

RUST-OUT
WORKING PAPER

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SUMMARY AND CONCLUSIONS

This study has two goals: (i) an overview study of the contributing factors to rust-out and their relationship to asset management decision making; and (ii) an in-depth study of expenditure levels as one contributing factor to rust-out.

We have explored the complexities of rust-out and identified some of the contributing factors and solutions. With respect to expenditure levels we have uncovered some insights, but only scratched the surface with our quantitative analysis. This is due primarily to data limitations. The data limitations reflect the complexity of the problem, which is only partially understood. Systems and procedures to report data for analyses and monitoring do not yet exist.

SUMMARY OF FINDINGS

Part I: Factors Contributing to Rust-Out.

- Rust-out can be viewed at the component, building or portfolio levels.
- A rust-out problem can be critical or non-critical. Criticality is a function of building conditions and programme mandate. As such, a rust-out problem can be critical at the component or building level but non-critical at the portfolio level.
- Factor contributing to rust-out can be considered singly or, as more often the case, in combination with other factors. This makes the causes of a rust-out problem complex (involving a number of issues and factors), subtle (no one obvious cause), and interconnected (involving questions not immediately related to rust-out, such as corporate strategies).
- Heritage is a significant factor because maintenance and repair work is more costly, and will become more costly in the future. There is an aversion to do any renovation work because of stringent heritage regulations, which may actually end up aggravating the rust-out situation because an organizations is deterred from doing the proper maintenance/repair work.
- Technological upgrading is expensive and has limitations. It may be cheaper to replace a building or relocate the use. The situation gets worse for heritage buildings.
- Code and regulation compliance can mean minor or major expenditure, depending on building age and type. Again, heritage buildings are at a disadvantage. Early compliance, especially before the passing using of a health/safety/fire legislation, may result in lower expenditures or, at least, better planned expenditures.
- User and client demands can change in response to changes in demographics, market, technology, etc. This calls for long-term planning with options such as conversion and asset disposal. In the short-term, these demands put additional stress on buildings.

- Organizations have to recognize that reinvestment is unavoidable. Some view it as an opportunity for reuse. Mothballing has carrying costs, and presumes possible future use. It has to be considered together with demolition. Leasing offers flexibility. Disposition is becoming a popular solution, but it only works with a portfolio approach guided by long-term strategic goals.

Part II: Expenditure Levels as Both a Cause and Solution to Rust-Out.

- The distinction between maintenance and capital works can be theoretically clear, but in practice, it is quite confused. Sometimes it is just an accounting procedure that has no reality (e.g. when a dollar threshold is used to distinguish between maintenance and capital expenditure). In fact, these can be considered as two sides of the same coin--both are needed to make the building adequate to fulfill its functions.
- Deferred expenditure can simply be defined as an unfulfilled wish list, any budget shortfalls between what is requested and what is approved, and critical and emergency work.
- Accounting peculiarities aside, organizations have different expenditure patterns for their maintenance and capital work expenditures, ranging from a 30/70 split to 90/10 split.
- The famous 2+2 formula (2% of replacement cost of the building to be spent annually on each of maintenance and capital) is not something enshrined by the Building Owners' and Managers' Association (BOMA). BOMA puts out average cost per square foot for different building types, based on field observations and building life cycles, from which a roughly 2 + 2 formula can be deduced.
- We have no concrete findings (although our informants were quite adamant about it) that suggests "deferred maintenance" expenditure will lead to "higher capital" expenditure (nor higher future maintenance expenditure). Intuitively, our informants talked about an "escalation factor" or a "grapevine effect" that translate deferred maintenance into higher future costs. However, we have not factored in legal liabilities, which may indeed show that deferred maintenance leads to higher future costs.
- More and more, the tendency is towards patching up rather than replacement. Also, some argue that by deferring maintenance it may be possible to do all the needed work together, thus saving costs and reducing disruption to users. Over-zealous replacement of building components can actually damage the overall building system. Some argue that lower expenditure levels actually promote more efficient asset use and better management skills.
- Our very limited quantitative analysis suggests that there is no clear relationship between the amount of maintenance spending and capital spending. The total expenditure (maintenance and capital) for our case analysis hovers around 2%, whatever the split between maintenance expenditures and capital expenditures.
- The setting of expenditure levels has been based on some formula (cost per square foot and percentage of replacement value), as well as on revenue potential/generation of the asset.

- The prioritization of funds has been mainly based on health and safety concerns and importance of the asset to the mandate of the organization. There are a number of different prioritization systems.
- Long-term planning is clearly the preferred approach to reinvestment, focusing on the actual conditions of buildings and their use rather than any pre-determined work schedule.
- Other than increasing the expenditure levels as a solution to rust-out, informants talked about setting a life-line maintenance budget, applying a charge-back concept, embarking on preventive maintenance, developing uniform reporting and monitoring procedures, and establishing appropriate benchmarks and data bases.

