but present indications are that MPAC has energized its brand towards that of a responsive and customer service oriented professional valuation service.
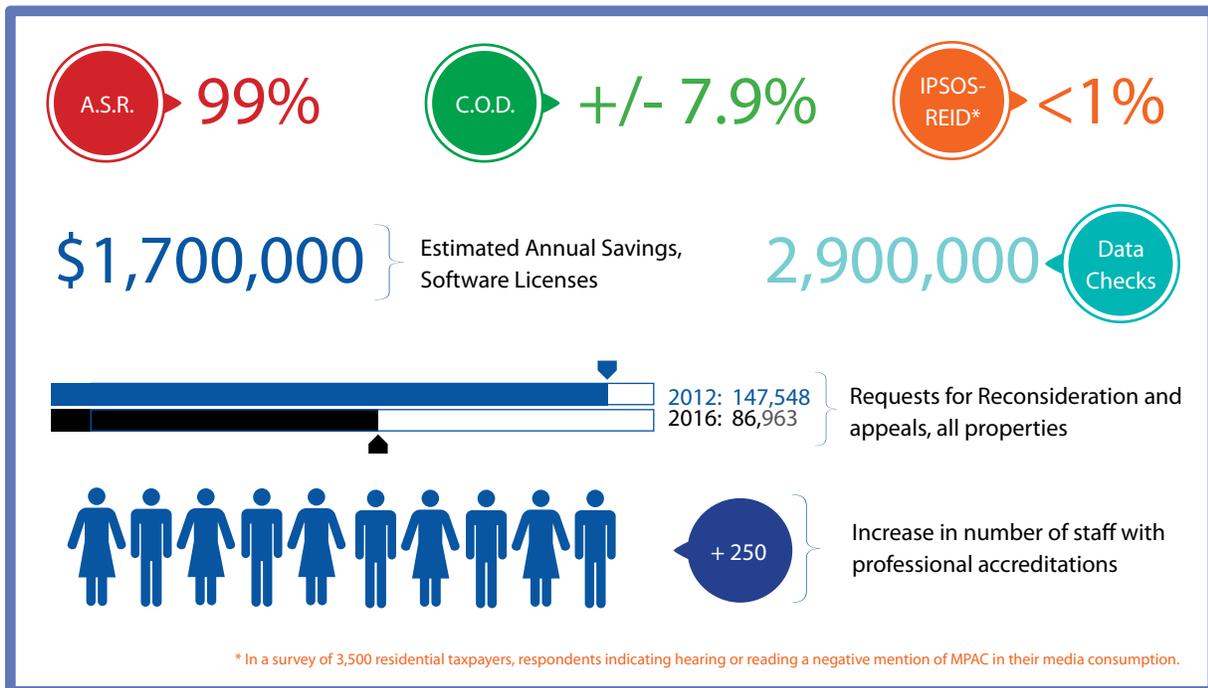
Service excellence outcomes are demonstrated in the very nature in which MPAC could distribute notices of assessment. Whereas in previous assessment updates MPAC released 5 million-plus notices of assessment en masse, for the 2016 assessment update they staged the release of notices over a period of several months beginning in April 2016. Coupled with this was the preparation and release of comparative data and visualization tools for taxpayers, available via the aboutmyproperty.ca website, which allowed taxpayers to review their valuation and compare their property to those proximal to them.

Whereas in previous assessment years MPAC had to employ more than 60 part-time temporary staff to manage the volume of calls commensurate with a one-time 5-million plus sized mailing, the staging of release of notices of assessment remarkably flattened MPAC's resource curve and allowed full-time, experienced staff members to handle customer calls and describe how a customer's property value was determined, which in turn, contributed to the significant decline in requests for reconsideration.

In keeping with the renewed thrust of exemplary disclosure, concurrent with the release of notices of assessment, MPAC produced first-of-a-kind fact-filled market trend reports for residential, farm, business and other property

types for all municipalities in the province. Using descriptive statistics, maps and expert analysis, these reports provided context for changing values in Ontario and the objective evidence necessary to demonstrate the quality of MPAC's valuation work. By sharing these knowledge discovery products with taxpayers, municipalities and the media, MPAC was successful in moderating the narrative surrounding property valuation and taxation. This resulted in a reduction of negative media mentions about MPAC, an improved quality of communication with the 400+ municipalities MPAC serves and a general enhanced perception of MPAC as a relevant and essential public service.

