Canada Mortgage and Housing Corporation

Study of the Benefits of Mortgage Data Standards

Final Report



February 14, 2020

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Executive Summary

The objective of this study was to provide an analysis of the potential benefits for the Canadian mortgage industry from the prospective adoption of a set of industry-wide definitions and standards for mortgage data.

It was comprised of two main phases:

- A review of the Canadian mortgage industry to identify (a) the challenges due to the lack of data standards (e.g., inefficiencies) and (b) the potential benefits from the implementation of a system of mortgage data standards.
- A review of mortgage data standards that have been implemented in the United States and their impacts on mortgage industry participants.

The study found that the economic benefits of mortgage data standards in the US have been quite substantial, and that would be the case in Canada as well. Furthermore, the overall economic benefits from implementing mortgage data standards appear to be well in excess of the implementation costs.

However, the benefits and costs of data standards are not evenly distributed among mortgage industry organizations, with the large banks (in both countries) perceiving fewer benefits and greater costs for themselves than other mortgage industry organizations. As a result, many large banks in the US have found ways of conducting transactions based on data standards without carrying out major modifications to their data and data formats. They have, in effect, undertaken a gradual roll-out process for implementing data standards, which could be the basis of an implementation model for Canadian large banks.

The main research questions the study focused on and the key findings for each question were as follows. The numbers in brackets are the numbers of the relevant findings in the report.

(1) To what extent does the Canadian mortgage industry experience inefficiencies due to the lack of mortgage data standards?

- Lenders have very few data transactions they regard as inefficient for themselves due to the lack of mortgage data standards. This is especially true of the large banks. [1]
- The main category of transactions that is perceived by lenders as inefficient is the transmission of data to regulators; but most lenders believe these problems are potentially mitigatable by mortgage data standards. [2, 3]
- Brokers and regulators experience significant inefficiencies in mortgage data transactions; service providers (mortgage loan insurers, servicers, and title insurers) experience some, but fewer, inefficiencies. {6, 7, 8, 9]

(2) What are the potential benefits of implementing mortgage data standards?

- The large Canadian banks perceive that there would be far fewer potential benefits for their organizations from the implementation of data standards than the other lenders. [10]
- Even when the negative views of the large banks are combined with the more positive views of the other lenders, the perceptions of Canadian lenders overall regarding potential benefits is more negative than the experience of US lenders regarding the benefits of data standards. [10]
- The other lenders, service providers, brokers, and regulators in Canada are positive on balance, and they expect there would be cost savings from efficiencies, easier interactions between parties, and increased transparency as significant benefits. [10,11]

- In the US the estimated annual savings due to the implementation of mortgage data standards during the 2012-2018 period is approximately $25 billion USD. [12, 13, 14, 15]
- In addition to these benefits, the US mortgage industry has experienced a number of other major benefits from the implementation of mortgage data standards (identified but not quantified in this study). [16]
- The estimated annual benefits of implementing mortgage data standards in Canada are approximately $4 billion CAD per year. [25]

(3) What are the potential challenges and costs associated with the implementation of mortgage data standards?

- The large Canadian banks perceive more potential challenges for their organizations from the implementation of data standards than the other lenders, service providers, brokers, and regulators. [18, 19]
- For all groups except service providers, IT challenges were perceived as the main challenges; service providers are not particularly concerned about IT challenges. [18,19]
- The large Canadian banks expect the costs of implementing mortgage data standards to be very high; the other organizations expect the costs to be minimal, or, at most, moderate. [20]
- The analysis of IT costs for mortgage lenders in the US found that these costs vary greatly with the characteristics of the organization's pre-data standards IT systems, as follows:
  - For lenders that can produce data fairly easily and have modern technology the costs are less than $1M USD.
  - For lenders that use off-the-shelf loan origination systems the costs are less than $1M USD.
  - For lenders that use old, legacy platforms the process of modifying databases and changing interfaces would be a big effort and would cost several million USD. (Because of the variability in sizes and types of legacy lenders and their data systems, it was not possible to estimate these costs more accurately.) [21]

(4) On balance how do the potential benefits for the industry compare with the potential costs?

- It is highly likely that the economic benefits of mortgage data standards significantly exceed the implementation costs. (This finding is based on an analysis of benefits and costs using assumed but realistic cost estimates.) [23]

1.0 Introduction

1.1 Study Objectives and Scope

The overall objective of this study was to provide an analysis of the potential benefits for the Canadian mortgage industry of the prospective adoption of a set of industry-wide definitions and standards for mortgage data.

The study focused on four major research questions:

(1) To what extent does the Canadian mortgage industry experience inefficiencies due to the lack of mortgage data standards?

(2) What are the potential benefits of implementing mortgage data standards?

(3) What are the potential challenges and costs associated with the implementation of mortgage data standards?

(4) On balance, how do the potential benefits for the industry compare with the potential costs?

This report is structured on the basis of the findings regarding these four questions. Other research questions that were addressed in the study are reported under these headings.

The scope of the study was defined as follows:

(a) The study was limited to residential mortgages.

(b) The mortgage data that was dealt with included all data that is exchanged in real estate financing transactions, together with

- All data that is transferred to mortgage financing providers (e.g., data provided by mortgage servicing organizations to banks), and
- All data that is transferred from mortgage financing providers (e.g., data provided by banks to regulatory agencies).

  So, for example, the scope did not include data provided by a servicing organization to another servicing organization that purchased servicing rights, since that data does not fall within either of these categories.

1.2 Study Phases

The data collection for the study was carried out in two phases:

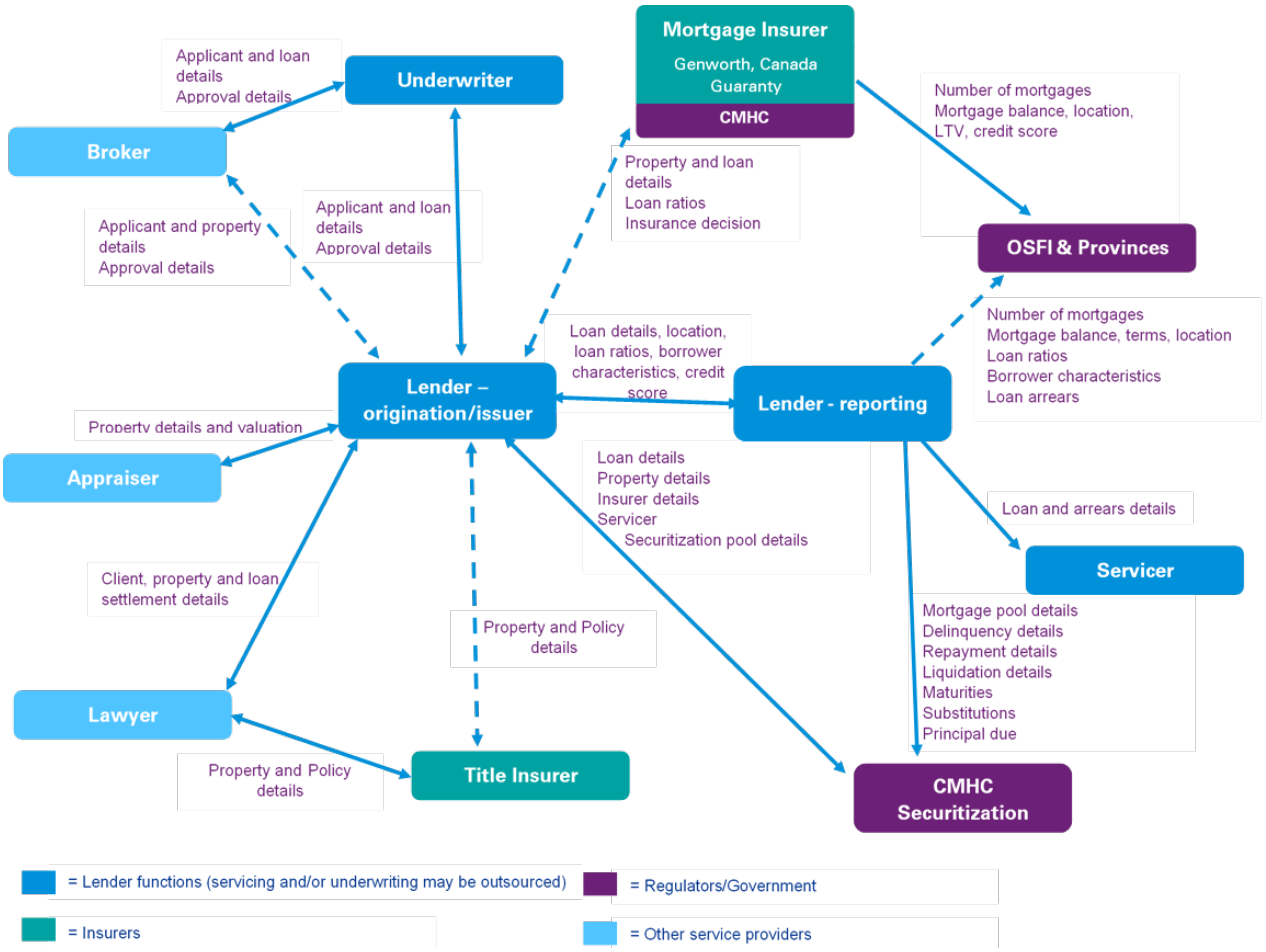
- Phase 1: A review of the Canadian mortgage industry to identify, among other things, (a) the challenges due to the lack of data standards (e.g., inefficiencies) and (b) the potential benefits of the implementation of a system of mortgage data standards.
- Phase 2: A review of mortgage industry data standards that have been implemented in the United States and their impacts on mortgage industry participants. (Other systems of standards were also reviewed at a high level, and it was found that ether (i) they are not applicable to the mortgage industry, or (ii) there is little useful information available regarding these systems.)

2.0 Inefficiencies in Canadian Mortgage Industry Processes

2.1 Methodology for Identifying Inefficiencies

2.1.1 Development of Transaction Tables

As noted in section 1.1, this study deals with data that is involved in mortgage financing transactions plus any other data transactions either from or to lenders. This set of transactions is illustrated below. The arrows that are dashed represent data transactions that were most frequently noted as inefficient by Canadian organizations in one or both directions.



The first step in the data collection was to develop tables that list mortgage data transactions between different entities in the Canadian mortgage industry which our mortgage industry experts believed could be potentially problematic – for either the transmitter of the data or the receiver of the data or both. Data transmissions were identified as potentially problematic in cases where there may be difficulties understanding the data. Note that these difficulties could occur because of ambiguous data definitions, but also in some cases because the data is received or requested in different formats. These transaction tables were necessary for developing the detailed interview questions.

Each table is structured on the basis of a pair of mortgage industry entities, the transmitter of the data and the receiver of the data. For example, the table below deals with mortgage data that is transmitted from lenders to mortgage loan insurers. In general, data problems potentially experienced by the data transmitters (e.g., lenders in this table) are identified by an x in the second column of the table; and data problems potentially experienced by the data receivers (e.g., mortgage loan insurers in this table) are identified by an x in the third column.[1]

Lenders to Mortgage Loan Insurers

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by Insurers)	Comments
4.1 Applicant details[1]	x	x	
4.2 Property details[2]	x	x	
4.3 Equity/downpayment % and source	x	x	
4.4 Basic Loan details[3]	x	x	
4.5 Additional Loan details[4]	x	x	
4.6 Credit score and history of applicant and co-applicant	x	x	
4.7 Applicant Income verification	x	x	
4.8 Cost estimates/contracts for renovations or home improvements	x	x	

1. Includes Borrower relationship, time in Canada, residency status
2. Includes purchase price, property address, property type, green home status, property appraisal, borrower occupancy status
3. Includes loan amount, interest rate/benchmark + margin, amortization period
4. Includes LTV at origination, LTV - ongoing, GDS ratio, TDS ratio

The complete set of transaction tables is contained in Appendix A.

2.1.2 Development of Interview Guides and Web Survey

The transaction tables were then used to develop interview guide tables. For example, the second column in the table above was used to develop the following interview guide table for the interviews of regulators.

Problems potentially experienced by Mortgage Loan Insurance Officials in receiving data from Lenders

	Applicant details (e.g., borrower relationships, time in Canada, residency status)	Property details (e.g., purchase price, property type, property appraisal, borrower occupancy status)	Equity/down-payment % and source	Basic loan details (e.g., loan amount, interest rate/bench-mark + margin, amortization period)	Additional loan details (e.g., LTV, GDS ratio, TDS ratio)
Inefficiencies and errors experienced					

[1] In a few cases this system was reversed in order to keep the number of tables to a reasonable number.

	Credit score and history of applicant and co-applicant	Applicant Income verification	Cost estimates and contracts for renovations or home improvements	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced					

Continuing with this example, mortgage loan insurers were asked:

- To check those data categories for which they experience significant inefficiencies or errors due to the lack of consistent data definitions, and
- To provide their comments regarding potential savings for their organization that would result if there were standard data definitions in place for these data items for both their organization and the transmitting organization (lenders in this case).

They were also asked a set of open-ended questions.

The lenders were a special case. There were too many interview guide tables for lenders to enable them to be asked about each one in an interview. Therefore, the data collection from lenders was a two-step process:

- An interview based on a set of open-ended questions, and
- A follow-up web survey based on the lender interview guide tables.

Copies of all interview guides and the web survey are contained in Appendices B and C.

2.1.3 Data Collection

All interviews were carried out in person or by phone by senior, experienced interviewers. The interviews of the large banks were all carried out in person.

The lenders were e-mailed the web survey after the interview. They were told during the interview that this would be coming, and they were encouraged to complete the survey.

Thirty-four telephone and personal interviews were completed, as follows:

Lender interviews

Tier 1 (D-SIB) banks	6
Tier 2 and foreign banks	3
Credit unions and centrals	4
Trust companies and mortgage investment companies	3
Total	16

The latter three categories are referred to as “other lenders” in this report.

Interviews of other mortgage industry organizations

Servicers	2
Title insurers	2
CMHC securitization	1
Mortgage loan insurers	3

Brokers	3
Industry associations	3
Regulators and Bank of Canada	4
Total	18

Ten completed web surveys were received from lenders, out of the total of 16 lenders who were interviewed.

Web survey responses

Tier 1 (D-SIB) banks	3 (out of 6)
Other lenders	7 (out of 10)
Total	10

The web survey responses from Tier 1 banks were disappointing – numerous follow-ups were made of the three non-respondents with no success; and the three web surveys that were submitted were very sparsely completed.

Note regarding number of responses: The number of interview and web survey responses is small in each category. Therefore, these responses should not be interpreted as necessarily being representative of all organizations in that category. On the other hand, this data collection involved highly knowledgeable senior individuals responding to mostly fact-based questions. Therefore, small numbers of responses are indicative of overall category responses.

2.2 Findings Regarding Inefficiencies

2.2.1 Inefficiencies Experienced by Lenders

Finding 1: Lenders have very few data transactions they regard as inefficient for themselves due to the lack of mortgage data standards. This is especially true of the large banks.

Finding 2: The transmission of data to regulators is the most inefficient category of transactions for lenders.

Supporting evidence

The following tables summarize the lenders' responses to the questions regarding inefficiencies.