CONCLUSIONS

What can this study of rust-out from the viewpoints of provincial, municipal and other quasi-public agencies inform federal departments? From the federal viewpoint, there are two parts to the question: the determination of the magnitude and urgency of the rust-out problem, and the allocation of funds among departments in order to deal with the problem.

At the beginning of this report we stated that the purpose of this research is to assist the federal government departments to (i) analyze the factors contributing to rust-out, (ii) provide justifications for reinvestment, and (iii) devise best management practices that can help avoid future problems. The following are some tentative thoughts.

With respect to the identification of contributing factors to rust-out, the findings point to the portfolio approach as the preferred approach. This approach can better handle the complexity and subtlety of causes and issues. Indeed, the problem of rust-out may well be interconnected with the corporate mandates and goals of an organization. The individual contributing factor of heritage, technology, code and regulation requirements, and user/client needs are common among organizations, federal or non-federal. What is important to know, though, is there is no agreed ranking of their relative significance. Everything depends on the physical conditions of the assets and the organization's goal, mandate and culture.

Everyone agrees that reinvestment will always be necessary. The question is how much. We found that there is no practical distinction between maintenance and capital in that they are different but related expenditures to keep a building in a reasonable operating shape. There is also no discernable relationship between historical expenditure levels. In other words, deferred maintenance does not seem to have created heavier future expenditure. Of course, part of this can be explained readily by the fact that organizations always seem to be able to come up with the money when the conditions deteriorate to dangerous levels, but before the system collapses.

As a result, the stop-and-go expenditure pattern only reflects a management-by-crisis mindset. As long as the system does not collapse (in our case, as long as buildings do not begin to crumble or people getting seriously hurt), there is no real measure of the cost of deferred maintenance.

Notwithstanding the above, we found a 2% total expenditure (maintenance and capital) to be a rather stable figure. This may suggest that our present “problem” is a manifestation of spending deficits in the past.

There is pressure for spending wisely (both in the amount of money to be spent and its allocation). But we must recognize that there is a “cost” in setting up elaborate systems of reporting, monitoring and evaluation. There is also a “cost” in devising sophisticated models to plan and manage. These costs may not be overtly monetary, but they are nonetheless real in terms of people’s energy and morale.

It seems that a central agency such as the Treasury Board may want to consider a simple norm or formula (a total maintenance and capital expenditure as a percentage of total replacement value of assets) and let the asset managers devise their own way to allocate the funds between maintenance and capital, and among the assets.

Future rust-out problems can never be avoided totally because the definitions of what constitutes a problem keep changing (heritage, technologies, code and regulations, user/client demands, etc). But too sophisticated a monitoring and allocation system can be costly, and there is no guarantee that it will do the job. It may be well to keep things simple and flexible.

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INTRODUCTION

"Rust-out" is defined as *“the deterioration of a real property asset, which limits or prevents the ability of such asset to serve the purpose for which it is retained”* (Federal Treasury Board, RPM 7050-008, March 17, 1999). This research, sponsored by the Queen’s Land Forum, addresses two aspects of “rust-out”: What contributes to rust-out? and How do expenditure levels relate to rust-out? The study findings are reported in two parts.

- **PART 1:** An overview of the contributing factors to rust-out and their relationship to asset management decision making. These include expenditure levels, heritage, technology, codes and regulations, and changing use and client demands.
- **PART 2:** An in-depth examination of expenditure levels as one contributing factor to rust-out. This includes understanding the financial relationship between maintenance, capital expenditure and deferred maintenance, and identifying any rules of thumb and prioritization systems.

The research team is made up of Professor Hok-Lin Leung and Mr. John Norris, and it reports to a steering group consisting of the federal Treasury Board (Chair), Public Works and Government Services Canada, and Natural Resources Canada. However, this research project is independent of concurrent federal research initiatives into the rust-out issue.

The research focuses on the experience and insight of asset-holding/managing organizations and groups outside the federal government (i.e. other levels of government, private, and quasi-public). The purpose is to provide a perspective as well as some concepts, procedures, and insights that can be used by the federal government to (i) analyze the factors contributing to "rust-out", (ii) provide justifications for reinvestment, and (iii) devise best management practices that can help avoid future problems.

An initial scoping exercise, completed in June of 1999, comprised a literature review and some interviews. Much of the literature came from the building sciences, real estate, economics and appraisal. In addition, the working group met twice to brainstorm. There was limited literature on the topic of "rust-out" specifically. Instead, the literature addressed salient issues such as maintenance in general, deferred maintenance, asset management, asset use and program delivery, rehabilitation /upgrading /modernization, obsolescence, heritage, legal restrictions /compliance, reinvestment /recapitalization, and asset disposition. This research sought to relate them to rust-out.

RESEARCH METHOD & IMPLEMENTATION

LITERATURE REVIEW

This is a detailed review of the policy and practice literature found outside the purview of federal government departments, such as from professional institutes and trade organizations.