There have been several impacts on human resources at MPAC that are worthy of note. From the standpoint of local assessors - all 1,200 of them distributed across Ontario's 908,000 square kilometres - there is substantially greater confidence on their part to describe, defend and substantiate values with taxpayers. The transformative nature of the Roll by 2015 project has inculcated itself across the entire enterprise, with staff recognizing that VaaS is an exceptional contribution to advancing the state of the art in property valuation worldwide. MPAC's success in their application for patent protection of the VaaS process has further raised staff pride and confidence in the direction of the company. These factors, combined with MPAC's drive to transform themselves from a "backroom" government valuation office to a globally-oriented professional valuation enterprise – stimulated as it was by the Roll by 2015 program – has led to a massive increase in MPAC staff who have sought and obtained formal professional accreditation – from 50 in 2012 to over 300 in 2016.

* In a survey of 3,500 residential taxpayers, respondents indicating hearing or reading a negative mention of MPAC in their media consumption.

Beyond Roll by 2015

Domestic and international case studies and the exclusive Axilogic/MPAC commercialization agreement

AS NOTED EARLIER, MPAC'S CREATION AND DEVELOPMENT OF VAAS FROM 2013 ONWARDS, AND ON-GOING REFINEMENT AND PRO-DUCTIZATION WORK THAT CONTINUES TO THE PRESENT DAY, HAS ESTABLISHED A BASIS TO INVESTIGATE THE COMMERCIAL FEASIBILITY OF VAAS IN FOREIGN ASSESSMENT JURISDICTIONS. TO MPAC LEAD-ERSHIP, SEVERAL STRATEGIC OBJECTIVES CAN BE ACHIEVED WITH A SUCCESSFULLY COMMERCIALIZED VAAS.

A new, supplemental revenue stream has been created, which will allow MPAC to reduce the levy it charges to Ontario municipalities in respect to its assessment services. The diverse and unique valuation needs of foreign jurisdictions will allow MPAC to identify and create new technical innovations which may have application and value in Ontario. MPAC may enhance its ability to achieve a broader social purpose, which can be achieved by the introduction of MPAC technology, people and processes in developing nations.

MPAC's structure includes a Business Development team which is responsible for creating data products and services for the Canadian market, financial institutions, the insurance industry, realtors and other Canadian Fortune 500 companies. MPAC's domestic products include the Multi-Property Search, Automated Valuation Model (AVM), Insured Automated Valuation Model (iAVM) and custom reports, among others made available through its propertyline. ca brand and channel. This unit was successful in generating some $20 million in revenue in 2016 – and $10 million in profit to offset the municipal levy. Notably, included in this achievement was approximately $250,000 in revenue from the Chippewas of Kettle and Stony Point (CKSP) First Nation in Ontario, MPAC's first ever deployment of VaaS outside the context of its roster of the 444 Ontario municipalities it is required to provide valuation services to under the Municipal Property Assessment Corporation Act, 1997. The CKSP adoption of VaaS is the subject of our first case study below.

Case Study: Chippewas of Kettle and Stony Point First Nation

With MPAC's assessment services support, the Chippewas of Kettle and Stony Point (CKSP) has become the first among indigenous nations in Ontario to implement a property assessment and taxation system under the First Nations Tax Commission. Located in southern Ontario along the shores of Lake Huron, 35km from Sarnia, Ontario and near the Michigan border, the community has 1,900 members, including 1,000 who live on reserve.

In 2016, MPAC partnered with CKSP and the First Nations Tax Commission to build and implement a property taxation system from the ground up. The project's vision was clear: create a funding model designed to support and

This important work, along with the FNTC's on-going support, will generate the increased local revenues and services necessary to support the current and future planned development on Kettle and Stony Point lands.

Chief Tom Bressette, Kettle and Stony Point First Nation

sustain community services and promote economic growth. MPAC's role was to design and implement a property assessment model that would become part of a larger property taxation system developed by the CKSP and the First Nations Tax Commission. The CKSP property tax system serves as a model of best practices for other First Nations in Ontario. Through collaboration and partnership, MPAC supported CKSP and the First Nations Tax Commission (FNTC) to:

• Develop assessment and taxation laws.