Table 1: Lender web survey responses regarding inefficiencies

Categories of data transactions	Number of Tier 1 banks (out of 3) that checked at least one type of transaction in this category as inefficient	Average number (over all 3 Tier 1 banks) of types of transactions in this category identified as inefficient	Number of other lenders (out of 7) that checked at least one type of transaction in this category as inefficient	Average number (over all 7 other lenders) of types of transactions in this category identified as inefficient
Inefficiencies experienced in transmitting data to regulators (OSFI for large banks and 3 of the other lenders; provincial regulators for 4 of the other lenders)	1 [1/3]	1.67 [1 respondent identified 5 types of inefficient transactions)	3 [3/7]	1.29 [3 respondents identified a total of 9 types of inefficient transactions]
Inefficiencies experienced in transmitting data to servicers	0 [0/3]	0	2 [2/7]	0.74 [2 respondents identified a total

Categories of data transactions	Number of Tier 1 banks (out of 3) that checked at least one type of transaction in this category as inefficient	Average number (over all 3 Tier 1 banks) of types of transactions in this category identified as inefficient	Number of other lenders (out of 7) that checked at least one type of transaction in this category as inefficient	Average number (over all 7 other lenders) of types of transactions in this category identified as inefficient
				of 5 types of inefficient transactions]
Inefficiencies experienced in transmitting data to mortgage loan insurers	0 [0/3]	0	2 [2/7]	0.86 [2 respondents identified a total of 6 types of inefficient transactions]
Inefficiencies experienced in transmitting data regarding insured mortgages to securitization officials	1 [1/3]	0.33 [1 respondent identified 1 type of inefficient transaction]	1 [1/7]	0.28 [1 respondent identified 2 types of inefficient transactions]
Inefficiencies experienced in transmitting data regarding uninsured mortgages to securitization officials	1 [1/3]	1.00 [1 respondent identified 3 types of inefficient transactions]	1 [1/7]	0.15 [1 respondent identified 1 type of inefficient transactions]
Inefficiencies experienced in receiving data from brokers	0 [0/3]	0	2 [2/7]	0.86 [2 respondents identified a total of 6 types of inefficient transactions]
Inefficiencies experienced in receiving data from servicers	0 [0/3]	0	1 [1/7]	0.15 [1 respondent identified 1 type of inefficient transactions]

Table 2: Lender interview responses regarding inefficiencies

Organizations	(a) # of times identified as a recipient of a large amount of mortgage data by the 6 Tier 1 banks	(b) # of times these data transfers were identified as problematic by the 6 Tier 1 banks	(c) # of times the 6 Tier 1 banks identified the problematic transfers (col b) as potentially mitigatable by data standards	(d) # of times identified as a recipient of a large amount of mortgage data by the 10 other lenders	(e) # of times these data transfers were identified as problematic by the 10 other lenders	(f) # of times the 10 other lenders identified the problematic transfers (col e) as potentially mitigatable by data standards
Regulators	6 [6/6]	4 [4/6]	2 [2/4]	8 [8/10]	3 [3/8]	3 [3/3]
Underwriters	2 [2/6]	0 [0/2]	0	4 [4/10]	1 [1/4]	1 [1/1]

Organizations	(a) # of times identified as a recipient of a large amount of mortgage data by the 6 Tier 1 banks	(b) # of times these data transfers were identified as problematic by the 6 Tier 1 banks	(c) # of times the 6 Tier 1 banks identified the problematic transfers (col b) as potentially mitigatable by data standards	(d) # of times identified as a recipient of a large amount of mortgage data by the 10 other lenders	(e) # of times these data transfers were identified as problematic by the 10 other lenders	(f) # of times the 10 other lenders identified the problematic transfers (col e) as potentially mitigatable by data standards
Mortgage loan insurers	3 [3/6]	0 [0/3]	0	9 [9/10]	2 [2/9]	2 [2/2]
Securitization officials	1 [1/6]	0 [0/1]	0	6 [6/10]	1 [1/6]	1 [1/1]
Servicers	1 [1/6]	0 [0/1]	0	2 [2/10]	0 [0/2]	0
Appraisers	2 [2/6]	0 [0/2]	0	2 [2/10]	0 [0/2]	0
Title insurers	1 [1/6]	0 [0/1]	0	3 [3/10]	0 [0/3]	0
Others	4 [4/6]	0 [0/4]	0	8 [8/10]	1 [1/8]	1 [1/1]

Support for Finding 1 is provided in:

- Table 1 – first column, which shows that only 1 Tier 1 bank (out of 6) identified any category of data transactions as inefficient; and column 3, which shows that at most 3 other lender respondents (out of 7) identified any category of data transactions as inefficient.
- Table 2 – column (b), which shows that only 1 of the 8 categories of data transactions was viewed as inefficient by any of the Tier 1 bank respondents; and column (e), which shows that, while 5 of these data transaction categories were viewed as inefficient by some of the other lender respondents, the highest number of other lender respondents who viewed any of the categories of data transactions as inefficient was 3 (out of 10).

Support for Finding 2 is provided in:

- Table 1 – second and forth columns, which show that the highest average number of types of transactions identified as inefficient by both sets of lenders was in the category of transmission of data to regulators.
- Table 2 – columns (b) and (e), which show that the highest number of data transfers identified as problematic by both sets of lenders was transfers to regulators.

Finding 3: For the other lenders the transmission of data regarding property characteristics, LTV ratios, and borrower characteristics are the most inefficient types of data transactions.

Supporting evidence

This was indicated in the other lender responses to the web survey.

Finding 4: Most lenders believe that problems related to the transmission of data to regulators, which is the data transaction they view as most problematic (Finding 2), are potentially mitigatable by mortgage data standards.

Supporting evidence

Support for Finding 4 is provided in Table 2, columns (c) and (f), which show that half of the Tier 1 bank respondents and all of the other lender respondents who identified data transfers to regulators as problematic believe that these problems are potentially mitigatable by data standards.

Finding 5: Lenders do not perceive any efficiencies in

- receiving mortgage-related data from other organizations, or in
- internal mortgage data transactions.

Supporting evidence

Regarding receiving data, combining the responses from both the Tier 1 banks and the other lenders, the only organizations mentioned by more than two lenders as transmitters of a large amount of mortgage-related data to them were mortgage insurers and title insurers. However, these transactions were not identified as problematic.

When asked whether there are internal mortgage data transactions within their organization that are problematic, only 1 lender out of 16 said "some," and all the rest said "almost none."

Note: The same question regarding internal mortgage data transactions was posed to all the other interview respondents discussed below (service providers, brokers, regulators), and they all reported minimal or no problems.

2.2.2 Inefficiencies Experienced by Service Providers

"Service providers" are defined in this study as mortgage loan insurers, servicers, and title insurers.

Finding 6: Mortgage loan insurers and title insurers both experience inefficiencies in receiving property details from lenders.

Finding 7: Both mortgage loan insurers and servicers experience some degree of inefficiency in about half a dozen other types of transactions.

Supporting evidence

The following tables summarize the service providers' responses to the questions regarding inefficiencies.

Table 3: Inefficiencies Perceived by Mortgage Loan Insurers (3 interviews)

Type of data transaction	# of times identified as problematic
Receipt of applicant details	2 [2/3]
Receipt of property details	3 [3/3]
Receipt of equity/down-payment % and source	0 [0/3]
Receipt of basic loan details	2 [2/3]
Receipt of additional loan details (e.g., LTV, GDS ratio, TDS ratio	2 [2/3]
Receipt of credit score and history of applicant and co-applicant	1 [1/3]
Receipt of applicant Income verification	2 [2/3]
Receipt of cost estimates and contracts for renovations or home improvements	2 [2/3]

Table 4: Inefficiencies Perceived by Servicers (2 interviews)

Type of data transaction	# of times identified as problematic
Transmission of P & I repayment data & reconciliation	1 [1/2]
Transmission of matured or prepaid loans	1 [1/2]
Transmission of foreclosure data	1 [1/2]
Transmission of arrears data	1 [1/2]
Receipt of loan details	1 [1/2]
Receipt of borrower details	0 [0/2]
Receipt of arears status	1 [1/2]
Receipt of property details	0 [0/2]

Table 5: Inefficiencies perceived by Title Insurers (2 interviews)

Type of data transaction	# of times identified as problematic
Receipt of policy details	2 [2/2[
Receipt of mortgage details	0 [0/2]
Receipt of property search results	0 [0/2]
Receipt of Fraud Prevention	1 [1/2]

Finding 6 follows from the second line of Table 3 and the first line of Table 5.

Finding 7 follows from Tables 3 and 4.

Some examples of elaborating comments:

- Mortgage Loan Insurers
  - We have to be careful with property type, for example with a specialty mortgage for a four-unit property.
  - Data details regarding new single family construction, including new condo construction, can be a challenge where there is not a lot of history regarding the property (e.g., price and appraisal information).
  - We ask for occupation data, including job title, as part of the industry codes, but the codes don't necessarily reflect the current changes in the work force.
  - Real estate or MLS data is sometimes not helpful, where the listing characteristics do not match the actual property; this could require a drive by to verify the data.
  - The intended purpose can be confusing – e.g., when the borrower says they intend to live in the property, although they also have five other properties currently.
  - Sometimes private sales by an owner can have issues with respect to square footage or in the description of the land around a home.

- Servicers
  - There is a big problem with lack of common definitions – e.g., “renewal” versus “refinance,” “arrears” versus “delinquency.” We spend a lot of time figuring out terms with lenders.
- Title insurers
  - We have to re-map the policy details, including transaction type and policy type. We have no choice as there are no data standards in place. We get the data dictionary from the lender client and then get the data to fit their requirements.

2.2.3 Inefficiencies Experienced by Brokers

Finding 8: Brokers experience significant problems in all types of data interactions with lenders.

Supporting evidence

Brokers’ responses to the questions regarding inefficiencies were as follows:

Table 5: Inefficiencies perceived by Brokers (3 interviews)

Type of data transaction	# of times identified as problematic
Transmitting financial status of applicant and co-applicants	2 [2/3]
Transmitting proof of deposit and source of funds	3 [3/3]
Transmitting appraised value of the property	2 [2/3]
Receiving approved mortgage terms and conditions	2 [2/3]
Receiving other data items	2 [2/3]

Finding 8 is apparent from this table. Elaborating comments include:

- As deals appear to be becoming more complex recently in terms of the number of interactions between lenders, underwriters, insurers, and regulators, the broker is often required to go back to the client upwards of three to four times in the process to obtain consistent information.
- Regarding proof of deposit and source of funds borrowers are often asked to provide details for each of their accounts and the source of the down payment. Often this information is confusing and needs to be verified more than once.

2.2.4 Inefficiencies Experienced by Regulators

Finding 9: Four types of data transactions are problematic for regulators, especially data regarding mortgage terms and LTV ratios.

Supporting evidence

Regulators' responses to the questions regarding inefficiencies were as follows:

Table 6: Inefficiencies perceived by Regulators (4 interviews)

Type of data transaction	# of times identified as problematic
Outstanding mortgage balances	0 [0/4]
Credit score data	2 [2/4]
Mortgage amortization period and mortgage terms	3 [3/4]
Property characteristics	2 [2/4]
LTV ratio	3 [3/4]
Loan arrears status	0 [0/4]
Other data items	0 [0/4]

Finding 9 is apparent from this table. Elaborating comments include:

- It's difficult to get consistently defined dates for amortization periods.
- There are differences between lenders regarding how value is determined in calculating LTV ratio.

3.0 Benefits of Implementing Mortgage Data Standards

3.1 Canadian Mortgage Industry Expectations of Benefits

3.1.1 Expectations of Lenders

Finding 10: The Tier 1 banks expect few potential benefits for their organizations from the implementation of data standards and far fewer than the other lenders, who perceive cost savings from efficiencies, easier interactions between parties, and increased transparency as significant benefits. Overall, the perceptions of Canadian lenders regarding the potential benefits of data standards are more negative than the experience of US lenders regarding the benefits of data standards they actually receive.

Supporting evidence

Table 7 summarizes the lenders' views of the potential benefits of data standards.

Table 7: Lenders' Views of Potential Benefits

Potential benefits	Number of times identified by Tier 1 banks (6 interviews)	Number of times identified by other lenders (10 interviews)
Cost savings (from increased efficiency)	0 [0/6]	5 [5/10]
Reduced errors	1 [1/6]	2 [2/10]
Easier interactions between parties	1 [1/6]	7 [7/10]
Increased transparency	2 [2/6]	5 [5/10]
Other benefits	2 [2/6]	8 [8/10]

Table 7 shows that no more than a third of the Tier 1 banks identified benefits in any category, while 50% or more of the other lenders identified benefits in four categories, particularly in the three categories noted in Finding 10.

Combining the responses of the Tier 1 banks and the other lenders in table 7 and disregarding "other benefits," the perceptions of Canadian lenders regarding the potential benefits of mortgage data standards were:

- Reduced errors – 19% of respondents
- Cost savings (from increase efficiency) – 31%
- Increased transparency – 44%
- Easier interactions between parties – 50%.

In the fourth quarter of 2017 Fannie Mae surveyed over 200 lender senior executives in the US regarding the benefits of mortgage data standards they experience.[2] The structure of the Fannie Mae sample was similar to our interview sample – about 37% of the respondents were from large institutions in both cases.

Based on the results of this survey, the views of US lenders regarding the benefits they experience are more positive than the perceptions of Canadian lenders regarding the potential benefits they expect to experience.

- 74% of the respondents found mortgage data standards either very valuable or somewhat valuable (and, contrary to our interview results, the large institutions were the most positive); and
- The most important benefit identified was "enhanced data accuracy and consistency of mortgage data transactions," identified by 41% of the respondents. This benefit is comparable to the potential benefit of "reduced errors" in our interviews (identified by 19% of our respondents).

Elaborating comments of the other lenders we interviewed included:

- Regarding cost savings
  - Possibly less staff required in operations team. Faster reviews. Also, fewer updates to systems to meet requirements from multiple entities.
  - Could reduce time required to straighten out definitions.
  - Time spent on agreeing on common definitions would be reduced, especially with regard to regulations.
- Regarding easier transactions between parties
  - Would allow easier allocation of business across insurers.
  - No need to do data mappings.
  - Faster checks for insurance and securitization.
- Regarding transparency
  - Could help with audits and credit procedures.
  - May improve liquidity of MBS due to transparency of data. Easier to buy new mortgage portfolios.

3.1.2 Expectations of Service Providers, Brokers, and Regulators

Finding 11: The expectations of service providers and regulators regarding the potential benefits of mortgage data standards are comparable to the expectations of the other lenders, with cost savings from efficiencies and easier interactions between parties perceived as the main benefits. Brokers' expectations regarding benefits are higher.

Supporting evidence

Table 8 summarizes the views of all three types of organizations of the potential benefits of data standards.

Table 8: Views of Service Providers, Brokers, and Regulators Regarding Potential Benefits

Potential benefits	Number of times identified by 7 service providers	Number of times identified by 3 brokers	Number of times identified by 4 regulators
Cost savings (from increased efficiency)	4 [4/7]	3 [3/3]	4 [4/4]
Reduced errors	3 [3/7]	2 [2/3]	0 [0/4]
Easier interactions between parties	4 [4/7]	3 [3/3]	3 [3/4]

[2] Fannie Mae, 2018, *Lenders Experience with Mortgage Industry Data Initiatives*

Potential benefits	Number of times identified by 7 service providers	Number of times identified by 3 brokers	Number of times identified by 4 regulators
Increased transparency	2 [2/7]	1 [1/3]	1 [1/4]
Other benefits	4 [4/7]	0 [0/3]	3 [3/4]

The table shows that, on average about half the service providers and half the regulators identified each of the four potential benefits (not counting other). This is comparable to the other lenders (see Table 7). About three-quarters of the brokers, on average, identified each of the four potential benefits.

Elaborating comments included:

- Regarding cost savings
  - Service provider – In the absence of across-the-board data standards lenders will work within their own application standards. Data standards would allow us to expect that everyone would be providing the same level of information.
  - Broker – In terms of processing the application initially and also the number of interactions after the loan is processed, if these were reduced, that would enable us to have more time to focus on other aspects of our business.
  - Regulator – Less time required for data cleaning and validation, which would lead to some cost savings.
- Regarding easier interactions between parties
  - Service provider – Data standards would result in our getting better data and ore detailed information on loan applications. This would help mitigate fraud.
  - Broker – Having a more data driven standardization process in place would enable lender decisions to be more accurately and consistently communicated to brokers and borrowers.

3.1.3 Summary of the Magnitude of Expected Benefits by Canadian Organizations

Based on Tables 7 and 8, the perceptions of each type of organization of the benefits to their organization from the implementation of mortgage data standards are as follows.

Type of Organization	Relative number of benefits identified
Tier 1 banks	Low
Other lenders	Medium
Service providers	Medium
Brokers	High
Regulators	Medium

Regarding cost savings, it is important to note that all 34 organizations that were interviewed were asked to estimate the potential savings for their organization from the implementation of mortgage data standards (see section 2.1.2). None of the respondents were able to do this. Typical comments were:

- There would be the potential for savings in dollars and time from moving to data standards, but can't say by how much.
- Common data definitions would make things a lot easier, but the dollar savings would be a wild guess.