The academic, booked-based literature was primarily useful for theory and definitions. The practical/policy literature was more useful for understanding the complexity of rust-out. For example, the Canada Mortgage and Housing Corporation (CHMC) publishes several studies relating to its building stock, including those that estimate the level of deterioration as well as required level of maintenance and life-cycle replacement. Also, the American Public Works Association (APWA) 1990 study, *Committing to the Cost of Ownership, Maintenance and Repair of Public Buildings*, drew far-reaching conclusions regarding maintenance, repair, and funding levels.

There are many similarities between the academic and policy/practice literature about the subject matters they covered, but individual studies do not generally address the complexity between maintenance, replacement and obsolescence.

CASE STUDIES

These are based on key informant interviews (Appendix 1) using an open-ended structured interview format (Appendix 2) and review (where available) of financial statements and budgets, policy guidelines, and procedures.

Interviews were conducted with both maintenance/facilities managers and capital/finance personnel from a number of organizations, including: the Archdiocese of Ottawa, City of Kingston, City of Ottawa, City of Toronto, Metropolitan Toronto Housing Authority, Ministry of Health, Ottawa District School Board, Ontario Hydro, Queen’s University, and the Ontario Realty Corporation.

ORGANIZATION OF THE STUDY AND FINDINGS

The study used two templates to organize the complexities of rust-out issues: one for studying the contributing factors to rust-out (Part I), and the other for the in-depth study of expenditure levels as one of the contributing factors (Part II).

The Part I template has four components:

- Scope and Nature – Scope refers to the scale at which rust-out is considered to be a problem. It can be at the component, building, and portfolio level. Nature refers to whether the rust-out problem is critical or non-critical to the organization concerned.

- Contributing Factors - which vary in magnitude and urgency. These can be single or multiply factors.
- Rust Out Solutions - including reinvestment, demolition, mothballing, leasing, and disposition.

The Part II template has four components:

- The Concept of Expenditure - including the distinction between maintenance and capital, and their interchangeability.
- Effect and Impacts of Expenditure – including deferred expenditure and the legal implications of deferred maintenance.
- Factors Affecting Expenditure Levels – including prioritization systems and justification for expenditure levels.
- Expenditure Levels as Solution to Rust Out - including higher investment levels, charge-back systems, and procedures and practices.

FINDINGS – PART I

The is an overview of the contributing factors to rust-out and their relationship to asset management decision-making.

SCOPE OF RUST-OUT

Rust-out can be described on a number of levels (component, building and portfolio). Each of these levels can vary in nature (critical or non-critical). This way of describing rust-out can entertain some degree of subtly, complexity and interconnectiveness.

The definition of rust-out as “*the deterioration of a real property asset, which limits or prevents the ability of such asset to serve the purpose for which it is retained*” goes beyond the traditional conception of facilities management, which focuses only on physical deterioration, life cycle costing, and maintenance practices. The broader definition accommodates the demands of changing use and the other non-monetary solutions to rust-out. As such, it allowed our informants to put forth a great variety of insights regarding the description and analysis of the rust-out problem.

Describing Rust-Out

Informants have described rust-out in relation to components (e.g. roofing systems), buildings (e.g. specific heritage buildings), or portfolio (e.g. the overall condition of the buildings). They also described their rust-out as critical (e.g. an urgent need for capital reinvestment) or non-critical (e.g. an every-day part of facilities management).

- The City of Kingston had an old limestone building which had developed leaks inside the walls. It was considered by the City as a structural problem and the walls were fixed. However, the City did not do any internal repairs (no money), and the building, while made safe was not usable because the inside was not fixed. In other words, the repairs of the external walls did not address the real issue which was to restore the building use. The City of Kingston now realizes that in order to reuse the building it needs to raise funds from outside its usual budget. It is currently investigating the possibility of entering into a private/public partnership to raise the necessary capital for interior repairs, to be repaid by future rent. This is an example of a critical rust-out problem at the building level.
- The City of Ottawa considers the rust-out problem in some of its buildings as part of deferred works. It believes it has good systems in place to prioritize expenditures and that a temporary shortfall of money within the "protect asset" category (prevention of rust-out) constitutes only a non-critical situation at the portfolio level.

Explaining Rust-Out

Informants used a variety of factors to explain their rust-out problem (e.g. heritage, age, changing use, and codes and regulations). These were viewed (i) in isolation (ii) in conjunction with another.