• Inspect and value over 400 leased residential properties.

• Powered by VaaS, implement a First Nations IT application to store, maintain and value First Nation properties.

• Return a first-ever assessment roll to an Ontario First Nation.

• Establish a Request for Reconsideration and appeal process.

• Host a joint community open house where representatives met with CKSP property owners and leaseholders to discuss their new assessments and taxation system.

» Kettle Point, Ontario

MPAC executed a contract for services with CKSP on April 22, 2016 and returned a roll less than 8 weeks later on June 15. On an assessed residential base of $64,500,000, $929,000 in new revenue was generated to fund essential community services (representing approximately 11% of its total expected federal and provincial government transfers budgeted at $8.3 million in 2016). Over the course of the initial five-year agreement, CKSP will generate net revenues (total revenue less MPAC expenses) of approximately $4 million.

The Axilogic/MPAC Commercialization Agreement

Notwithstanding the performance of the MPAC Business Development unit in 2016, it is not equipped or structured in a way to exhaustively investigate, pursue and negotiate complex services deals with diverse foreign jurisdictions, while at the same time continue to exploit sales opportunities in Canada related to data products and services.

Arising from this, MPAC established an exclusive international commercialization agreement with Axilogic Inc. in March 2017. Under the terms of the Agreement, Axilogic is responsible for global prospecting and business development, client engagement and solution design and delivery, with MPAC supplying its VaaS engine, valuation modelling expertise and world-class technical know-how in property assessment.

As international commercialization partners, MPAC and Axilogic believe that their business proposition will be attractive in mature property valuation jurisdictions that may have similar objectives as MPAC. For those that have already made significant investments in Computer Aided Mass Appraisal (CAMA) systems, VaaS is an ideal solution as it is designed to be CAMA-agnostic. Should an advanced assessment jurisdiction choose, as MPAC did, it can maintain its investment in various legacy software (including packaged CAMA applications) that store property inventory, maintain state and condition data, assist with workflow management and produce tax statements for instance. At the same time, it can swap out their CAMA solution's closed valuation platform for the sophisticated and high performance VaaS engine. Unlike current commercial solutions where data must be brought to the models, VaaS brings the models to the data, ensuring empowered valuation modellers and dramatic cost savings.

Roll by 2015 demonstrated that technology generally, and VaaS specifically, can transform even a large and sophisticated assessment agency and produce substantial benefits for multiple stakeholders. To the extent that opportunities exist in mature assessment markets to promote and support VaaS, Axilogic and MPAC will demonstrate that similar outcomes are achievable. But the commercialization agreement is more than about the pursuit of deals and revenue streams in highly developed assessment jurisdictions. Just as Roll by 2015 was grounded on a bold mission statement, implicit in the Axilogic/MPAC commercialization agreement is a similarly bold objective. That is, we wish to burden VaaS, complimentary technologies and progressive property taxation methods crafted at MPAC, with the responsibility of delivering substantial social, economic

and human development impacts in developing nations, including the world's poorest countries. The notion of **Technology for Good** is relevant to this objective, as is the idea of democratizing best-in-breed property valuation technologies, expertise and processes, to close the resource capability and revenue creation gap between the "haves" and the "have nots".

Indeed, the role and importance of modern property registry, valuation and taxation systems in developing nations has been materially elevated in the past two years with the promulgation of the 2030 Agenda for Sustainable Development. The United Nations Heads of State met at the U.N. Headquarters in New York from September 25 to 27, 2015 and adopted a historic decision on a comprehensive, far-reaching and people-centred set of universal and transformative goals and targets for developing nations:

We resolve, between now and 2030, to end poverty and hunger everywhere; to combat inequalities within and among countries; to build peaceful, just and inclusive societies; to protect human rights and promote gender equality and the empowerment of women and girls; and to ensure the lasting protection of the planet and its natural resources. We resolve also to create conditions for sustainable, inclusive and sustained economic growth, shared prosperity and decent work for all, taking into account different levels of national development and capacities.