- We do continuous data cleaning and validation. Better, more stringent data standards would reduce the amount of work required for this, but can't say by how much.

3.2 Benefits of Mortgage Data Standards in the US

3.2.1 Brief History of Mortgage Data Standards in the US

Work in the US on the development of standards for mortgage-related data began in the early 1990s and increased significantly in 2000 with the formation of MISMO (the Mortgage Industry Standards Maintenance Organization), a wholly owned subsidiary of the Mortgage Bankers Association. MISMO developed a common language for exchanging information for the mortgage finance industry and throughout the period 2000-2010 heavily promoted the adoption of MISMO data standards by mortgage industry organizations.

The major push for industry implementation of MISMO data standards came in 2010. At the direction of the Federal Housing Finance Agency, the government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, launched the Uniform Mortgage Data Program (UNDP), a major long-term undertaking that involves requiring the use of data standards based on MISMO for transmitting data regarding the mortgages they purchase.

The components of the UNDP that have been developed and implemented incrementally since that time. They currently include

- The Uniform Appraisal Dataset,
- The Uniform Residential Loan Application and associated Loan Application Dataset
- The Uniform Closing Dataset, and
- The Uniform Loan Delivery Dataset,

as well as other components. According to the MISMO website: "Today, MISMO standards are accepted and deployed by every type of entity involved in creating mortgages, and they are required by most regulators, housing agencies, and the GSEs that participate in the industry."

3.2.2 Approach for Estimating Benefits

By "benefits" we mean cost savings or increased revenues that have been realized by mortgage industry organizations as the result of the implementation of mortgage data standards.

The study period for this analysis was 2012-2018. The costs and revenues associated with originating and delivering mortgages have been influenced by many factors during this period – inflation, changes in regulatory requirements, changes in reporting requirements, increases in mortgage sizes due to higher house prices, changes in compensation arrangements for mortgage industry professionals, higher costs of equipment and technology-related expenses, and so on. As an example, total loan production expenses have increased from $5,300 per loan at the beginning of 2012 to $8,500 at the end of 2017 [MBA, 2017]. One factor that has affected costs and revenues has been mortgage data standards.

This analysis is based on isolating the effects of mortgage data standards. We asked the question: How were industry costs and revenues different than they would have been if mortgage data standards had not been implemented. In other words,

$$Costs\ or\ Revenues_{with\ Standards} - Costs\ or\ Revenues_{without\ Standards} = Benefits\ of\ Standards$$

The analysis was based on estimating the benefits of data standards in a number of different "benefit categories." The term "benefit category" refers to specific types of benefits (e.g., increased revenues resulting from the ability to issue more loans) which were believed to satisfy two criteria:

(1) It is reasonable to expect that that the total dollar amount of the benefits of that type have been large; and

(2) It is reasonable to expect that these benefits can be quantified, at least approximately –i.e., the key variables can be identified and their values can be quantitatively estimated through a combination of available data sources and expert opinion.

The study team identified three benefit categories based on the literature and consultations with industry experts:

- **Benefit Category 1:** Fewer custom IT interfaces – the avoided costs for mortgage industry organizations from having to prepare many complex custom IT interfaces, which had been necessary in the absence of data standards.
- **Benefit category 2:** Higher quality data – the reduced time spent by lenders throughout the mortgage lifecycle in reconciling the values and definitions of data transmitted to and from other parties.
- **Benefit category 3:** Reduced loan processing times – more efficient loan processing by lenders, which reduced costs and also enabled them to issue more loans.

The analysis of the benefits in each category was a two-step process.

Step 1 – Initial internal estimates of key variables	Step 2 – Validation of our internal estimates, followed by calculations of benefits
Initial values of the key variables that are needed to estimate the benefits were first estimated by our study team. Prior to agreeing on the estimated values we did some background research. This usually involved one or two "background interviews" with mortgage industry experts, along with some supplementary analyses (e.g., reviewing any available data and relevant documents).	We then validated our internal estimates of the key variables in short, focused interviews with industry participants. These "validation interviews" were conducted by asking interviewees: "We have estimated the values of the key variables to be X and Y; do you think those are reasonable estimates?" We then estimated the benefits based on these key variables and available secondary data.

This approach of collecting data by means of validation interviews as opposed to open-ended interviews (e.g., "what is your estimate of the benefits of …") was necessary because:

- People are unable or unwilling to provide quantitative estimates of benefits they have never thought about in quantitative terms, which is the situation regarding mortgage data standards in both the US and Canada. (As noted in section 3.2.6, none of the Canadian interviewees were able to answer questions of this type.)
- When interviewing US mortgage industry participants, this situation is made more difficult because of the long, drawn-out nature of the introduction of data standards over the past 30 years, which overlapped with a number of other industry changes.

3.2.3 Benefits in Category 1 – Fewer Custom IT Interfaces[3]

Finding 12: The estimated cost savings for mortgage industry organizations from not having to prepare as many custom IT interfaces was $113 M per year during the study period.

Supporting evidence

[3] All dollar figures in sections 3.2 and 3.3 are US dollars.

We first estimated the values of the key variables for mortgage insurers, LOS providers, and credit report providers, as follows:

- Mortgage Insurers

  Key variables:

  - Number of avoided custom IT interfaces during the study period = 50
    - Initial estimate based on study team knowledge plus one interview of an MI provider
    - Estimate validated by two mortgage industry experts
  - Cost per interface of avoided custom interfaces = $30K
    - Initial estimate based on study team knowledge plus one interview of an MI provider
    - Estimate validated by two mortgage industry experts

  Secondary data:

  - Number of MI providers in the US = 7 (Arch Capital Group, Essent Guaranty, Genworth Financial, MGIC, National Mortgage Insurance, Old Republic International, and Radian Guaranty, Inc.)

- LOS providers

  Key variables:

  - Number of avoided custom IT interfaces during the study period = 100
    - Initial estimate based on study team knowledge plus two interviews of LOS providers plus one interview of a technology services provider
    - Estimate validated by two mortgage industry experts
  - Cost per interface of avoided custom interfaces = $50K
    - Initial estimate based on study team knowledge plus one interview of an LOS providers plus one interview of a technology services provider
    - Estimate validated by two mortgage industry experts

  Secondary data:

  - Number of LOS providers in the US = 100 (a conservative estimate; 129 LOS providers are listed on the website www.capterra.com/loan-origination-software.)

- Credit report providers

  Key variables:

  - Number of avoided custom IT interfaces during the study period = 20
    - Initial estimate based on study team knowledge plus one interview of a credit report provider
    - Validation interviews conducted with two technology providers that are experienced managing integrations to credit report providers
  - Cost per interface of avoided custom interfaces = $40K
    - Initial estimate based on study team knowledge plus one interview of a credit report provider
    - Validation interviews conducted with two technology providers that are experienced managing integrations to credit report providers

  Secondary data:

  - Number of credit report providers in the US = 80 (This is the average of our internal team estimates of the number of credit report providers currently [approximately 60] and the number at the beginning of the study period [approximately 100].)

Appraisal management companies and title appraisers

Following the estimates for the above three types of organizations, in order to make the category 1 benefit estimate more complete we applied the averages of the key variables from the MIs and credit report providers to two other types of service providers – appraisal management companies and title appraisers. I.e.,

- Key variables for each of these additional types of service provider:
  - Number of avoided custom IT interfaces during the study period = 35 [(50+20)/2]
  - Costs of each avoided custom IT interface during the study period = $35K [($30K+$40K)/2]
- Secondary data:
  - Number of appraisal management companies = 53
  - Number of title insurers= 30
    - Information derived from lists of companies provided by a leading LOS provider

The benefit calculations are as follows.

Table 9: Benefit Calculations for Category 1 Benefits

	Number of customized interfaces avoided	Cost per interface ($K)	Number of providers	Total savings per company over the period ($M)	Total savings for all companies of that type over the period ($M)	Annual savings ($M)
Mortgage Insurers	50	30	7	1.5	10.5	
LOS Providers	100	50	100	5.0	500.0	
Credit Providers	20	40	80	0.8	64.0	
Appraisal Management	35	35	53	1.2	64.9	
Title Insurers	35	35	30	1.2	36.8	
					Total = 676.2	Annual savings = 112.7

3.2.4 Benefits in Category 2 – Reduced Required Staff Time by Lenders Due to Higher Quality Data

Finding 13: The estimated savings from reduced lender staff salaries due to higher quality data was $19,346 M per year during the study period.

Supporting evidence

First, we asked the experts in our Mortgage Advisory practice to identify the main complex interactions between lenders and other organizations that occur during the mortgage lifecycle, where by a “complex interaction” we mean a data transaction involving lenders which involves a large amount of staff time for dealing with the data in the absence of data standards.

They identified 29 such transactions. We eliminated 10 of these transactions based on the fact that they were not applicable to all lenders (e.g., interactions between lenders and brokers). The remaining 19 complex data transactions are as follows:

Table 10: Complex Data Transactions

	Loan details and definitions (e.g. mortgage vs line of credit)	Arrears details/status	Property details	Income details and verification	Appraisal details
Lenders – regulators	X	X	X		
Lenders – mortgage insurers	X		X	X	X
Lenders – securitization	X	X	X		X
Lenders – servicers	X	X	X		X
Lenders – underwriters	X		X	X	X

The next step was to estimate the reduction in staff time required to deal with a typical complex data transaction because of data standards. We did this by asking three highly knowledgeable interviewees the following questions. We first gave them examples of several typical complex data transactions from the table above.

> *Thinking back to the time just before mortgage data standards were adopted by the majority of lenders in the US for most mortgage-related processes:*
>
> *Q1. What is a rough estimate of the total staff time that was spent by lenders dealing with the data for a typical complex data transaction? (By "staff time for dealing with data" we mean the time required for data entry, including multiple entries of the same data; the time required for reconciling data values and definitions; the time required to correct inaccurate or incomplete data; and so on.) [Call this T]*
>
> *Q2. What is a rough estimate of the percentage of this total staff time that was required for data reconciliation (clarifying the meaning of data items and reconciling apparently inconsistent data values)? [Call this P]*

T and P are the key variables. The reduction in staff time required to deal with a typical complex data transaction because of data standards is then approximately PT. We assumed this reduction remained constant from this time (the time just before mortgage data standards were adopted) to the present.[4]

The results of the interviews were as follows:

	T (hours)	P (%)
Interviewee 1	21	43
Interviewee 2	20	45
Interviewee 3	15	33
Averages	19	40

Interviewee 2 was the most knowledgeable because of the nature of the data collected by his company, so we accepted his estimates. (Note also that interviewee 2's estimates are close to the averages of the three interviewees.) Three validation interviews for these estimates were conducted.

Therefore, we set T= 20 hours and P = 45%, and so PT = 9 hours.

[4] Other reductions in staff time during this period may have occurred because of technological improvements, but that does not affect our calculation.

Secondary data:

- Average typical hourly salary for an employee dealing with the data = $30/hour.
  - This estimate is based on Bureau of Labour Statistics data on average annual wages observed between 2012 and 2018. We selected occupations we believe are most reflective of the services provided during the mortgage processing lifecycle. This includes: compliance officers, appraisers and assessors of real estate, insurance underwriters, credit counselors and loan officers, and financial specialists. We took the average across all occupations and all years to estimate $30. Note that this is likely an underestimate because it does not include overhead expenses that would be allocated to each employee.
- The number of times a typical complex data transaction occurs during the mortgage lifecycle = 9. (This is a very conservative estimate made by our team by:
  - Starting with the 19 transactions listed above and assuming each of these occurs only once during the mortgage lifecycle, and then
  - Eliminating 4 transactions related to underwriters so as to not double-count with benefit category 3,
  - Eliminating half of the transactions with services because some lenders do servicing in-house (this is a conservative choice, based on the assumption that servicing done internally reduces the complexity of the transaction because the same data definitions are used as in the loan origination process), and
  - Eliminating the transactions related to mortgage insurers so as to not overlap with benefit category 3 because arranging mortgage loan insurance is part of the loan application process. (This is a very conservative assumption because the interviews for benefit category 3 did not deal with mortgage loan insurance. A more realistic assumption would probably be to eliminate half of the 4 transactions involving mortgage loan insurers.)
  - So we're left with 19 - 4 - 2 - 4 = 9 (or 11 if we only eliminate half the mortgage loan insurance transactions).
- The number of mortgages issued per average year = 7,930,508 (average HMDA data between 2012 and 2017 for all mortgage originators).

The annual savings in lender staff salary costs was therefore estimated as:

> 9 hours saved per complex transaction x $30 per hour salary cost x 9 complex transactions per mortgage x 7,930,508 mortgages per year = $19,346 M.
>
> (Alternatively, if we only remove 2 of the transactions with mortgage loan insurers, the estimate is 9 x $30 x 11 x 7,930,508 = $23,602 M.)

Note that in a 2018 survey of over 200 mortgage lenders in the US carried out by Fannie Mae, 74% of the respondents found mortgage data standards either “very valuable” or “somewhat valuable,” and the main reason given (by 41% of the respondents) was “enhanced data accuracy and consistency of mortgage transactions.”[5]

3.2.5 Benefits in Category 3 – Reduced Loan Processing Times

Finding 14: The estimated savings from reduced lender staff salaries due to more efficient application processing was $5,503 M per year during the study period.

Supporting evidence

We considered using statistical methods on mortgage processing data to estimate the effects of mortgage data standards on loan processing times. Unfortunately, this was not possible for a variety of reasons: first, the data for historic loan processing times is not easily accessible. Time series prior to 2014 are provided by MBA to mortgage

[5] Fannie Mae, 2018, *Lenders’ Experience with Mortgage Data Initiatives.*

lenders who are members, but are not provided to others. Based on conversations with MBA and assessment of publically available data, we determined that we would not be able to use this approach. In addition, following the housing crisis, regulatory measures for banks were introduced concurrent with the uptake of mortgage standards. It would be extremely difficult to be able to accurately identify the impact of mortgage data standards on mortgage processing times given the assortment of other influencing factors. Finally, as mortgage data standards were introduced over an extended period of time and the adoption is difficult to quantify, it would be impossible to identify the true impact of mortgage standards on loan processing times from a statistical approach.

Consequently, our estimate of the value of the benefits in this category was based on directly estimating the reduced staff time required by lenders as a result of more efficient loan application processing.

The two key variables are T' and P', where

- T' = the total staff time that was spent by lenders to process loans just prior to the adoption of mortgage data standards, and
- P' = the percentage of this total staff time that was reduced after data standards were introduced into the loan application process.

We asked the same three people who were interviewed in relation to benefit category 2 the following questions:

> *Thinking back to the time just before mortgage data standards were adopted by the majority of lenders in the US for most mortgage-related processes:*
>
> *Q3. Please provide a rough estimate of the total time (number of person-days) that was required by lenders at that time to process loans from the original intake of application information to loan closing? [This is T']*
>
> *Q4. By what percentage, if any, was this amount of time reduced after data standards were introduced for the loan application process? [This is P']*

The responses were as follows:

	T' (person-days)	P' (%)
Interviewee 1	19	40
Interviewee 2	16	15
Interviewee 3	N/A	68

Again, interviewee 2 was the most knowledgeable because of the nature of the data collected by his company. We accepted interviewee 2's estimate for T'. However, for P' we increased his estimate to 18% because the responses of the other two interviewees were so much higher. Three validation interviews were conducted for these estimates.

The reduced amount of staff time required for loan application processing, is then approximately P'T' = 2.9 person-days = 23 person-hours. We assume this reduction remained constant from this time (the time just before mortgage data standards were adopted) to the present.

Secondary data:

- Average typical hourly salary for an employee dealing with the data = $30/hour (estimation approach described above).
- The number of mortgages issued per average year = 7,930,508 (Average HMDA data between 2012 and 2017 for all mortgage originators).

The annual savings in lender staff salary costs was therefore estimated as:

23 hours saved per mortgage x $30 per hour salary cost x 7,930,508 mortgages perf year = $502.8 M

Further consideration of the benefits due to reduced loan processing times

We have used this $5,502.8 M as the value of this benefit, since it seems likely that, as a result of the increased efficiency in loan application processing, lenders most commonly realized this benefit in terms of savings in staff salary costs (i.e., by laying off or redeploying staff). However, some lenders may have used some of this freed-up staff time to issue more mortgages, in which case they would have realized part of this benefit in terms of increased revenue.