- The Ottawa-Carlton School Board has to manage three factors at the same time: adaptation to changing programme need, funding shortfall in maintenance and capital repairs, and the need to comply with code changes. There is pressure to change many of its workshops to computer labs. It realizes that a facility can become obsolete to academic needs within an eight- to ten-year cycle, yet the facility can have a much longer physical life span. So there are always difficulties in matching buildings to program needs. At the same time the Board has to do regular maintenance and capital repairs to the buildings, as well as to upgrade constantly the facilities for code changes (health and safety issues, such as mold spores).
- Rust-out can be caused in some very “unconventional” situations. As a public organization out-sources and privatizes its operations but not its buildings, some functions will be performed by the "out-sourcers" in buildings owned and operated by the public organization. These tenants (out-sourcers) will be paying market rent and will demand adequate building maintenance and repair. Any inability to meet with the tenants' demands through the rents collected is an indication that the buildings are not really viable commercially. This is "induced" rust-out, and may sometimes prepare the ground for the eventual disposal of the buildings.

Understanding Rust-Out

The rust-out problem has many complexities (e.g. a large number of issues and factors involved), subtleties (not obvious relationship and effects), and interconnectedness (rust-out strategy connected with other corporate strategies).

- Both Ontario Hydro and the Ontario Realty Corporation have widely distributed facilities across Ontario, with a sizable portion of their portfolio dating from the 1950’s and 1960’s. Ontario Hydro facilities include service and administration centres and storage yards, whereas Ontario Realty Corporation facilities range from office buildings to psychiatric hospitals. Many of these facilities have (or are approaching) the end of their designed life cycle and require sizable capital investment to renovate to present-day standards. Also, many of them were designed for uses that were no longer needed nor appropriate for the long-term goals of the organizations. Ontario Hydro is undergoing a transition from a quasi-public organization to a private organization with emphasis on revenue generation and competitiveness; and Ontario Realty Corporation is increasingly concerned with the issue of “efficiency”, concentrating its resources on core facilities, and divesting surplus buildings. These are good examples of the complexities of rust-out (the disposition of assets to meet long-term organizational goals), subtlety (building age

affecting their use and hence their priority for maintenance funding) and interconnectedness (where building expenditure is dependant on disposition strategy).

CONTRIBUTING FACTORS

Rust-out can be brought about through normal aging and wear-and-tear. But there are some other more specific factors which are thought to contribute to this process. Different organizations have identified different contributing factors. These include expenditure levels, heritage, technology, codes and regulations, and use and client demands.

Expenditure Level

- The expenditure level is an important factor in rust-out. Issues include the concept of expenditure, the distinction between maintenance and capital, and variation in expenditure levels as a solution to rust-out. Part II of this study discusses these issues in depth.

Heritage

- Heritage buildings cost more to maintain and repair. An industry rule of thumb is that costs are probably 50% higher. This is because of the type of construction, the age of components (often functioning far beyond their designed life span) and the requirement of heritage legislation. For example, the City of Ottawa claims that it is generally less expensive to renovate buildings than replace them, especially when modern buildings are essentially skeleton structures which are relatively easy to modify. On the other hand, heritage buildings have a kind of rigidity to them (a “predetermined hardness” of the building technology) that makes “flexibility” difficult and expensive. Also, legal obligations require renovations to be done in accordance with the Heritage Act. This leads to additional costs. Once the renovation is started the heritage regulations have to be compiled with.
- To pay for the additional heritage costs, some organizations request extra funding in the form of special budget allocations outside the normal capital budget. In the case of Ontario Realty Corporation, as well as using special budget allocations, it puts money aside (or makes provision for extra funds) from one year to the next. Where organizations do not have additional money, heritage becomes a factor for accelerated rust-out because maintenance and repair works are so much more expensive.
- Because heritage can be a major factor, some organizations recommend avoiding getting involved with heritage buildings and, if there is a choice, getting out of them. But this is not always possible. The City of Ottawa, as a municipal government, has little choice but to pay for the required investment to maintain its heritage buildings. If an organization has taken it upon itself to be a custodian of heritage buildings, or

considers the heritage character of its buildings as an integral part of their functions, then it has to incur extra expenses. Also, some high profile/visibility buildings are considered “sacrosanct” to an organization and/or the community and cannot be demolished or modified. In such a case the organization has little choice but to renovate.

- To maintain heritage buildings properly, one has to replace or repair with compatible components (“like stuff”) which is typically more expensive. The Ottawa-Carleton School Board considers its heritage buildings more expensive to operate, inadequate in space, and not easily expanded or modified to the standards of modern schools. This means that funds are being used unproductively in maintaining these heritage buildings that do not meet the demands of the required use. An organization may put a lower priority on and, perhaps, ultimately dispose of, the buildings that are not suitable for its use.

Technology

- With respect to HVAC and fire protection systems, upgrading buildings to new standards can be very expensive. In some cases, a system cannot be upgraded, and has to be replaced. For example, Queen’s University cannot retrofit many of its systems because the new technology is not compatible with the old: the only option is to tear out the existing system and replace most of the component (e.g. a computer control system). The cost of technological upgrading and updating can contribute to rust-out because if an organization does not have the funds then it may decide to defer expenditure or dispose of the building.
- Certain physical building types are more expensive to upgrade. There may be a temptation to prioritize buildings that are more easily upgraded. The construction of a building determines whether one can integrate a new technology (such as a distributed network wiring) into the building. A building with accessible passageways is much easier to work with than a building with hard surfaces, such as an old heritage building.