A total of 17 Sustainable Development Goals and 169 specific targets were established across the three dimensions of sustainable development: economic, social and environmental. When set within the context of the historical role and importance of property taxation to fund essential municipal services such as schools, police, public works, libraries and more, there is a direct connection between several of the 17 Sustainable Development Goals and progressive property taxation practices:

Goal #4:   Quality Education

Goal #6:   Clean Water and Sanitation

Goal #9:   Industry, Innovation and Infrastructure

Goal #11: Sustainable Cities and Communities

Goal #16: Peace, Justice and Strong Institutions

While exceptionally resource-rich and with the world's fastest economic growth rate, Africa is the world's poorest inhabited continent and is indeed a development priority for the UN. Although property taxation is widely known to be among the best forms of taxation for ensuring equity, economic growth, and providing stable funding for local governments, it has remained highly underused

in many parts of the world, including Africa. The African continent therefore represents an ideal proving ground for the Axilogic/MPAC commercialization agreement given the highly variable range and quality of policy, processes and technologies employed in property assessment across the continent. Indeed, several non-governmental and non-profit organizations have emerged to promote modernization in property taxation (including the adoption of modern information technologies) to achieve the UN's Sustainable Development Goals, including the World Bank, the African Tax Institute, the International Centre for Tax and Development and its recently established African Property Tax Initiative (funded by the Bill and Melinda Gates Foundation).

Current international discourse on sustainable development strongly suggests that the Axilogic/MPAC proposition will be attractive in developing nations who heretofore have not recognized or realized the benefits of progressive property valuation and taxation. Since VaaS is not an entire CAMA solution, in developing nations where needs cannot be met solely with VaaS (e.g., a country may have limited or antiquated property valuation and taxation tools or are using manual processes), Axilogic will be responsible for creating or acquiring new supporting technologies to ensure a complete solution. For instance, the development of smartphone-based data collection, workflow management and property tax e-payment solutions are contemplated to meet the needs of developing foreign jurisdictions where cellphone adoption is exceptionally significant due to the absence of traditional communication infrastructure. The Axilogic/MPAC collaboration, encompassing VaaS and new componentry, is currently being implemented in the Sub-Saharan country of Sierra Leone, the subject of our second case study below.

Case Study: Bo/Makeni, Sierra Leone

In April 2017, MPAC and Axilogic were introduced to an ex-patriate Canadian and property tax expert, Mr. Paul Fish, who has been working in the west African country of Sierra Leone since 2006 to implement property valuation and tax systems in larger cities including Bo (pop. 243,000) and Makeni (pop. 115,000). Over the past decade, working in collaboration with Bo and Makeni district governments, Mr. Fish completed a range of foundational work including reviewing and developing policy, conducting community education and awareness sessions, discovering assessable properties, GIS fieldwork and address/street identification.

A market value assessment approach was deemed infeasible in Sierra Leone due to the absence of an active or transparent property sales market as well as limited profes-

sional valuation capacity. Despite criticisms of area-based approaches, Sierra Leone adopted a hybrid method where an area approach is used to establish base values that are then adjusted using a points-based system across 30 different property attributes (such as road surface, presence of electrical connection, sanitation facilities, roof type, for example). A rudimentary Microsoft Access database was created to host data and generate statements, with work also done to permit taxpayers to pay their tax bill at a community bank or directly to a registered Financial Services Agent who collects door-to-door (expressed in Canadian dollars, the average property tax bill is approximately $35).

While the current system and processes has resulted in a property tax regime that is producing local revenue, there are several challenges present that imperil its long-term effectiveness and ability to function as a consistent and optimized solution across the entire country, including its capital city, Freetown (pop. 1,050,000). The current CAMA solution is dated, expensive to maintain, lacks important functionality and is hard to access because of lack of computer equipment and software licenses. The current system lacks workflow management, has no system of assigning privileges to different users, has no tools to track the lineage of a valuation and features little in the way of management reporting and data visualization. The current CAMA provider has no plans to improve the system, including providing the country with mobile data collection tools, e-payment functionality (to allow taxpayers to pay their bill using their cellular phone rather than to a tax collector), fraud detection solutions (to reduce so-called "rent-seeking" behaviour along the entire property tax collection chain), or incorporate more sophisticated modelling approaches that are appropriate for non-residential properties including businesses, factories or multi-residential units. As they exist today, Sierra Leone's current system is not scalable or suitable for adoption across the entire country of 7.1 million people.