The upper bound across all lenders of the increased annual revenues from issuing more mortgages, assuming all lenders spent all their freed-up staff time doing this, was calculated as follows:

- # of additional mortgages issued = the % reduction in application processing time x the number of mortgages issued per average year = 0.18 x 7,930,508 = 1,427,491;

and then

- Increased annual revenues for all lenders = 1,427,491 x $662 = $945.0 M, where $662 is the profit per mortgage.

The profit per mortgage figure is the average net production income per mortgage over the past three years reported by MBA.

Note that this $945.0 M is not an addition to the $5,502.8 M value of the reduced staff time required. In fact, if some of the lenders spent some of their freed-up staff time on issuing more mortgages instead of laying off staff, these calculations imply that that would have reduced their economic benefit from more efficient loan application processing.

3.2.6 Summary of Estimated US Benefits

Finding 15: The estimated total benefits to the US mortgage industry in the three benefit categories have been approximately $25 B per year during the study period.

Supporting evidence

The calculations used to derive these estimates are presented in the three previous sections. The estimates are as follows:

Table 11: Summary of estimated annual benefits

Benefit category	Beneficiaries	Annual Reduced Costs ($US)
1. Fewer custom IT interfaces	LOS providers and other servicers	113 M
2. Higher quality data	Lenders	19,346 M
3. Reduced loan processing times	Lenders	5,503 M
		Total = 24,962 M

3.3 Other Benefits of Data Standards in the US

Finding 16: In addition to the benefits quantified in section 3.2, the US mortgage industry has experienced a number of other benefits from the implementation of mortgage data standards. These include:

- Facilitation of automation
- Reduced fraud
- Facilitation of securitization

- Reduced development costs for technology providers
- Reduced hedging costs
- Appraisal waivers
- Facilitation of innovation
- Reduced post-closing costs

Supporting evidence

The benefits discussed below were identified in our interviews of senior participants in the US mortgage industry. There is also support in the literature for most of these benefits (although there is no literature that quantifies these benefits in economic terms).

1. Facilitation of automation

As one major lender said; "mortgage data standards have made possible the digitization of the mortgage environment." This was echoed by other US interviewees.

It can't be claimed that the automation that has taken place in the mortgage industry is completely due to data standards, as evidenced by the Canadian experience, where there has been considerable automation over the past half dozen years in the absence of data standards. The impact of mortgage data standards in the US has been the difference is between automated transactions that do not rely on data standards and automated transactions that have an efficient level of integration due to the existence of data standards.

As far back as 2004, a survey of 125 mortgage industry participants found:

> "If automated processes that do not use standards are compared with similar processes that take advantage of current MISMO standards, there is no question that those processes with MISMO as a key component have a higher degree of maintainability, openness, and reliability."[6]

Based on the 14 years of experience since then, a recent Fannie Mae report concluded that:

> "While the mortgage industry is finally accepting the challenge to digitize and innovate, they still have a long road ahead. As they continue on that journey, they must keep in mind the often-overlooked importance of data standards to support replicable and sustainable solutions. Data standards are the foundation for the new digital model, providing benefits across the board — from a common vocabulary and taxonomy to reducing inconsistencies, simplifying processes, and improving interoperability. Without this foundation, the mortgage industry would not successfully go digital."[7]

2. Reduced fraud

Mortgage fraud results in a major cost to the industry. According to the latest CoreLogic report[8]

- About 1% (0.92%) of mortgage loan applications contained fraud, as of the second quarter of 2018. (This includes both mortgage purchases and refinance transactions.)
- Most mortgage fraud is committed by bona fide borrowers, by various means, the most common one being income fabrication.

[6] MBA, 2004, *A Time and Motion Study*.

[7] *Op. cit*. Fannie Mae,2019.

[8] CoreLogic, 2018, *Mortgage Fraud Report*.

As an example of the magnitude of fraud, in early 2018 Home Capital Group in Canada cut ties with 45 mortgage brokers after an investigation into forged documents, such as fake income letters and income statements. The brokers who were fired generated nearly $1 billion worth of mortgages for the company in 2017. Along the same lines, Credit Bureau Equifax says it has been able to flag over $1-billion worth of attempted mortgage fraud among its lender clients since 2013.[9]

Several interviewees stated unequivocally that mortgage fraud in the US has been reduced by data standards – the most common reason given being the existence of third party verification services (companies that verify employment, income, and assets) on the basis of analyses of standardized data.

The Globe Mail Article referenced above provides an example of this type of verification analysis: "Lenders don't usually send [the mortgage insurance company] the paper documents, but the insurer gets a set of about 160 data fields from each application that it feeds into a software system that scores every deal based on details such as the borrower's age, income, the industry they work in, etc. Applications that score low are sent for a more detailed review."

3. Facilitation of securitization

Most of the literature in this area deals with the impact of data standards on facilitating the processes used by the GSEs to evaluate the mortgages they purchase. See, for example, J.P. Morgan Chase, 2012[10] for a discussion of the role of standardized data definitions and common validation processes. Similarly, the Mortgage Bankers Association recently stated: "By creating an up-to-date, well-defined, standardized mortgage asset dataset, MISMO helps enable rating agencies to grade mortgage assets more precisely and produce a smoother, more efficient securitization process…"[11] The Fannie Mae paper referenced in item 1 describes how mortgage data standards have reduced the need for scrubbing logic and have reduced manual work, resulting in faster intake data processing.

Several of our interviewees noted that more efficient securitization processes also benefit lenders (mortgage sellers) by reducing the time and effort required to securitize mortgages, therefore contributing to either cost savings or increased revenue through additional securitizations. For example, a recent article by the Urban Institute states that: "The GSEs' ability to relieve lenders from certain origination representations and warranties was made possible in large part by better-quality origination data that they collect under the Uniform Loan Delivery Standards."[12]

4. Reduced development costs for technology providers

The technology providers we interviewed stated that data standards have reduced their development costs. The largest benefit is that they are able to build single integrations that can then be reused with any client/partner/vendor who builds to the same standard. This increases the scope of what they can apply their technology to and allows them to focus on building functionality instead of integrations.

An example from a major technology services provider:

- *One of our recent products is a data integration hub.*
- *This product is a web services based solution that allows lenders to submit data once, in a single format, and then have access to a number of services (e.g. credit, automated underwriting, income validation, asset validation, etc.) Our company's value add is to lower integration costs for our clients.*
- *Our initial development focused on: how do we bring in loan application data from our potential clients? One of our key initial decisions was whether we should design our solution on proprietary, custom data schema, or if we should*

[9] Globe and Mail, May 15, 2018, *How Mortgage Fraud is Thriving in Canada's Hot Housing Market*.

[10] JP Morgan Chase, 2012, *Securitization Infrastructure at FHFA.*

[11] MBA, 2018, *October 11, 2018, Press Release*.

[12] Urban Institute, 2018, *The Case for Uniform Mortgaging Servicing Standards.*

go to an industry data standard. After some research, we decided to build to the MISMO 3.4 standard, as going to a native standard would have been significantly more costly.

5. Reduced hedging costs

Hedging is essentially a type of insurance that protects the lender from changes in interest rates from the time of the agreement with the borrower up to the time the lender sells the mortgage (e.g., to a GSE). The term "hedging costs" refers to the costs of this insurance.

Hedging costs are reduced by faster loan processing because less time passes between the time the mortgage is agreed on with the borrower and the time it is sold. (Note that, although faster loan processing is the basis of benefit category 3, reduced hedging costs are not included in our calculation of the benefits for that benefit category, so this is an "other benefit.")

One of our interviewees said that, in his opinion, reduced hedging costs are one of the two main benefits of mortgage data standards. We subsequently verified this opinion with another mortgage industry expert.

The main beneficiaries of reduced hedging costs would be expected to be FinTech lenders (lenders that offer an application process than can be completed on-line, with the rest of the loan origination process also completed largely on-line). This is because Fin Tech lenders process mortgage applications 20% faster than other lenders.[13] FinTech lenders now comprise about 10% of the US mortgage market, and Quicken Loans, a FinTech lender, is the second largest US mortgage lender.

An additional beneficiary of reduced hedging costs would be warehouse lenders in the US who use eNotes (electronic mortgages). The GSEs in the US all take eNotes, which are required to be in MISMO format. Because the time between the mortgage agreement and the sale of the mortgage is close to zero, there is a significant hedging cost reduction, estimated to be between 1bp and 12bp.[14]

6. Appraisal waivers

The Appraisal Waiver program was highlighted as a benefit of mortgage data standards by a senior executive at an appraisal management company. This is a program of the GSEs in the US. For loans that are relatively risk free the GSEs don't require that the lender obtain an appraisal.

To be clear, just introducing data standards didn't automatically give the GSEs the ability to introduce appraisal waivers. However, in our expert's opinion, data standards were a prerequisite for the type of analytical work that enabled the program.

This is a new program, and now only about 1% of loans sold to the GSEs are using appraisal waivers, about 250,000 of loans per month. However, the program is growing quickly. Fannie Mae's target at launch was 5%,[15] so assuming Freddie Mac's target was similar, this 250,000/month can be expected to quickly reach 1,250,000/month. At $500 of savings from not having to order an appraisal this would amount to annual industry savings of $7.5 B (1,250,000/month x 12 months x $500). Of course, there is a question regarding who ends up getting this benefit – held by the lender, passed on to the borrower, pulled in by the GSE, or some split of these.

Note that this calculation just focuses on the cost savings from the appraisal fee cut. There are also time savings, in that the lender doesn't have to wait for an appraisal, which is typically one of the longest steps in the origination process. Even if the appraisal can be done while other things are going on, a conservative estimate of the time reduction would be three days.

[13] Fuster et. al, 2018, *The Role of Technology in Mortgage Lending*, Federal Reserve Bank of New York Staff Reports, vol 836.

[14] MBA, 2018, *MISMO Webinar October, 2018*.

[15] Housing Wire, 2019 (September), *Appraisals Will No Longer Be Required on Certain Home Sales*

7. Facilitation of innovation

This item overlaps with item #4 (reduced development costs for technology providers), but the focus there was on cost reduction. Here the focus is on the role of data standards in facilitating the development of new products.

We heard a number of stories from the industry experts we interviewed about how they were able to develop new products because data standards simplified their technology – i.e. "since we weren't worried about the structure of the data once it was agreed on, we were able to concentrate on X."

An example has been the proliferation of digital Point of Sale (POS) solutions in the US. These solutions enable traditional mortgage lenders to rapidly develop an online mortgage lending "storefront". Borrowers can use these tools to enter information about their financial situation and lending priorities and receive loan and pricing options (sometimes even an approval) from the lender. A common feature of these solutions is that they facilitate the transfer of data from the POS to the lender's LOS. The leading POS vendors all leverage industry data standard formats to move the loan application data from the POS to the LOS. A product manager at one of the vendors stated, "The LOSes are all already able to consume those standard loan application data formats, so we just built the single integration and then focused on building new product features to excite our customers and their borrowers."

Other examples mentioned in our interviews:

- A credit reporting company described their "smart API (application programming interface)" product, which allows a client to integrate once and then request a number of services. This product could not have been developed in the absence of data standards. This has been one of their fastest growing products.
- The same person gave another example of how standard data formats have enabled the development of their verification of employment (VOE) product. That product runs a cascade that checks for automated verification of employment, but if the data isn't available for the borrower / employer, the traditional request is triggered. That initial automation depends on a standardized data format across the service.
- An executive at an appraisal management company explained that having the data standardized has allowed them to do more advanced product development with algorithms and, more recently, artificial intelligence.

8. Reduced post-closing costs

The appraisal waiver is a specific example of the role of data standards in reducing post-closing costs, but data standards have had an impact across the whole post-closing process. (Post-closing comprises the quality assurance activities that need to be carried out before a mortgage is sold.)

This was first brought up by a senior executive at one of the largest mortgage lenders in the US. He said that because there are a set of rules that help ensure the integrity of the data, their bank now only has to examine those elements of the mortgage that don't pass the rules test: "Now we only have to do exception-based processing." This has reduced the time required for post-closing activities by more than half. In a later elaboration he said that their bank can do the post-closing activities as soon as the loan is funded: "90% of our loans are salable after 3 days when that used to require 7-9 days and more people."

Our other lending institution interviewees agreed that the time saved in post-closing activities because of data standards has been significant.

4.0 Implementation Challenges and Costs

4.1 Potential Challenges and Costs Perceived by the Canadian Mortgage Industry

4.1.1 Potential Challenges Perceived by Lenders

Finding 18: The Tier 1 banks perceive more potential challenges (as a percentage of respondents) for their organization from the implementation of data standards than the other lenders, with both groups perceiving IT challenges as the main challenge.

Supporting evidence

Table 12 contains the lenders' interview responses regarding potential challenges.

Table 12: Lenders view of potential challenges

Potential Challenges	Number of times identified by Tier 1 banks (6 interviews)	Number of times identified by other lenders (10 interviews)
Achieving acceptance by all parties	3 [3/6]	5 [5/10]
Internal change management/HR challenges	2 [2/6]	4 [4/10]
IT challenges	6 [6/6]	7 [7/10]
High costs	5 [5/6]	2 [2/10]
Other challenges	5 [5/6]	6 [6/10]

As shown in the table, respondents were asked about four groups of possible challenges, plus "Other". On average, 70% of the Tier 1 respondents identified each group as an actual challenge. On average, 48% of the other lenders identified each group as an actual challenge. (These percentages include "Other," but they do not change significantly if "Other" is not included.)

IT challenges were the main category of challenges identified by both sets of lenders. The Tier 1 lenders also identified high costs as a challenge, presumably at least partly because of envisioned high IT implementation costs.

Elaborating comments were as follows:

- Tier 1 banks
  - Depends on whether current systems already capture required data at the same level of granularity.
  - Level of costs and challenges depends on granularity of definitions and how much they vary from those used currently.
  - Depends on whether changes require changing our legacy systems.

  - It would be time consuming and costly to change legacy systems. That would also impact other areas of our business (e.g., credit cards, personal lending); may have unintended consequences.
  - Our legacy systems are complex, and any changes would require major investments.
- Other lenders
  - Depends on how complex the changes are and the number of systems impacted.
  - The inputting of new definitions would be a big job.
  - Any changes in our legacy systems would be costly.

4.1.2 Potential Challenges Perceived by Other Organizations

Finding 19: Other organizations' views of potential challenges are as follows:

(a) Service providers perceive fewer potential challenges from the implementation of data standards than brokers or regulators, and they are not particularly concerned about IT challenges.

(b) On balance, the views of brokers and regulators are similar to the views of the other lenders (see section 4.1.1).

Supporting evidence:

Table 13 contains the interview responses of these groups regarding potential challenges.

Table 13: Other Organizations' Views of Potential Challenges

Potential Challenges	Number of times identified by 7 service providers	Number of times identified by 3 brokers	Number of times identified by 4 regulators
Achieving acceptance by all parties	5 [5/7]	3 [3/3]	1 [1/4]
Internal change management/HR challenges	0 [0/7]	1 [1/3]	3 [3/4]
IT challenges	2 [2/7]	1 [1/3]	3 [3/4]
High costs	3 [3/7]	3 [3/3]	0 [0/4]
Other challenges	1 [1/7]	0 [0/3]	2 [2/4]
Average % of respondents who identified each challenge	31%	53%	45%

Elaborating comments were as follows:

- Service provider – Although a challenge for all players involved in processing mortgage transactions, the IT challenges would not be significant enough to stop us from wanting to move towards data standards.
- Broker – If there are any challenges, they would appear to be something that can be addressed as companies, including brokers and lenders, are able to address IT challenges. Our company is challenged daily with respect to IT issues, so data standards and their roll-out would not be any different.
- Regulator – We always have these kinds of challenges whenever there are big system changes.

4.1.3 Summary of the Magnitude of Expected Challenges by Canadian Organizations

Based on Tables 12 and 13, the perceptions of each type of organization of the challenges for their organization from the implementation of mortgage data standards are as follows.

Type of Organization	Relative number of challenges identified
Tier 1 banks	High
Other lenders	Medium
Service providers	Medium
Brokers	Medium
Regulators	Medium

4.1.4 Perceptions of Potential Costs

Finding 20: The Tier 1 banks expect the costs of implementing mortgage data standards to be very high. The other organizations estimate the costs to be minimal or, at most, moderate.