Codes and Regulations

- Upgrading facilities to comply with changes for disabled access (barrier-free) and health and safety (fire code, asbestos, insulation, and air quality) can be a minor or major expense depending on the type of building. (Heritage buildings with out-of-date components are more expensive to upgrade than building with modern components.) Organizations view compliance with code and regulation in different ways. For example, the City of Kingston considers changes a cost of doing business and not a major factor to rust-out. This contrasts with the Metropolitan Toronto Housing Authority’s assertion that fire code changes (over the past three or four years) are costing an “enormous” amount of money, which is having a profound impact on decisions regarding expenditure and the scheduling of upgrades.

- The City of Ottawa reasons that code and regulation changes that are not addressed in a timely manner can be a major factor contributing to rust-out. When an organization has insufficient funds it has to prioritize. Buildings that require less upgrading may get lower attention. The City of Ottawa, because of its responsiveness to public participation, is often made aware of changes before these are legislated. Its “sensitivity” to the public forewarns, and enables, them to plan its spending accordingly.

Use and Client Demands

- Organizations need to rationalize existing uses and plan for future ones. This provides a rational in dealing with rust-out (e.g. reinvestment according to potential reuse). This is particularly significant with respect to the demand of new technology. The infrastructure should be maintained to keep up with the technology. For example, the Ontario Realty Corporation assesses its long term needs and plans for new technology (e.g. "If the future demand is for one or two computers on everyone’s desk then we have to allow for it.").
- Demands can change. The City of Kingston believes that with an aging population there is a need to adapt and modify facilities to meet new demands. For instance, community centres have to be converted from servicing teenagers into servicing multi-generations. Similarly, Ontario Hydro is reviewing its existing service centres with the aim of disposing of those centres that are no longer needed, consolidate the existing and remaining ones, and purchasing new ones in areas where the customer base is growing.
- Use has to be matched to standards of building construction because some uses put greater stress on buildings. For example, court use places heavier demands on the physical structure (i.e. the need for public access as well as prisoner security) than the conventional office use.
- Location is responsible for the volume of use and can be a major rust-out factor. Under-use can lead to building rust-out. In the Catholic Archdiocese of Ottawa, many people have moved out of the City of Ottawa in the past 10-20 years. There are now parishes with only a few parishioners. Is it worthwhile to reinvests in these churches if they may be closed in five years?

RUST-OUT SOLUTIONS

Asset management solutions to rust-out include reinvestment, demolition, mothballing, leasing, and disposition.

Reinvestment

Buildings may require reinvestment because they have reached the end of their life span or because they have a long history of low maintenance expenditure. Some organizations have a detailed process for redevelopment and reinvestment of buildings. For example, the City of Ottawa has spent much time, energy, and money in the last 10 years to bring its buildings up to standard and keep them in a reasonable shape. Rust-out has also been viewed as an opportunity for adaptive reuse. For example, the City's many old fire stations have been modified to become community daycare, teaching, and drop-in centres.

Mothballing

This may be a preferable option to the disposition or demolition of a building. It preserves the building (or the site) for some future use. It is important to consider each building in terms of its role to the long-term needs the organization. Once a building is disposed of it could be very expensive to buy it back.

Demolition

Sometimes it is cheaper to demolish than mothball. Mothballing has carrying costs, such as minimal maintenance and building security. To make the choice between disposing and mothballing an organization has to examine the building to determine the state of structural obsolescence, the revenue that can be generated by the sale, and the cost of renovation.

Leasing

Owning buildings carries with it obligations for expenditure, which can be higher than the cost of leasing. Also, leasing provides an organization with a degree of flexibility, as it can get out of the lease. When an organization assesses whether to dispose of a building its should also assess the leasing options.

Disposition

The disposition of facilities is an important aspect of portfolio management, and is becoming a more popular solution to rust-out. The portfolio management approach involves assessment of buildings needs for present and future uses. For instance, Ontario Hydro focuses on the cost to maintain certain assets and their relevance to long term strategic goals of the organization. The Ontario Realty Corporation considers surplus buildings as a potential future liability. Consequently, the disposal of these buildings does more than raising revenue for the province.

Another option is the transfer of the building to another part of the organization (or government department/ministry). The Ontario Realty Corporation has an obligation to

circulate the buildings to other ministries (if a building is surplus to one ministry, it does not mean it is not needed by another). This circulation involves a cost analysis for conversion to alternative uses and a long-term maintenance and needs assessment.

FINDINGS - PART II

This is an in-depth examination of expenditure levels as a contributing factor to rust-out.

THE CONCEPT OF EXPENDITURE

Here are some working definitions of maintenance, capital, and deferred expenditure. It seems that there is no one standard definition although similarities exist.