Beginning in July 2017, Axilogic and MPAC commenced a Proof of Concept (POC) in collaboration with Bo and Makeni District Councils, considered to be one of several that will be undertaken to transform the Sierra Leone property taxation system over the next 18 months. Using a 100-day Rapid Results framework, the initial POC will focus on transforming the data from the existing Access CAMA solution and loading it into VaaS for valuation generation. Axilogic will build additional software, including mobile tools, for field assessors in Sierra Leone to produce statements and update property records. The initial POC will culminate in the generation of approximately 27,000 property tax statements for the two cities in advance of their December 2017 assessment update, with subsequent projects building out the remainder of the cloud-based

» Makeni, Sierra Leone

CAMA solution, integrating mobile payment tools, augmenting their cadastre through satellite and drone imagery and extending the valuation process to include all major municipalities in Sierra Leone by their December 2018 assessment update.

Throughout this project, a rigorous evaluation will be conducted to identify lessons learned and the social, economic and human development impacts of introducing a modernized property assessment regime delivered by Axilogic and MPAC. The team will engage with the international funding community, including the World Bank and large international development foundations, to identify financing mechanisms to support the expansion of the Axilogic/MPAC property valuation solution in the poorest Sub-Saharan African countries, including the use of innovative Development Impact Bonds (DIBs). Lastly, to build essential human capital capacity in Sierra Leone and other developing nations, Axilogic will be launching Valuation Without Borders, a grassroots initiative where an internarional community of experienced valuation professionals will be assembled and deployed to developing nations in special missions where they will train and mentor staff and support significant change initiatives involving property valuation and taxation.

Conclusion

In assessing the Roll by 2015 results, several key factors for success emerge, including:

The use of software engineering principles – including but not limited to phased development plans, continuous validation, disciplined product control, use of modern development practices, clear accountability for results and

continuous process improvement, among others - are essential for success in a change initiative of this scale.

Maintaining the view of the potential commercialization and productization potential of VaaS was essential to ensure that any technologies developed could be used in a diversity of jurisdictions and contexts.

Close collaboration and mutual goal support between the business and the IT department was instrumental in creating the conditions for the modelling department to be self-reliant and empowered to exploit the quality, equity and transparency potential of VaaS.

Simplicity in engineering and execution, aligned with a well-articulated and powerful "stretch" goal that was embedded in the organization's overall four-year strategic plan, demonstrated the power necessary to transform an organization.

Executive level commitment to Roll by 2015, including at Board level, ensured leadership aligned along a common transformation path.

The establishment of three key development principles was essential to program success, including: employ enterprise data warehousing principle of one version of the truth for all valuation data; the solution must use open source and cloud computing technologies to perform the entirety of valuation; and that processes and technologies had to be investigated, developed and implemented to self-enable the valuation department and therefore reduce their reliance on MPAC's information technology (IT) department.

Concentrated use of Rapid Results Approach ensured the sense of urgency required to effect transformative change.

More Information

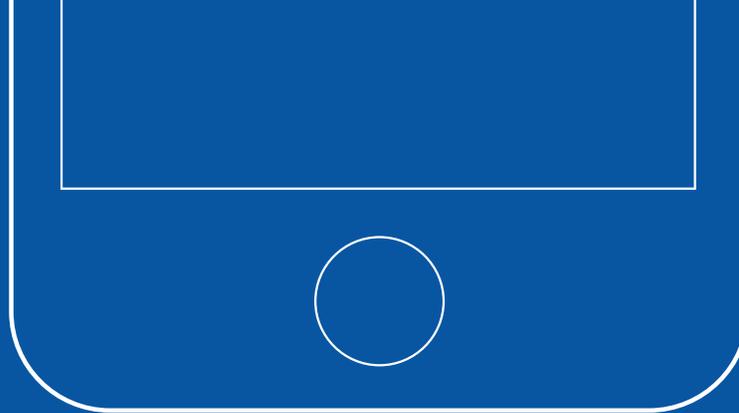To learn more about VaaS or discuss valuation transformation in your jurisdiction, please contact:

AXILOGIC ASSESSMENT CORPORATION
100 Via Renzo Drive, Suite 304, Richmond Hill, Ontario, Canada L4S0B8
www.axilogic.com
info@axilogic.com

axilogic

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www.axilogic.com