Supporting evidence

All respondents were asked to comment on the order of magnitude of likely costs, and their responses were rated by the interviewer on a 1 to 5 scale, where 1 – negligible and 5 = major. The percentages of respondents in each respondent group who rated the likely costs as very high (4 or 5) are shown in Table 14.

Table 14: Mortgage Organizations' Views of Potential Costs

Organization	% of organizations whose rating for likely IT development costs was very high	% of organizations whose rating for likely IT implementation costs was very high	% of organizations whose rating for likely costs for developing new systems and procedures was very high	% of organizations whose rating for likely HR costs was very high	% of organizations whose rating for likely other costs was very high
Tier 1 banks	83	83	67	83	17
Other lenders	10	20	20	10	0
Service providers	14	14	0	0	0
Brokers	0	0	0	0	0
Regulators	0	0	0	0	0

Finding 20 is self-evident from this table.

All 34 interviewees were asked to estimate the potential costs for their organization of implementing a system of mortgage data standards. Only one interviewee (out of 34) provided a meaningful response.[16]

[16] One of the "other lenders" said that the costs of IT development, IT implementation, and new systems and procedures would be on the order of $3 to $5 million.

4.2 Costs of Implementing Data Standards in the US

4.2.1 Introduction

Our analysis of implementation costs in the US focused on IT costs for mortgage lenders, because:

- IT costs are the largest implementation costs and are the costs of most concern, in both Canada and the US; and
- Lenders are the main organizations concerned about these costs.

As a result of interviews with mortgage industry experts in the US, it became clear that the magnitude of IT implementation costs varies greatly with the characteristics of the organization's pre-MISMO IT systems. (This report uses the term "MISMO data standards," since virtually all systems of data standards that have been implemented in the US are related to MISMO standards.) Therefore, we focused on obtaining order-of magnitude estimates of IT implementation costs for lenders within each of three IT profiles:

- IT profile 1 – Lenders that can produce data fairly easily and have modern technology
- IT profile 2 – Lenders that use off the shelf loan origination systems
- IT profile 3 – lenders that have old IT legacy platforms.

It was only possible to obtain order-of-magnitude estimates because:

- We were unable to identify representatives of lenders within each profile who are knowledgeable about these costs;
- Even if we had been able to identify knowledgeable representatives, our preliminary conversations with a few lenders indicated that they would not be willing to provide this information.

The information in the following sections summarizes the views of our in-house mortgage industry experts, which incorporate the views of a number of external industry experts interviewed during this study.

4.2.2 Background

The purpose of MISMO is to facilitate the development and maintenance of mortgage industry data standards for the exchange of mortgage data between organizations. It consists of two main parts:

(1) A set of definitions for data and business terms that are commonly used in the mortgage industry, together with

(2) Guidelines for how this data needs to be formatted and exchanged.

There are more than 2,000 data items that have been defined in the MISMO data dictionary. These data definitions have been formulated by working groups of participants in the mortgage industry, and this is an on-going process.

Part (2) consists of a set of XML (extensible markup language) rules for how the data should be formatted for exchange between organizations.

Simplistically, the transfer of a set of mortgage data between organizations (say the transfer of loan application data from lenders to mortgage insurers) is done by:

(a) Retrieving the relevant data files by the sending organization from their database;

(b) Translating the data into MISMO format, if it's not already in MISMO format;

(c) Transmitting the files to the receiving organization; and

(d) Translating the files by the receiving organization into the data format of their database if required (i.e., if their database format is not already MISMO format).

MISMO warehouses the data definitions and the XML data formats for use by mortgage industry participants. However, MISMO does not involve the transmission of mortgage data from participants to a central hub, and there is no central database of mortgage information. This is a system for peer to peer data exchanges, and exchanges of data within organizations.

4.2.3 IT System Requirements for MISMO Users

The main things that are required in order to operate with MISMO data is for senders and receivers of data to address steps (b) and (d) above. This means that these organizations have to either (i) already have their data in MISMO format or (ii) build a translation program that converts their existing data into MISMO format (for sending data) and converts incoming data from MISMO format into their existing data format (for receiving data).

One of the challenges with translation programs is ensuring that the data structure matches on both ends of the transaction – e.g., if the sender's translation program combines their existing data into MISMO data in a certain way, then the receiver's translation program needs to "un-combine" that MISMO data and represent it in their existing database so that it has the same meaning as it has in the sender's database.

This situation is not specific to MISMO – any transaction being used for conducting business electronically must be formatted on both ends for the purpose of the transaction. Of course, formatting is of no use if it's not possible to get the data from the sender's system. This is more likely to be true when dealing with older technologies – modern systems are more likely to have built-in capabilities to manage and extend their database structure.

4.2.4 Overview of IT Implementation Costs

Finding 21: Implementation costs will vary from less than $1 million to $ several million, depending on the characteristics of the lender's pre-MISMO IT systems.

Supporting evidence

The following describes the IT costs for lenders within each of the IT profiles in order to enable them to deal with data in MISMO format.

- IT profile 1 – Lenders that can produce data fairly easily and have modern technology, specifically:
  - The data is available and in the substantially same format as is necessary for writing to the MISMO transactional format, and
  - Building the required transactions and transports for transactions is not difficult.

    Both of these are much easier with modern technology, for which it is fairly straightforward and not very costly to add additional data and format requirements.

    The current costs of implementing mortgage data standards in this case would be nominal, well less than $1M.
- IT profile 2 – Lenders that use off-the-shelf loan origination systems.

  The current costs of implementing mortgage data standards in this case depends on the LOS provider. If an LOS were not viable without the interface, there would likely be no charge to the lender, and similarly if the lender is paying by the loan. If the upgrade is proprietary for a solution, then there would likely be a charge to the lender.

  To elaborate, currently LOSs are expected to have a range of interfaces. See, for example, the references to interfaces on the following LOS provider websites:

  - https://www.calyxsoftware.com/products/path/partners-vendors-integrations
  - http://www.blackknightinc.com/wp-content/uploads/2018/03/BK_EmpowerNow.pdf.

  Any significant costs would be for add-ons, for example with a specific trading partner of the lender.

Again, the current costs of implementing mortgage data standards in this case would be nominal on average, with any additional integrations costing in the range of $100K – $300K, and total costs less than $1M. There would also be costs for training and updates to documentation, probably around 1/4 – 1/3 of development costs. (Note that this discussion relates to the situation currently – historically when LOSs had to maintain multiple interfaces, it would have been more likely for there to have been a charge to the lender.)

- IT profile 3 – Lenders that have old IT legacy platforms.

  In this scenario the only option for achieving MISMO operability is to convert the lender's existing data to MISMO format. The process of modifying databases and changing interfaces would be a big effort and would cost several $M.

  It is not possible to obtain information on these costs from the legacy lenders that have undertaken – or are planning to undertake – this development process. In addition to the challenges discussed above (section 4.1.1), many of the lenders within this profile don't have this information, since they have deferred much of the work required to achieve full MISMO operability. Additionally, the conversion work that has occurred has often taken place as part of other technology projects, going back almost 20 years, making it difficult for even the lenders to themselves to find specific cost numbers.

4.2.5 Implications of the US Experience for "Legacy Lenders" in Canada

Finding 22: A gradual roll out process could be adopted for legacy lenders in Canada, which would involve deferring the major IT implementation costs until substantial benefits from using data standards have begun to be realized.

Supporting evidence

Rather than modifying the data and data formats in their systems many of the large lenders in the US have instead just developed systems for priority transactions. For example, since 2010 the GSEs in the US have required data on the mortgages they purchase from lenders to be transmitted using data standards based on MISMO (specifically, the Uniform Mortgage Data Program). Accordingly, data standards were partially implemented by many lenders at around that time but were limited to data points required for the delivery of loans to the GSEs.[17]

This history in the US provides a model for a gradual roll-out process of MISMO that could be followed in Canada. The basic idea is that the initial standards for Canada (which aren't defined at this time) could be defined by a set of priority data standards with which industry participants agree. This would involve the following steps:

(a) Establish agreed-to standards methods – governance, change management, and so on.

(b) Create logical data dictionary – this can be done in phases based upon priority data.

(c) Create physical data dictionary.

(d) Develop and agree to transactional content.

(e) Agree to transactional methods and formats – may be xml, may be something else.

(f) Data definitions and transactions would be adopted by industry participants based upon agreed-on timeframes.

The key thing is a common set of data with common data definitions, structures, values, and uses.

[17] Urban Institute, 2018, *The Case for Uniform Mortgage Servicing Data Standards*.

In terms of timeframes for adoption (step (f)), the process for the large banks could be as follows:

(1) Opt-in integration period – There would be no projects that specifically require the use of the standards, just a time period when the banks look for integrations that could use the standards, and they would commit to incorporating them where appropriate. When banks develop new technology solutions going forward, they could voluntarily use the standards that were agreed on. There would potentially be incremental costs for those projects, but nothing that would make a project significantly more expensive.

(2) Limited roll-out for priority transactions (the priority transactions would be identified by the industry participants). During this period the participating banks would develop integrations to the specific formats to facilitate the priority transactions. In these cases the banks wouldn't have to necessarily rebuild their systems; they would just have to modify their integrations to produce and consume the standards format. These projects wouldn't be large-scale. They basically would involve:

    (a) Mapping their current integration data format to the industry standard; and

    (b) Developing an integration that transforms the data from their current format to the industry standard format and vice-versa.

(3) Longer-term use of additional standards – This would be voluntary, and would happen over time at the pace decided on by the banks. It would involve converting lender data and systems to MISMO formats, as opposed to just using MISMO for integrations.

    This is the stage where significant costs would be incurred. Hopefully by this time, the banks would have started to realize that there are substantial benefits from using data standards as well as costs. For example, in the US, many mortgage companies started using MSMO for credit very early – it was just a subject area that lent itself to MISMO; and as it became a norm for credit transactions, the incentives for other companies to take advantage of the standard became greater. Over time, more transactions and systems have started to confirm to MISMO – when the benefits of being on a standard outweighed the transition costs of moving to the standard.

    The Mortgage Bankers Association in the US used this voluntary approach – it has been primarily up to the mortgage lenders and technology firms to adopt the standards when it made sense for them (although in recent years the GSEs have used their market position to "encourage" adoption for certain transactions.[18]

It should be emphasized that this is a cost deferral plan. Data management is expensive no matter what. Data standards drastically reduce the cost of data management between trading partners, because the data standards create a common language for exchanging data. However, although the benefits of adopting data standards are significant, as shown elsewhere in this report, it is not possible to definitively assess the extent to which these benefits may or may not outweigh the costs for legacy lenders.

4.3 Illustrative Comparisons of Costs and Benefits

4.3.1 Introduction

In order to weigh the costs and benefits of mortgage data standards, it would be ideal to compare the quantitative estimates of the benefits of mortgage data standards calculated in section 3.2 with the estimates of implementation costs described in section 4.2. Unfortunately this cannot be done.

[18] Fannie Mae (2019), *Without Data Standards the Mortgage Industry Doesn't go Digital*.

In order to compare the costs and benefits, both the benefit estimates and the cost estimates would have to be calculated by type of lender (banks, credit unions, and non-bank mortgage lenders). This is not difficult for the benefit estimates; the main benefit estimates (categories 2 and 3) are based on the number of mortgages issued annually, which can be broken down by type of lender. However, it's not possible to estimate implementation costs by type of lender, because we would need to know the percentage of lenders of each type within each of the three IT profiles, and that data is not available.

However, for the purpose of illustrating hypothetical cost-benefit calculations, we can assume values for the percentages of each lender type within each IT profile. These values might not be able to be defended as "reasonable," but we believe they are realistic. The calculations follow.

4.3.2 Illustrative Calculations

4.3.2.1 Illustrative Calculations of Benefits[19]

From section 3.2, we know that the annual category 2 and category 3 benefits per mortgage issued are equal to the total annual benefits divided by the number of mortgages issued

= $24,849,000,000/7,930,000 = $3,134.

To derive the annual benefits by type of lender, we need to know the percentages of mortgages issued by each type of lender, which are assumed to be[20]:

Banks = 46%
Credit unions = 10%
Non-bank lenders = 44%

The calculations of benefits by type of lender are then straightforward; for example:

The annual benefits for banks = the number of mortgages issued by banks x $3,134

= 7,930,000 x 0.46 x $3,134 = $11,432 M

Similarly, the annual benefits for other types of lenders are:

Credit unions = $2,485 M
Non-bank lenders = $10,916 M

4.3.2.2 Illustrative Calculations of Costs

Here we need to make three assumptions:

(1) The breakdown of the number of lenders of each type:

Banks = 5,247[21]
Credit unions = 6,160[22]
Non-bank landers = 858[23]

[19] All calculations are based on the study period, unless otherwise noted.

[20] Based on the actual breakdown for 2017 reported in *US Mortgage Market Statistics,* Magnify Money, December 2018, then modified using trend data for the study period from *Trends in Mortgage Origination and Servicing,* Federal Deposit Insurance Corporation Quarterly Report, November 2019.

[21] From *Number of FDIC-Insured Commercial Banks in the US*, Statistica, November 2019.

[22] From *Number of Credit Unions in the US from 2013 to 2018*, Statistica, March 2019.

[23] Data provided by MBA.

(2) The breakdown of each type of lender by IT profile:

Lender type	Profile 1 (%)	Profile 2 (%)	Profile 3 (%)
Banks	30	30	40
Credit unions	60	30	10
Non-bank lenders	70	30	0

The assumptions in this table are admittedly somewhat arbitrary. However, they are loosely based on our interviews (e.g., what lenders said about IT costs) and the relevant literature (e.g., reluctance of the large banks to convert their existing data to MISMO format). For example, the assumption that 40% is the percentage of banks that are still heavily dependent on old legacy systems does not seem unrealistic. It should be kept in mind that this assumption is 40% of all banks, not 40% of the large banks.

(3) The annual implementation costs by lender type (assuming the conversion to MISMO format was done over a five-year period):

Profile 1 lenders = $150 K
Profile 2 lenders = $200 K
Profile 3 lenders = $2 M

These cost assumptions are loosely based on the order of magnitude cost estimates in section 4.2. The assumption that is the main driver of the results is the assumption regarding implementation costs for profile 3 lenders, and we have done some sensitivity test on that assumption – i.e., $4 M/year and $6 M/year.

Given these assumptions, the calculations of the annual implementation costs are straightforward. For example:

Costs for banks = 0.3 x 5,247 x $150,000 + 0.3 x 5,247 x $200,000 + 0.4 x 5,247 x $2 M = $4,749 M

And similarly for the other two types of lenders.

4.3.2.4 Summary of Illustrative Calculations

Finding 23: It is highly likely that the economic benefits of mortgage data standards significantly exceed the implementation costs.

Supporting evidence

Table 15: Summary of illustrative calculations

Type of lender	Annual benefits of mortgage data standards ($M)	Annual IT Implementation costs, assuming $2 M/year implementation costs for profile 3 lenders ($M)	Benefits minus costs ($M)	Benefits minus costs, assuming $4 M/year implementation costs for profile 3 lenders ($M)	Benefits minus costs, assuming $6 M/year implementation costs for profile 3 lenders ($M)
Banks	11,433	4,749	6,684	2,486	-1,712
Credit unions	2,485	2,156	329	-903	-2,135
Non-banks	10,916	142	10,774	10,774	10,774
Totals	24,834	7,047	17,787	12,357	6,927

It can be seen in Table 15 that the benefits minus costs are positive in every scenario. The overall conclusion in finding 23 seems credible, even though, because of the assumptions that had to be made, the values of the individual numbers are not particularly meaningful, including the breakdown of the calculated net benefits by lender type.

Note that these calculations do not include the other benefits of data standards that we have not quantified (see section 3.3). Note also that these are estimates of annual benefits during an assumed five year implementation period. After this period, the benefits would be the same but the costs would be minimal, so the benefits minus costs would be much greater.