Maintenance

- In the literature, maintenance is defined as “a process that provides the repairs and services necessary to satisfy tenants and preserve the physical condition of the building.” (Downs 1986, 153) It is also defined as “the preservation of a building so that it can serve its intended purpose.” (Institute of Real Estate Management 1986, 173) These definitions focus on maintaining the condition of buildings so that they may fulfil a use.
- Maintenance can be divided into six categories: preventive, corrective (after the fact), routine, emergency (breakdown), cosmetic, and deferred. There is considerable variation between the actual maintenance tasks included in these categories. For instance, painting can be classified as a deferred task (e.g. when it is cosmetic and its deferral will not damage the structure) or as a preventive task (e.g. when it is essential to maintain the condition of the exterior walls).
- Maintenance often includes some redesigning and/or retrofitting. For instance, when a boiler fails and needs replacement, the usual practice is to replace it to modern standards rather than repair or replace with the same old, out-of-date technology. Sometimes, maintenance can mean improving the building rather than just maintaining at existing standards. For example, the Catholic Archdiocese of Ottawa has maintenance procedures that include repairs and replacements that extend the life of building components.
- The Building Owners' and Managers' Association (BOMA) defines repairs and maintenance as “expenditure for the general repairs and maintenance of a building including common areas and general upkeep.” Major maintenance and retrofitting are not included in this definition because these are viewed as capital expenses. BOMA acknowledges that some organizations might include some retrofitting within their maintenance definition, such as small scale retrofitting of life-cycle components.

Capital

- BOMA does not attempt to define capital items (or publish average figures for capital expenditure). A BOMA representative suggested these reasons: there are no industry

definitions for what capital includes; that each organization has its own policy for what is included; and therefore, it is difficult to have comparable definitions.

- In practice, organizations have similar definitions of maintenance and capital works. The City of Kingston's definition is quite typical. Maintenance is the regular, day-to-day tasks that ensure the longevity of buildings and equipment, including some minor repairs; and capital is major repairs and the replacement of portions of building structures and equipment.

Deferred Expenditure

- Deferred expenditure is defined as the putting off (not spending) on maintenance and/or capital tasks until a later date. There are three interpretations of deferred expenditure: the wish list (e.g. every task that could possibly be identified requiring expenditure); the budget shortfall (e.g. the difference between what is identified and what is approved in the budgetary process); and critical tasks (e.g. tasks that require immediate expenditure). Deferred expenditure is often estimated as an annual accumulating total.
- In practice, deferred expenditure is viewed as critical tasks that are needed to preserve the integrity of the asset and prolong its life, but there is no money to do so. There are a number of reasons for deferred expenditure: budget limitations, scheduling, and inclement weather (and the potential costs and difficulties associated with it).

DISTINCTION BETWEEN MAINTENANCE AND CAPITAL EXPENDITURES

Interchangeability

- It is necessary to distinguish between maintenance and capital expenditures in accounting procedures. If a maintenance item is included (or reported) as capital, then the maintenance expenditure may appear artificially low compared to capital expenditure. This gives the impression of cost-efficient maintenance, compared to capital expenditures, and will skew future allocation of funds between maintenance and capital.
- Whether an expenditure is for maintenance or capital the purpose is to keep a building in some acceptable functioning condition or to maintain its asset value. If so, the distinction between maintenance and capital is not that important. Maintenance and capital expenditures can be considered interchangeable (two sides of the same coin). The distinction is secondary to the more crucial “total expenditure.”
- Take the City of Kingston. It usually considers flooring a capital item in its reporting. Sometimes when the flooring is done at a low cost it is reported in the maintenance

budget. The distinction between maintenance and capital expenditure, therefore, is based on a dollar threshold rather than on the type of work. Organizations tend to use both methods - the type of work and the dollar threshold. The Catholic Archdiocese of Ottawa has a \$10,000 threshold and the Ontario Realty Corporation has a \$25,000 threshold.

Proportionate Spending between Maintenance and Capital

- Organizations have very different proportionate spending between maintenance and capital. For example, the Metropolitan Toronto Housing Authority has a approximate 40/60 split between maintenance and capital (based on eight years of data), the Catholic Archdiocese of Ottawa has a 50/50 split (based on eight years of data), the Ontario Housing Corporation has a 30/70 split (1998 data), and the City of Kingston has 80-90/20-10 (estimate).
- Expenditure levels can also be expressed in dollars per square foot. For instance, Queen’s University spends around a dollar per square foot for maintenance and custodial costs--a figure it believes to be low compared to other similar organizations. Expenditure levels can also be expressed as a lump sum. For instance, the Ontario Realty Corporation reported spending \$80 million on operations and maintenance and \$51 million on capital.