5.0 Conclusions Regarding the Benefits of Implementing Mortgage Data Standards in Canada

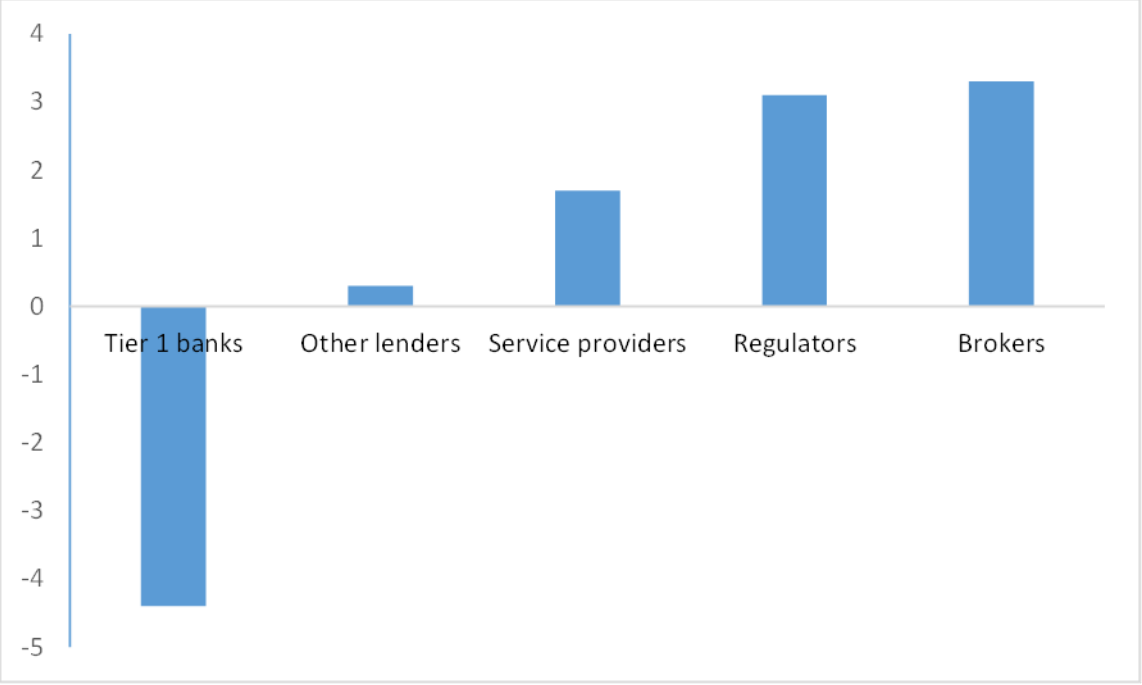
5.1 Summary of the Perceptions of Canadian Mortgage Industry Organizations

Finding 24: The perceptions of industry participants regarding the net benefits (benefits minus costs) for their organization of implementing mortgage data standards are positive on balance, but vary widely by the type of organization:

- The Tier 1 banks are very negative about the potential net benefits of mortgage data standards for their organization.
- Other lenders and service providers are slightly positive about the potential net benefits.
- Regulators and brokers are very positive about the potential net benefits.

Supporting evidence

All respondents were asked: Do you feel that the benefits for your organization would outweigh the costs? Each response was rated on a -5 to +5 scale, where -5 = major net costs; 0 = costs and benefits about the same; and +5 = major net benefits. The averages of these ratings are shown below.



The net benefits ratings by the Tier 1 banks should not be surprising in view of the previous tables (see sections 3.1.1 and 4.1.3). Based on our interviews of the Tier 1 banks:

- They are not necessarily negative about the concept of mortgage data standards.
- However, they perceive that mortgage data standards would not be beneficial to them, because:
  - They have sufficient resources and business knowledge readily available in the banks to discuss, implement, and automate any potential data issues that might appear from time to time (e.g., income definition, customer debt ratios, LTV, product category/definition). They see these data issues as one-time things – after they solve them, they automate the way to deal with them, and they don't have any more problems.
  - They already have internal data dictionaries and data definitions.
  - All their vendors build their solutions for the respective bank's definitions.
  - Given their market share, they wouldn't benefit from more transparency, as they have all the necessary information for modelling, analyzing market trends, forecasting, and so on (or, if necessary, they can easily get the necessary information);
  - They have large IT legacy systems and automated reporting in place that would cost them many millions to change to accommodate new data standards

5.2 Extrapolation of US Benefit Findings to Canada

Finding 25: The estimated annual benefits of implementing mortgage data standards in Canada are on the order of $4 billion.

Supporting evidence

We assume that the introduction of mortgage data standards in Canada would lead to similar improvements and efficiency gains as have been realized in the US market. Using the benefits estimates from the US market calculated in section 3.2 as a baseline, we can forecast the potential benefits to the Canadian market. In order to do so, we have assumed that, on the whole, the US and Canadian mortgage markets are relatively comparable. (We investigated a number of differences in the two mortgage markets, such as the fact that the standard Canadian mortgage is renewed every five years, and we also investigated the definitions underlying the data we collected. We concluded that none of these factors materially affects the extrapolation.)

In order to extrapolate our benefits estimate to the Canadian market, we compare the number of mortgages originated in the US market with the number of mortgages originated in the Canadian market. We consider the average over the three most recent years of data, since the projection to the Canadian market is forward looking, assuming mortgage data standard are introduced in the future.

Table 16 below summarizes the mortgage loan origination information for the residential markets in Canada and the US.

Table 16: Residential mortgage originations in Canada and the US

Loan Originations				
		Canada		**US**
2015		1,012,478		7,404,258
2016		1,025,426		8,377,907
2017		959,074		7,330,496
Average	**A**	998,993	**B**	7,704,220
Source		CMHC		HMDA [A1-A3]
Relative size of Canadian market to US market		**C = A/B**		**13.0%**

The Canadian market is approximately 13 percent of the US market. We can therefore multiply 13 percent by the USD 24,962 M in total benefits we estimated in section 3.2 and estimate that the savings to the Canadian market would be roughly USD 3,237 M, or CAD 4,100 M[24].

5.3 Likelihood of Adoption of Mortgage Data Standards by Canadian Legacy Lenders.

Finding 25: If mortgage data standards are implemented in Canada, legacy lenders will, over time, convert their data systems to be compatible with MISMO formats, most likely using some sort of gradual roll-out process.

Supporting evidence

As discussed in section 4.2, many of the large lenders in the US with legacy IT systems have deferred much of the work required to achieve full MISMO operability. Rather than modifying their data and data formats early on, the way they conducted transactions using MISMO data standards was by translating their data to transactional standards for interacting with the GSEs and others.

According to the recent Fannie Mae paper on this subject[25]: "In the short term, many lenders [in the US] will continue to avoid large systems overhaul projects. Legacy lenders tend to rely on the same human-based processes that have served them well over the past decade — or longer. These processes allowed them to survive the default crises and to handle the ensuing new regulatory compliance hurdles. However, the legacy model has a high fixed-cost profile and is not agile. As competitors move to a much nimbler approach based on leveraging standards and emerging technologies [in order to enhance the borrower experience through portal and workflow technology], the legacy lenders will eventually reach a point where they cannot cut variable costs anymore."

Therefore more recently, in order to remain competitive, particularly with Fintechs, some of these large landers in the US have begun to transform their data, data formats, and data definitions in order to be able to engage in MISMO-based transactions more fully.

If data standards were adopted in Canada, the same sort of evolution would be likely to happen here, with the speed of conversions to data standards depending on the implementation process (see the discussion of a gradual roll-out process in section 4.2).

What is clear is that the transition to mortgage data standards is inevitable. All industries continue to demand more data – to enable automated processing, assess risk, select products, identify possible fraud, cross-market products, and so on. The mortgage industry is no different. As stated in the Fannie Mae paper referenced above:

> "Data standards are the foundation for the new digital model, providing benefits across the board — from a common vocabulary and taxonomy to reducing inconsistencies, simplifying processes, and improving interoperability. Without this foundation, the mortgage industry would not successfully go digital."[26]

[24] In order to determine the benefit value in 2019 Canadian dollars, we need to convert the US dollar estimate. Since this estimate is based upon US dollars between the period 2012-2017, we take the average exchange rate between CAD and USD in the same time period to convert to 2012-2017 Canadian dollars (the average exchange rate in this time period was 1.17 CAD/USD). We then use the Canadian consumer price index (CPI) between 2012-2017 and 2019 in order to convert the estimate to 2019 Canadian dollars (the inflation rate based on CPI was 8.0 percent).

13.0% x USD 24,962M x 1.17 CAD/USD2012-2017x 1.08 =CAD 4,100M

[25] *Op. cit*, Fannie Mae, 2019

[26] *Op. cit*, Fannie Mae, 2019

Appendix A - Transaction Tables

1. Lenders to Regulators

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by Regulators)	Comments
1.1 Outstanding mortgage balances (balances minus write-offs and impairments)		x	
1.2 Credit score data	x	x	Considered potentially problematic due to difference in scores between providers
1.3 Mortgage amortization periods and mortgage terms (incl. currency, re-advancable provisions)		x	
1.4 Property characteristics (single detached vs multiple; assessed value; location)	x	x	
1.5 LTV ratio	x	x	Considered potentially problematic due to infrequency of valuation updates
1.6 Borrower characteristics	x	x	
1.7 Loan arrears status (days past due, staging, allowances)		x	

2. Brokers to Lenders

Data category	Problems potentially experienced transmitting data in this category (by Brokers)	Problems potentially experienced using data that is transmitted in this data category (by Lenders)	Comments
2.1 Financial Status of applicant and co-applicants[1]	x	x	
2.2 Proof of deposit and source of funds	x	x	
2.3 Appraised value of the property	x	x	
2.4 Approved mortgage terms and conditions[2]	Lenders are data suppliers	Brokers are data receivers	

[1] includes Gross annual income, RIF & RRSP statements, Proof of taxes paid, Debts of applicant and co-applicants

[2] includes application decision, approved amount of the mortgage, approval conditions, mortgage terms interest rate and repayment provisions

3. Lenders/Brokers to Underwriters

Data category	Problems potentially experienced transmitting data in this category (by Lenders and Brokers)	Problems potentially experienced using data that is transmitted in this data category (by Underwriters)	Comments
3.1 Financial Status of applicant and co-applicants[1]	x	x	
3.2 Proof of deposit and source of funds	x	x	
3.3 Property details[2]	x	x	
3.4 Approved mortgage terms and conditions[3]	Underwriters are data suppliers	Lenders are data receivers	
3.5 Applicant details[4]	x	x	
3.6 Documentation requirements[5]	x	x	
3.7 Credit score and history of applicant and co-applicant	x	x	

[1] includes Gross annual income, RIF & RRSP statements, Proof of taxes paid, other assets, Debts, Expenses, Proof of rental income if rental property, of applicants and co-applicants and derived ratios

[2] includes appraised value of the property, property appraisal details, property address, property type, owner occupied or rental status, title details

[3] includes application decision, approved amount of the mortgage, approval conditions, mortgage terms interest rate, application status and repayment provisions

[4] includes applicant name, address and contact details, residency status, relationship between applicants

[5] includes title search, agreement of purchase and sale

4. Lenders to Mortgage Loan Insurers

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by Insurers)	Comments
4.1 Applicant details[1]	x	x	
4.2 Property details[2]	x	x	
4.3 Equity/downpayment % and source	x	x	
4.4 Basic Loan details[3]	x	x	
4.5 Additional Loan details[4] Table 4 continued	x	x	
4.6 Credit score and history of applicant and co-applicant	x	x	
4.7 Applicant Income verification	x	x	

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by Insurers)	Comments
4.8 Cost estimates/contracts for renovations or home improvements	x	x	
4.9 Insurance decision	Insurers are data suppliers	Lenders are data receivers	

[1] includes Borrower relationship, time in Canada, residency status

[2] includes purchase price, property address, property type, green home status, property appraisal, borrower occupancy status

[3] includes loan amount, interest rate/benchmark + margin, amortization period

[4] includes LTV at origination, LTV - ongoing, GDS ratio, TDS ratio

5. Lenders to CMHC Securitization (insured mortgages)

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by CMHC Securitization)	Comments
NHA MBS - loan qualification requirements			
5.1 Loan details[1]	x	x	
5.2 Interest rate details[2]	x	x	
5.3 Loan insurer[3]	x	x	
5.4 Arrears details[4]	x	x	
5.5 Securitization pool details[6]		x	
5.6 Registered titleholder		x	

[1] includes loan number, name of mortgagor(s), loan balance, loan maturity/tenor, loan renewal date, remaining amortization period, loan repayment frequency, prepayment priviliges, provisions, penalties and/or indemnities, mortgage rank, cross default provisions

[2] includes interest rate, interest adjustment date, rate type, interest rate index, interest rate reset frequency

[3] includes loan insurer and loan insurer number

[4] includes days past due and date of last arrears

[5] includes NHA MBS Pool number, NHA MBS Pool administrator

6. Lenders to CMHC Securitization (uninsured mortgages)

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by CMHC re requirements for reporting)	Comments
Reporting requirements for uninsured mortgages for NHA MBS issuers - loan level			
6.1 Loan details[1]	x	x	
6.2 Interest rate details[2]	x	x	
6.3 Loan approval details[3]	x	x	
6.4 Property details[4]	x	x	
6.5 Whole Loan Purchase Source	x	x	

[1] includes loan purpose, loan type, loan amount, contractual amortization, loan term, maturity date, interest adjustment date or renewal date, refinance (Y/N)

[2] includes interest rate, interest rate type

[3] includes borrower income, credit borrower score used for approval, GDS used for approval, TDS used for approval, LTV used for approval, combined LTV on all products

[4] includes Property FSA, occupancy type

7. Lenders to Servicers

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by Servicers)	Comments
7.1 Loan details[1]	x	x	
7.2 Borrower details[2]	x	x	
7.3 Arrears status[3]	x	x	
7.4 Property details[4]	x	x	
7.5 Fire insurance details/insurer	x	x	

[1] includes loan number, lender details, loan amount, interest rate/benchmark + margin, interest rate type, funding date, loan term, amortization period, repayment frequency

[2] includes borrower name and borrower address/contact details

[3] includes days past due and performing/non-performing classification

[4] includes property address, property tax rate/amount, property value, title details

8. Lenders to Appraisers

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is trans mitted in this data category (by Appraisers)	Comments
8.1 Property details[1]	x	x	
8.2 Property characteristics[2]	x	x	
8.3 Property sale details[3]	x	x	
8.4 Area, City and Neighbourhood Data		x	
8.5 Rental income	x	x	
8.6 Comparable property sales		x	
8.7 Appraisal details[4]	Appraisers are data suppliers	Lenders are data receivers	

[1] includes identification of the property, including title information , location, existing use, property assessment and taxes, land use controls, contact to access property

[2] includes site size, building type, design/style, age, condition, livable floor area, room count, basement, parking, other characteristics

[3] includes date of sale, sale price, days on market, sales history

[4] includes appraised property value, appraisal method, appraiser, whether appraisal has been disputed, access issues

9. Lenders to Lawyers

Data category	Problems potentially experienced transmitting data in this category (by Lenders)	Problems potentially experienced using data that is transmitted in this data category (by Lawyers)	Comments
9.1 Client details[1]	x	x	
9.2 Property Sale/Purchase details[2]	x	x	
9.3 Mortgage details[3]	x	x	
9.4 Property searches		x	
9.5 Confirmation of insurance	x	x	
9.6 Sale proceed disbursement details (if applicable)	x	x	
9.7 Occupancy details, potential other requirements by municipality/province	x		

[1] includes full name, date of birth, home address and telephone number, occupation, residency status 2 - includes agreement of purchase and sale, real estate agent details, relationship of purchasers

[2] includes details of any existing mortgages or lines of credit against the property, mortgage company details, broker details (if applicable), loan disbursement details

[3] includes land survey, status certificate, title search results, tax search results, utility search results

10. Lenders (or Lawyers) to Title Insurers

Data category	Problems potentially experienced transmitting data in this category (by Lenders of their Lawyers)	Problems potentially experienced using data that is transmitted in this data category (by Title Insurers)	Comments
10.1 Policy details[1]	x	x	
10.2 Property details[2]	x	x	
10.3 Mortgage details[3]	x	x	
10.4 Property search results[4]	x	x	
10.5 Fraud prevention[5]	x	x	
10.6 Lawyer details		x	
10.7 Insurance details[7]	x		

[1] includes anticipated closing date, transaction type, policy type

[2] includes full legal description of property, property address, property type, property occupancy, purchase price, interest in land, survey details, purchaser name

[3] includes lender name, mortgage amount, mortgage priority, proceed disbursement recipients

[4] includes registered instruments on property and whether they are to be discharged, tax search results, utility search results, condominium status certificate, execution search results, other endorsements required

[5] includes customer ID verification, deposit paid to vendor?, title transferred in last 6 months, title insurance refused by other lender?, power of attorney being used

[6] includes vendor name, vendor solicitor

[7] includes insurance decision and premium

11. Servicers to Lenders

Data category	Problems potentially experienced transmitting data in this category (by Servicers)	Problems potentially experienced using data that is transmitted in this data category (by Lenders)	Comments
11.1 P & I repayment data & reconciliation	x	x	
11.2 Matured or prepaid loans	x	x	
11.3 Foreclosure data	x	x	
11.4 Arrears data	x	x	

12/13. Data transactions involving loan origination system (LOS) providers

LOS providers have mortgage data interactions with both lenders/brokers and underwriters as follows:

(a) Brokers/Lenders -> LOS Providers -> Underwriters, and

(b) Underwriters -> LOS Providers -> Brokers/Lenders.

These data interactions are especially complicated to map, since they would necessitate the development of four transaction tables (one for each of the four arrows). For simplicity we have chosen to focus on the two of these that are related to LOS providers' interactions with Underwriters:

(a) Problems experienced by LOS Providers in transmitting data to Underwriters and problems experienced by Underwriters in receiving data from LOS Providers

(b) Problems experienced by Underwriters in transmitting data to LOS Providers and problems experienced by LOS Providers in receiving data from Underwriters

Furthermore we have used the Lender/Broker to Underwriter table (table 3) mappings to represent these transactions as follows:

LOS providers' interaction with Underwriters	Represented by
(a) Problems experienced by LOS providers in transmitting data to Underwriters	Table 3: Problems experienced by Lenders/Brokers in transmitting data to Underwriters
(b) Problems experienced by Underwriters in receiving data from LOS Providers	Table 3 reversed (i.e., Problems experienced by Underwriters in receiving data from Lenders/Brokers)
(c) Problems experienced by Underwriters in transmitting data to LOS Providers	Item 3.4 (i.e., Problems experienced by Underwriters in transmitting data to Lenders/Brokers)
(d) Problems experienced by LOS Providers in receiving data from Underwriters	Item 3.4 reversed (i.e., Problems experienced by Lenders/Brokers in receiving data from Underwriters)

So we have the following two transactions tables for LOS providers.

12. LOS Providers to Underwriters

Data category	Problems potentially experienced transmitting data in this category (by LOS Providers)	Problems potentially experienced using data that is transmitted in this data category (by Underwriters)	Comments
3.1 Financial Status of applicant and co-applicants[1]	x	x	
3.2 Proof of deposit and source of funds	x	x	
3.3 Property details[2]	x	x	
3.4 Approved mortgage terms and conditions[3]	Underwriters are data suppliers	LOS providers are data receivers	
3.5 Applicant details[4]	x	x	
3.6 Documentation requirements[5]	x	x	
3.7 Credit score and history of applicant and co-applicant	x	x	

[1] includes Gross annual income, RIF & RRSP statements, Proof of taxes paid, other assets, Debts, Expenses, Proof of rental income if rental property, of applicants and co-applicants and derived ratios

[2] includes appraised value of the property, property appraisal details, property address, property type, owner occupied or rental status, title details

[3] includes application decision, approved amount of the mortgage, approval conditions, mortgage terms interest rate, application status and repayment provisions

[4] includes applicant name, address and contact details, residency status, relationship between applicants

[5] includes title search, agreement of purchase and sale

13. Underwriters to LOS Providers

Data category	Problems potentially experienced transmitting data in this category (by Underwriters)	Problems potentially experienced using data that is transmitted in this data category (by LOS Providers)	Comments
3.1 Financial Status of applicant and co-applicants[1]	x	x	
3.2 Proof of deposit and source of funds	x	x	
3.3 Property details[2]	x	x	
3.4 Approved mortgage terms and conditions[3]	LOS providers are data suppliers	Underwriters are data receivers	
3.5 Applicant details[4]	x	x	
3.6 Documentation requirements[5]	x	x	
3.7 Credit score and history of applicant and co-applicant	x	x	

[1] includes Gross annual income, RIF & RRSP statements, Proof of taxes paid, other assets, Debts, Expenses, Proof of rental income if rental property, of applicants and co-applicants and derived ratios

[2] includes appraised value of the property, property appraisal details, property address, property type, owner occupied or rental status, title details

[3] includes application decision, approved amount of the mortgage, approval conditions, mortgage terms interest rate, application status and repayment provisions

[4] includes applicant name, address and contact details, residency status, relationship between applicants

[5] includes title search, agreement of purchase and sale

Appendix B – Interview Guides

Interview Guide for CMHC Securitization Officials

Introduction

We are engaged in a focused effort to bring visibility to important issues related to mortgage data interactions and to produce an evidence-based understanding of the benefits and costs for the industry of the possible implementation of mortgage data standards. By "mortgage data standards" we mean consistent definitions, formats and processes for data shared at various stages throughout the mortgage lending cycle.

An important part of this study is to obtain the views of industry participants, and we are asking for your perspectives, assessments, and suggestions regarding this topic.

Questions regarding the current situation

(1) To what extent are some form of agreed-on mortgage data standards currently used in your interactions with Lenders? Please provide some examples if possible.

(2) Please provide responses regarding the following two tables:

(a) Identify the data categories for which your organization experiences significant inefficiencies or errors due to the lack of consistent data definitions between your organization and Lenders with which you interact, and

(b) At the end of the second part of each table provide your comments regarding potential savings for your organization that would result if there were standard data definitions in place for these data categories for both your organization and Lenders.

Table 1: Problems potentially experienced by CMHC in receiving data from Lenders related to securitized insured mortgages

	Loan details (e.g., loan maturity/tenor, loan renewal date, remaining amortization period, loan repayment frequency, prepayment privileges and provisions, provisions, mortgage rank, cross default provisions)	**Interest rate details (e.g., interest adjustment date, rate type, interest rate index, interest rate reset frequency)**	**Loan insurer**	**Arrears details (e.g., days past due and date of last arrears)**
Inefficiencies and errors experienced				

Table 1 continued

	Securitization pool details (e.g., NHA MBS Pool number, NHA MBS Pool administrator)	Registered titleholder	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced				

Table 2: Problems potentially experienced by CMHC in receiving data from Lenders related to securitized uninsured mortgages

	Loan details (e.g., contractual amortization, loan term, maturity date, interest adjustment date or renewal date)	Interest rate details	Loan approval details (e.g., credit borrower score used for approval, GDS and TDS used for approval, LTV used for approval, combined LTV on all products)
Inefficiencies and errors experienced			

Table 2 continued

	Property details (e.g., property FSA, occupancy type)	Whole Loan Purchase Source	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced				

(3) Are there internal mortgage data transfers within your organization that are problematic – i.e., notably inefficient or a potential source of errors?

- Possible example: drawn down amounts (different databases, different reporting times for authorization and outstanding)

(a) If so, please describe.

(b) Might any of these be mitigated by a system of mortgage data standards?

Questions regarding possible implementation of a system of mortgage data standards

(4) In general, what do you see as the main potential benefits for your organization from the implementation of a system of mortgage data standards?

(5) What do you see as the main potential challenges for your organization that would be associated with the implementation of a system of mortgage data standards?

(6) What do you expect would be the potential costs for your organization of implementing a system of mortgage data standards? Please list costs by category if possible (e.g., software development, IT implementation costs, HR costs).

(7) Do you feel that the benefits for your organization would outweigh the costs? Please explain why or why not.

(8) Other than for your organization, are there any other impacts, either positive or negative, you foresee as a result of implementing a system of mortgage data standards?

THANK YOU FOR YOUR PARTICIPATION!

Interview guide for LOS Providers

Introduction

We are engaged in a focused effort to bring visibility to important issues related to mortgage data interactions and to produce an evidence-based understanding of the benefits and costs for the industry of the possible implementation of mortgage data standards. By "mortgage data standards" we mean consistent definitions, formats and processes for data shared at various stages throughout the mortgage lending cycle.

An important part of this study is to obtain the views of industry participants, and we are asking for your perspectives, assessments, and suggestions regarding this topic.

Questions regarding the current situation

(1) To what extent are some form of agreed-on mortgage data standards currently used in your interactions with underwriters, lenders/brokers, and other mortgage industry participants? Provide some examples if possible.

Possible example: Calculation of GDS and TDS ratios

(2) Please provide responses regarding the following two tables.

(a) Identify the data categories for which your organization experiences significant inefficiencies or errors due to the lack of consistent data definitions between your organization and underwriters with which you interact, and

(b) At the end of the table provide your comments regarding potential savings for your organization that would result if there were standard data definitions in place for these data categories for both your organization and underwriters. Please be sure to specify what you mean by "your organization" – for example, your head office, a typical branch office, your organization overall, etc.

Table 1: Problems potentially experienced by LOS Providers in TRANSMITTING data to Underwriters

	Financial Status of applicants and co-applicants	Proof of deposit and source of funds	Property details (e.g., ap praisal details, title details)	Approved Mortgage terms and conditions
Inefficiencies and errors experienced				

Table 1 continued

Applicant details (e.g., residency status, relationship between applicants)	Documentation requirements (e.g., title search)	Credit score and history of applicant and co-applicant	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced				

Table 2: Problems potentially experienced by LOS Providers in RECEIVING data from Underwriters

	Financial Status of applicants and co-applicants	Proof of deposit and source of funds	Property details (e.g., ap praisal details, title details)	Approved Mortgage terms and conditions
Inefficiencies and errors experienced				

Table 2 continued

Applicant details (e.g., residency status, relationship between applicants)	Documentation requirements (e.g., title search)	Credit score and history of applicant and co-applicant	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced				

(3) Are there internal mortgage data transfers within your organization that are problematic – i.e., notably inefficient or a potential source of errors?

(a) If so, please describe.

(b) Might any of these be mitigated by a system of mortgage data standards?

Questions regarding possible implementation of a system of mortgage data standards

(4) In general, what do you see as the main potential benefits for your organization from the implementation of a system of mortgage data standards?

(5) What do you see as the main potential challenges for your organization that would be associated with the implementation of a system of mortgage data standards?

(6) What do you expect would be the potential costs for your organization of implementing a system of mortgage data standards? Please list costs by category if possible (e.g., software development, IT implementation costs, HR costs).

(7) Do you feel that the benefits for your organization would outweigh the costs? Please explain why or why not.

(8) Other than for your organization, are there any other impacts, either positive or negative, you foresee as a result of implementing a system of mortgage data standards?

THANK YOU FOR YOUR PARTICIPATION!

Interview guide for Servicers

Introduction

We are engaged in a focused effort to bring visibility to important issues related to mortgage data interactions and to produce an evidence-based understanding of the benefits and costs for the industry of the possible implementation of mortgage data standards. By "mortgage data standards" we mean consistent definitions, formats and processes for data shared at various stages throughout the mortgage lending cycle.

An important part of this study is to obtain the views of industry participants, and we are asking for your perspectives, assessments, and suggestions regarding this topic.

Questions regarding the current situation

(1) To what extent are some form of agreed-on mortgage data standards currently used in your interactions with Lenders? Provide some examples if possible.

Possible example: Definition of outstanding loan amount.

(2) Please provide responses regarding the following two tables:

(a) Identify the data categories for which your organization experiences significant inefficiencies or errors due to the lack of consistent data definitions between your organization and Lenders with whom you interact, and

(b) At the end of the table provide your comments regarding potential savings for your organization that would result if there were standard data definitions in place for these data categories for both your organization and Lenders. Please be sure to specify what you mean by "your organization" – for example, your head office, a typical branch office, your organization overall, etc.

Table 1: Problems potentially experienced by Servicers in TRANSMITTING data to Lenders

	P & I repayment data & reconciliation	Matured or prepaid loans	Foreclosure data	Arrears data	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced						

Table 2: Problems potentially experienced by Servicers in RECEIVING data from Lenders

	Loan details (e.g., lender details, loan amount, interest rate/benchmark + margin, interest rate type, funding date, loan term, amortization period, repayment frequency	Borrower details (e.g., contact details)	Arrears status (e.g., days past due and performing/ non-performing classification	Property details (e.g., property taxes, property value, title details)	Fire insurance details and insurer	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced							

(3) Are there internal mortgage data transfers within your organization that are problematic – i.e., notably inefficient or a potential source of errors?

Possible example: The transmission of loan data to the loan arrears management team

(a) If so, please describe.

(b) Might any of these be mitigated by a system of mortgage data standards?

Questions regarding possible implementation of a system of mortgage data standards

(4) In general, what do you see as the main potential benefits for your organization from the implementation of a system of mortgage data standards?

(5) What do you see as the main potential challenges for your organization that would be associated with the implementation of a system of mortgage data standards?

(6) What do you expect would be the potential costs for your organization of implementing a system of mortgage data standards? Please list costs by category if possible (e.g., software development, IT implementation costs, HR costs).

(7) Do you feel that the benefits for your organization would outweigh the costs? Please explain why or why not.

(8) Other than for your organization, are there any other impacts, either positive or negative, you foresee as a result of implementing a system of mortgage data standards?

THANK YOU FOR YOUR PARTICIPATION!

Interview Guide for Brokers

Introduction

We are engaged in a focused effort to bring visibility to important issues related to mortgage data interactions and to produce an evidence-based understanding of the benefits and costs for the industry of the possible implementation of mortgage data standards. By "mortgage data standards" we mean consistent definitions, formats and processes for data shared at various stages throughout the mortgage lending cycle.

An important part of this study is to obtain the views of industry participants, and we are asking for your perspectives, assessments, and suggestions regarding this topic.

Questions regarding the current situation

To what extent are some form of agreed-on mortgage data standards currently used in your interactions with Lenders?

Provide some examples if possible.

Possible example: Application status

(2) Please provide responses regarding the following two tables:

(a) Identify the data categories for which your organization experiences significant inefficiencies or errors due to the lack of consistent data definitions between your organization and Lenders with which you interact, and

(b) At the end of the table provide your comments regarding potential savings for your organization that would result if there were standard data definitions in place for these data categories for both your organization and Lenders. Please be sure to specify what you mean by "your organization" – for example, your head office, a typical branch office, your organization overall, etc.

Table 1: Problems potentially experienced by Brokers in TRANSMITTING data to Lenders

	Financial Status of applicant and co-applicants (e.g., Gross annual income, proof of taxes paid, debts of applicant and co-applicants)	Proof of deposit and source of funds	Appraised value of the property	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced					

Table 2: Problems potentially experienced by Brokers in RECEIVING data from Lenders

	Approved mortgage terms and conditions (e.g., approved amount of the mortgage, approval conditions, mortgage terms, interest rate, and repayment provisions	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced			

(3) Are there internal mortgage data transfers within your organization that are problematic – i.e., notably inefficient or a potential source of errors?

Possible example: Drawn down amounts (different databases, different reporting times for authorization and outstanding)

(a) If so, please describe.

(b) Might any of these be mitigated by a system of mortgage data standards?

Questions regarding possible implementation of a system of mortgage data standards

(4) In general, what do you see as the main potential benefits for your organization from the implementation of a system of mortgage data standards?

(5) What do you see as the main potential challenges for your organization that would be associated with the implementation of a system of mortgage data standards?

(6) What do you expect would be the potential costs for your organization of implementing a system of mortgage data standards? Please list costs by category if possible (e.g., software development, IT implementation costs, HR costs).

(7) Do you feel that the benefits for your organization would outweigh the costs? Please explain why or why not.

(8) Other than for your organization, are there any other impacts, either positive or negative, you foresee as a result of implementing a system of mortgage data standards?

THANK YOU FOR YOUR PARTICIPATION!

Interview Guide for Insurers

Introduction

We are engaged in a focused effort to bring visibility to important issues related to mortgage data interactions and to produce an evidence-based understanding of the benefits and costs for the industry of the possible implementation of mortgage data standards. By "mortgage data standards" we mean consistent definitions, formats and processes for data shared at various stages throughout the mortgage lending cycle.