Expenditure Levels

- Expenditure levels can be expressed as a percentage of the replacement cost of the building. Take the Metropolitan Toronto Housing Authority (MTHA). It believes that money should be spent to maintain the value of the building and obtain the maximum the life expectancy of components and the buildings. In the case of a roof (using industry standards that suggest spending 1 to 1.5% of the asset’s value) the recommended spending is 1.5% throughout its life span. The 1.5% will vary. In some years the spending will be 0.5%, and in other years it will be 3.5% or 5%, but the average should always be 1 to 1.5%.
- BOMA calculates average costs per square foot for different types of office buildings (downtown/ suburban, private/public) of various sizes (50 to 100,000; 100,000 to 300,000; 300,000 to 600,000 square feet). These average costs are compiled from Experience Exchange Reports for over 4000 buildings throughout North America. They identify, separately, costs for utilities, repairs, cleaning, roads and ground security, and administration and operation.
- BOMA’s average costs are used as rules of thumb for comparison between buildings and organizations. For example, the Ontario Realty Corporation consistently tracks operating and maintenance costs for their market comparable buildings. This is used as a performance measure to compare against the private sector. These costs include the management cost and are equivalent to BOMA definitions of maintenance and

operating costs. Last year's cost was about six dollars per square foot (on top of this Ontario Realty Corporation spent some extra capital money). It sets a goal of spending within 10% of the average BOMA rates.

- The 2 + 2 formula (2% of the replacement cost of the building to be spent annually on each of maintenance and capital) is commonly attributed to BOMA and cited as the recommend figure for office building reinvestment. Our BOMA informant denied that this ratio is published by them. Rather it is based on best management practices and the experience of people who operate buildings. However, BOMA’s (*Preventive Maintenance Guidelines*) outlines a framework for allocating a yearly capital reserve based on the building's life cycle.
- The American Public Works Association's (APWA) publication *Committing to the Cost of Ownership* maintains that “underfunding is a wide spread and persistent problem that undermines maintenance and repair of public buildings.” That study recommends that “maintenance and repair budgets should be structured to identify explicitly the expenditures associated with routine M & R requirements to reduce the backlog of deferred deficiencies.” It suggests that “an appropriate budget allocation for routine maintenance and replacement....will typically be in the range of 2 to 4 percent of the aggregate current replacement value of those facilities.” Furthermore that “in the absence of specific information upon which to base the M & R budget, this funding level should be used as an absolute minimum value” and where “neglect of maintenance has caused a backlog of needed repairs to accumulate, spending must exceed this minimum level until the backlog has been eliminated.”

EFFECT AND IMPACT OF EXPENDITURE LEVELS

Deferred Expenditure

- Deferred expenditure creates and compounds deferred works. However, deferred capital expenditure often has a larger impact than deferred maintenance expenditure because the deferred works could be at a critical point requiring a larger than normal capital investment.
- Deferred works tend to accumulate and cost more to resolve in the future. A Queen’s University consultant report, using an escalation factor for maintenance, has estimated a 17% extra cost for every year of deferred maintenance. This cost estimate includes construction inflation and the cost of damage from continued operation of systems which are under-maintained. For instance, the deferral of essential repairs to a leaking roof would lead to water damage and major structural deterioration.
- Deferred expenditure does not only lead to future costs in repairing individual components, but has a ‘grapevine’ effect on other parts of the building system (e.g. a

leaking roof can lead to damage to interior walls and floors). Metropolitan Toronto is especially concerned about its silent systems, such as electrical and air-conditioning. These systems are either on or off (working or not working) with no gradation in between. So, the effect of under-spending may remain unnoticed until the system experiences a critical failure, requiring expensive emergency repair.

- Deferred works can sometimes have positive consequences because it may be cheaper to carry out capital repairs at the same time as retrofitting. This may be more convenient for the occupants because they are disturbed only once. For example, the Ontario Realty Corporation repaired and replaced the wiring and cables in Osgoode Hall at the same time as a complete infrastructure renovation. The users benefited because all the required work was completed at one time, and the Ontario Realty Corporation benefited because the total work was cheaper.

Deferred Expenditure Estimates

- There are difficulties in estimating the volume (cost) of deferred expenditure as both deferred maintenance and capital are items not usually reported in the budgeting process. The estimates that are available come from periodic inventories of building portfolios, component-based reviews (e.g. windows and floors), and detailed studies of individual buildings.
- The Metropolitan Toronto Housing Association (MTHA) applied for \$60 million (98-99 budget) but was approved for only \$40 million, and the difference is considered deferred works. The Ontario Realty Corporation spends \$50 to \$60 million in annually repairs, but maintains a list of accumulated deferred work, which is at least twice the expenditure.

Legal Implications

- If an organization fails to provide a building that is safe and healthy for its users it runs the risk of being sued. Take the City of Ottawa. It has a legal obligation to maintain reasonable standard of building care expected by a reasonable person. If there is an accident (e.g. a user slips on the floor) the City will have to defend its maintenance standards.