An important part of this study is to obtain the views of industry participants, and we are asking for your perspectives, assessments, and suggestions regarding this topic.

Questions regarding the current situation

(1) To what extent are some form of agreed-on mortgage data standards currently used in your interactions with Lenders? Provide some examples if possible.

Possible example: Definition of GDS ratio

(2) Please provide responses regarding the following table:

(a) Identify the data categories for which your organization experiences significant inefficiencies or errors due to the lack of consistent data definitions between your organization and Lenders with which you interact, and

(b) At the end of the table provide your comments regarding potential savings for your organization that would result if there were standard data definitions in place for these data categories for both your organization and Lenders. Please be sure to specify what you mean by "your organization" – for example, your head office, a typical branch office, your organization overall, etc.

Table 1: Problems potentially experienced by Mortgage Loan Insurance officials in receiving data from Lenders

	Applicant details (e.g., borrower relationships, time in Canada, residency status)	Property details (e.g., purchase price, property type, property appraisal, borrower occupancy status)	Equity/down-payment % and source	Basic loan details (e.g., loan amount, interest rate/bench-mark + margin, amortization period)	Additional loan details (e.g., LTV, GDS ratio, TDS ratio)
Inefficiencies and errors experienced					

Table 1 continued

	Credit score and history of applicant and co-applicant	Applicant Income verification	Cost estimates and contracts for renovations or home improvements	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced					

(3) Are there internal mortgage data transfers within your organization that are problematic – i.e., notably inefficient or a potential source of errors?

Possible example: loan details for claims process

(a) If so, please describe.

(b) Might any of these be mitigated by a system of mortgage data standards?

Questions regarding possible implementation of a system of mortgage data standards

(4) In general, what do you see as the main potential benefits for your organization from the implementation of a system of mortgage data standards?

(5) What do you see as the main potential challenges for your organization that would be associated with the implementation of a system of mortgage data standards?

(6) What do you expect would be the potential costs for your organization of implementing a system of mortgage data standards? Please list costs by category if possible (e.g., software development, IT implementation costs, HR costs).

(7) Do you feel that the benefits for your organization would outweigh the costs? Please explain why or why not.

(8) Other than for your organization, are there any other impacts, either positive or negative, you foresee as a result of implementing a system of mortgage data standards?

THANK YOU FOR YOUR PARTICIPATION!

Interview Guide for Regulators and Bank of Canada

Introduction

We are engaged in a focused effort to bring visibility to important issues related to mortgage data interactions and to produce an evidence-based understanding of the benefits and costs for the industry of the possible implementation of mortgage data standards. By "mortgage data standards" we mean consistent definitions, formats and processes for data shared at various stages throughout the mortgage lending cycle.

An important part of this study is to obtain the views of industry participants, and we are asking for your perspectives, assessments, and suggestions regarding this topic.

Questions regarding the current situation

(1) To what extent are some form of agreed-on mortgage data standards currently used in your interactions with lenders, mortgage loan insurers, and other mortgage industry participants? Provide some examples if possible.

(2) Please provide responses regarding the following table:

(a) Identify the data categories for which your organization experiences significant inefficiencies or errors due to the lack of consistent data definitions between your organization and lenders and insurers with which you interact, and

(b) At the end of the table provide your comments regarding potential savings for your organization that would result if there were standard data definitions in place for these data categories for both your organization and lenders/insurers.

Table 1: Problems potentially experienced by Regulators in receiving data from Lenders and Insurers

	Outstanding mortgage balances (balances minus write-offs and impairments)	Credit score data	Mortgage amortization periods and mortgage terms (incl. currency, readvancable provisions)	Property character-istics (single detached vs multiple; assessed value; location)
Inefficiencies and errors experienced				

Table 1 continued

	LTV ratio	Property character-istics (single detached vs multiple; assessed value; location)	Loan arrears status (days past due, staging, allowances)	Other data items	Comments regarding potential savings with mortgage data standards
Inefficiencies and errors experienced					

(3) Are there internal mortgage data transfers within your organization that are problematic – i.e., notably inefficient or a potential source of errors?

Possible example: outstanding loan balances (different calculations for write offs and impairments)

(a) If so, please describe.

(b) Might any of these be mitigated by a system of mortgage data standards?

Questions regarding possible implementation of a system of mortgage data standards

(4) In general, what do you see as the main potential benefits for your organization from the implementation of a system of mortgage data standards?

(5) What do you see as the main potential challenges for your organization that would be associated with the implementation of a system of mortgage data standards?

(6) What do you expect would be the potential costs for your organization of implementing a system of mortgage data standards? Please list costs by category if possible (e.g., software development, IT implementation costs, HR costs).

(7) Do you feel that the benefits for your organization would outweigh the costs? Please explain why or why not.

(8) Other than for your organization, are there any other impacts, either positive or negative, you foresee as a result of implementing a system of mortgage data standards?

THANK YOU FOR YOUR PARTICIPATION!

Interview Guide for the Canadian Bankers Association (CBA)

Introduction

We are engaged in a focused effort to bring visibility to important issues related to mortgage data interactions and to produce an evidence-based understanding of the benefits and costs for the industry of the possible implementation of mortgage data standards. By "mortgage data standards" we mean consistent definitions, formats and processes for data shared at various stages throughout the mortgage lending cycle.

An important part of this study is to obtain the views of mortgage industry participants and industry organizations, and we are asking for your perspectives, assessments, and suggestions regarding this topic.

Questions regarding the current situation

(1) Extent of use: Based on your observations, to what extent are some form of agreed-on mortgage data standards currently used in mortgage data interactions between banks and other mortgage industry organizations?

(a) In general, mortgage data standards are used: In _____% of banks' mortgage data interactions; or to a high/medium/low extent; or don't know.

(b) Specifically, in the following types of interactions:

Types of interactions	Extent of use of mortgage data standards high/medium/low or don't know	Examples of the forms of mortgage data standards used
Between banks and regulators		
Between banks and brokers		
Between banks and mortgage loan insurers		
Between banks and securitization officials		
Between banks and other organizations (e.g., servicers, LOS providers)		

(2) Extent of challenges: Based on your observations, to what extent has the lack of mortgage data standards contributed to data interaction challenges and problems – i.e., inefficiencies (e.g., lots of time spent reconciling data) or errors?

(a) In general, extent of challenges/problems due to lack of mortgage data standards: In _____% of banks' mortgage data interactions; or to a high/medium/low extent; or don't know.

(b) Specifically, in the following types of interactions:

Types of interactions	Extent of challenges/problems due to lack of mortgage data standards high/medium/low or don't know
Between banks and regulators	
Between banks and brokers	
Between banks and mortgage loan insurers	
Between banks and securitization officials	
Between banks and other organizations (e.g., servicers, LOS providers)	

Questions regarding possible implementation of a system of mortgage data standards

(3) In general, what do you see as the main potential benefits for banks from the implementation of a system of mortgage data standards?

(4) What do you see as the main potential challenges for banks that would be associated with the implementation of a system of mortgage data standards?

(5) What do you expect would be the main types of costs for banks of implementing a system of mortgage data standards – for example, e.g., software development, IT implementation costs, HR costs?

(6) Do you feel that the benefits for banks would outweigh the costs? Please explain why or why not.

(7) Other than for banks, are there any other impacts, either positive or negative, you foresee as a result of implementing a system of mortgage data standards?

(8) Do you have any other comments regarding this issue?

THANK YOU FOR YOUR PARTICIPATION!

Appendix C – Lender Web Survey

Mortgage Data Standards Project -Web Based Survey of Lenders

As a lender, your organization conducts mortgage data transactions with a number of different organizations.

Tables of main data categories by the types of organizations you may deal with have been developed which we believe include the main mortgage data interactions between your organization and the specified organization.

For each of the seven tables, check the data categories for which your organization experiences significant inefficiencies or errors due to the lack of consistent data definitions between your organization and the specified organization.

Reminder re confidentiality of responses: No individual responses will be transmitted to any party outside of KPMG, and the same is true of organizational responses – individual organizations will not be identified.

1. Problems potentially experienced by Lenders in transmitting data to Regulators

Data categories	Do you experience significant inefficiencies or errors in transmitting this data? Check all that apply	If you checked any data categories, which one is most problematic? Check only one	For the data category you selected as most problematic, how frequently does this problem occur? (Drop down list: Daily Weekly Less Often)	For the data category you selected as most problematic, what is the level of effort required to deal with the problem? (Drop down list: Minimal Moderate Major)
1.1 Credit score data	❑	❑		
1.2 Property characteristics (single detached vs multiple; assessed value; location)	❑	❑		
1.3 LTV ratio	❑	❑		
1.4 Borrower characteristics	❑	❑		
1.5 Other data items (specify)	❑	❑		

1.6 Considering all the problems you have in transmitting data to **regulators**, please provide an estimate of the potential savings for your organization that would result if there were standard data definitions in place for both your organization and the specified organization.	Please enter an annual dollar amount in thousands (e.g., “10,000” for ten thousand dollars annually) *(Survey to restrict to numerical entries only)*

2. Problems potentially experienced by Lenders in transmitting data to Servicers

Data categories	Do you experience significant inefficiencies or errors in transmitting this data? Check all that apply	If you checked any data categories, which one is most problematic? Check only one	For the data category you selected as most problematic, how frequently does this problem occur? (Drop down list: Daily Weekly Less Often)	For the data category you selected as most problematic, what is the level of effort required to deal with the problem? (Drop down list: Minimal Moderate Major)
2.1 Loan details (e.g., lender details, interest rate/benchmark/margin, interest rate type, funding date, loan term, amortization period, repayment frequency)	❑	❑		
2.2 Borrower details	❑	❑		
2.3 Arrears status	❑	❑		
2.4 Property details (e.g., property tax information, title details)	❑	❑		
2.5 Fire insurance details and insurer	❑	❑		
2.6 Other data items (specify)	❑	❑		

2.7 Considering all the problems you have in transmitting data to **servicers**, please provide an estimate of the potential savings for your organization that would result if there were standard data definitions in place for both your organization and the specified organization.	Please enter an annual dollar amount in thousands (e.g., “10,000” for ten thousand dollars annually) *(Survey to restrict to numerical entries only)*

3. Problems potentially experienced by Lenders in transmitting data to Mortgage Loan Insurers

Data categories	Do you experience significant inefficiencies or errors in transmitting this data? Check all that apply	If you checked any data categories, which one is most problematic? Check only one	For the data category you selected as most problematic, how frequently does this problem occur? (Drop down list: Daily Weekly Less Often)	For the data category you selected as most problematic, what is the level of effort required to deal with the problem? (Drop down list: Minimal Moderate Major)
3.1 Applicant details (e.g., relationships between applicants, residency status	❑	❑		
3.2 Property details (e.g., purchase price, property type, appraisal)	❑	❑		
3.3 Equity/down-payment % and source	❑	❑		
3.4 Basic loan details (e.g., interest rate, term, amortization period)	❑	❑		
3.5 Additional loan details (e.g., LTV, GDS ratio, TDS ratio)	❑	❑		
3.6 Credit score and history of applicant and co-applicant	❑	❑		
3.7 Applicant Income verification	❑	❑		
3.8 Cost estimates and contracts for renovations or home improvements	❑	❑		
3.9 Other data items (specify)	❑	❑		

3.10 Considering all the problems you have in transmitting data to m**ortgage loan insurers**, please provide an estimate of the potential savings for your organization that would result if there were standard data definitions in place for both your organization and the specified organization.	Please enter an annual dollar amount in thousands (e.g., “10,000” for ten thousand dollars annually) *(Survey to restrict to numerical entries only)*

4. Problems potentially experienced by Lenders (Issuers) in <u>transmitting data related to securitization of insured mortgages to CMHC</u>

Data categories	Do you experience significant inefficiencies or errors in transmitting this data? Check all that apply	If you checked any data categories, which one is most problematic? Check only one	For the data category you selected as most problematic, how frequently does this problem occur? (Drop down list: Daily Weekly Less Often)	For the data category you selected as most problematic, what is the level of effort required to deal with the problem? (Drop down list: Minimal Moderate Major)
4.1 Loan details (e.g., loan maturity/tenor, loan renewal date, remaining amortization period, loan repayment frequency, prepayment privileges and provisions, mortgage rank, cross default provisions)	❑	❑		
4.2 Interest rate details (e.g., interest adjustment date, rate type, interest rate index, interest rate reset frequency)	❑	❑		
4.3 Loan insurer	❑	❑		
4.4 Arrears details (e.g., days past due and date of last arrears)	❑	❑		
4.5 Other data items (specify)	❑	❑		

4.6 Considering all the problems you have in transmitting data **<u>related to securitization of insured mortgages to CMHC</u>**, please provide an estimate of the potential savings for your organization that would result if there were standard data definitions in place for both your organization and the specified organization.	Please enter an annual dollar amount in thousands (e.g., “10,000” for ten thousand dollars annually) *(Survey to restrict to numerical entries only)*

5. Problems potentially experienced by Lenders (Issuers) in transmitting data related to securitiazation of uninsured mortgages to CMHC

Data categories	Do you experience significant inefficiencies or errors in transmitting this data? Check all that apply	If you checked any data categories, which one is most problematic? Check only one	For the data category you selected as most problematic, how frequently does this problem occur? (Drop down list: Daily Weekly Less Often)	For the data category you selected as most problematic, what is the level of effort required to deal with the problem? (Drop down list: Minimal Moderate Major)
5.1 Loan details (e.g., contractual amortization, loan term, maturity date, interest adjustment date or renewal date)	❑	❑		
5.2 Interest rate details	❑	❑		
5.3 Loan approval details (e.g., credit borrower score used for approval, GDS and TDS used for approval, LTV used for approval, combined LTV on all products)	❑	❑		
5.4 Property details (e.g., property FSA, occupancy type)	❑	❑		
5.5 Whole Loan Purchase Source	❑	❑		
5.6 Other data items (specify)	❑	❑		

5.7 Considering all the problems you have in transmitting data **related to securitization of uninsured mortgages to CMHC**, please provide an estimate of the potential savings for your organization that would result if there were standard data definitions in place for both your organization and the specified organization.	Please enter an annual dollar amount in thousands (e.g., ”10,000” for ten thousand dollars annually) *(Survey to restrict to numerical entries only)*

6. Problems potentially experienced by Lenders in receiving data from Brokers

Data categories	Do you experience significant inefficiencies or errors in receiving this data? Check all that apply	If you checked any data categories, which one is most problematic? Check only one	For the data category you selected as most problematic, how frequently does this problem occur? (Drop down list: Daily Weekly Less Often)	For the data category you selected as most problematic, what is the level of effort required to deal with the problem? (Drop down list: Minimal Moderate Major)
6.1 Financial Status of applicant and co-applicants	❑	❑		
6.2 Proof of deposit and source of funds	❑	❑		
6.3 Appraised value of the property	❑	❑		
6.4 Other data items (specify)	❑	❑		

6.5 Considering all the problems you have in **receiving data from brokers**, please provide an estimate of the potential savings for your organization that would result if there were standard data definitions in place for both your organization and the specified organization.	Please enter an annual dollar amount in thousands (e.g., “10,000” for ten thousand dollars annually) *(Survey to restrict to numerical entries only)*

7. Problems potentially experienced by Lenders in receiving data from Servicers

Data categories	Do you experience significant inefficiencies or errors in receiving this data? Check all that apply	If you checked any data categories, which one is most problematic? Check only one	For the data category you selected as most problematic, how frequently does this problem occur? (Drop down list: Daily Weekly Less Often)	For the data category you selected as most problematic, what is the level of effort required to deal with the problem? (Drop down list: Minimal Moderate Major)
7.1 P & I repayment data & reconciliation	❑	❑		
7.2 Matured or prepaid loans	❑	❑		
7.3 Foreclosure data	❑	❑		
7.4 Arrears data	❑	❑		
7.5 Other data items (specify)	❑	❑		

7.6 Considering all the problems you have in **receiving data from servicers**, please provide an estimate of the potential savings for your organization that would result if there were standard data definitions in place for both your organization and the specified organization.	Please enter an annual dollar amount in thousands (e.g., "10,000" for ten thousand dollars annually) *(Survey to restrict to numerical entries only)*

Appendix D - Bibliography

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