Patch Up Versus Replace

- The decision between patching up and replacement affects the amount of capital and maintenance expenditure. A rough industry rule of thumb is that if it costs half as much to patch up as it does to replace, then replacement is recommended. In practice, this decision is more involving and requires an evaluation of the advantages of patch up, complete replacement, or partial replacement. The choice criteria can be subtle. For instance, the Ottawa-Carleton School Board assesses the long-term benefits against short time costs and asks questions such as: Is it cost-efficient to replace a

building component if the building is expected to be rusted-out in the immediate future (because of population shift from one school district to another)?

- Another choice is between condition-based versus frequency-based maintenance. For example, on account of budget cuts (as much as 40% in the 1990’s), Ontario Hydro has changed from a frequency-based maintenance programme in which a set amount of work was done every year to a condition-based maintenance programme in which each expenditure is evaluated.

QUANTITATIVE ANALYSIS

A quantitative analysis was carried out with data obtained for the Archdiocese of Ottawa. The portfolio consists of churches. Although they range from cathedrals to chapels their intended purposes are similar and, as such, provided a useful control to our analysis. We had planned to include the Metropolitan Toronto Housing Authority, which also had a rather uniform portfolio in terms of functions, but the data were not going to be available until some time next year.

Assessment of Data

- The data were not very robust. It was difficult to deduce from budget items whether an expenditure was for capital works (e.g. retrofitting or accommodating a change in use) or maintenance (e.g. minor repairs and routine works). There was also the liberal use of contingency (and/or emergency) accounts for certain maintenance and capital expenditures, making it difficult to pinpoint the exact nature of the expenditure.
- The data were organized by parishes. Many of them had data for one, two or perhaps five years. Where data were available for longer periods they were often incomplete and inconsistent. Reporting procedures for maintenance and capital had changed over the years. Our informants asserted that only the later years were reliable.

Findings

- The Archdiocese is divided up into 113 parishes. The buildings in each parish include churches, rectories, community halls and convents. Buildings can be as old as 150 years. Construction materials include stone, brick and stucco; some buildings have load-bearing walls while others are frame structures. The parishes are financially self-supporting in that they raise their own funds from their community to support their operations, including maintenance and capital repairs. They report both maintenance and capital to the Archdiocese, which maintains the record keeping. Both maintenance and capital spending are defined but there is a \$10,000 threshold, an expenditure greater than that is automatically considered capital works.
- The parishes need permission from the Archdiocese to spent capital amount over \$10,000. The Archdiocese maintains a loan fund for parishes: parishes with surpluses

invest their surpluses in the fund, and parishes with short falls borrow from the fund. Whenever there is a project in which the parishes want to invest in, they borrow the money from the fund. However, the parishes need to put up at least 50% of the money and Archdiocese will not loan more than 50%. Therefore, the amount of maintenance, repairs and renovation is based on the amount the individual parishes can raise and the loan they can afford to service.

- It is not possible to determine how much of the capital spending is for code changes and retrofitting. But since churches are relatively "simple" (single function) buildings we assumed that the vast majority of capital spending is actually related to repairs and replacements. Although, the parishes are supposed to follow guidelines for maintenance and capital reporting it was not possible to ensure the accuracy of the actual reporting.
- The Archdiocese provided parish data for a period from 1991 to 1998. We excluded those parishes with incomplete data and those that had convents or community halls. In total, we had workable data for about 80 buildings. We tested the relationship between maintenance and capital against age, size, type of construction, etc. We did not find any significant causal relationship between maintenance and capital expenditure levels for individual parishes. (Some spent less than 10% of their total building funds on maintenance whereas some spent in excess of 90% of their building dollars on maintenance.) Then we examined the aggregate spending of all parishes. For the time period 1991 to 1998 the expenditure split between maintenance and capital was 47.7% to 52.3%. Again, we found no relationship between deferred maintenance and capital spending. Part of the explanation lies with the reporting procedure where any spending over \$10,000 was classified as capital expenditure.
- We also analyzed the aggregate expenditure of maintenance and capital together, as a percentage of the replacement for each individual building. We found that the norm was around 2% (about 60% of all the parishes spent between 1% to 3%). This is very interesting. Assuming the behaviours of the different parishes mirror that of any population of buildings managers--some are more vigilant about preventive maintenance and others wait till there is a crisis before doing anything--the aggregate expenditure remains very comparable among the parishes. This finding is counter-intuitive, questioning the conventional wisdom that vigilant maintenance saves future costs. Although this finding is very suggestive, our data were very limited and incomplete for any generalization. Further investigation is certainly warranted.

FACTORS AFFECTING EXPENDITURE LEVELS

- Some organizations use formulas that estimate the total amount of maintenance and/or capital based on the cost per square foot of space. The maintenance level for the Ottawa-Carleton School Board is based on a provincial funding formula of 69

cents per square foot for buildings less than 20 years old, and 96 cents for buildings more than 20 years old.

- Expenditure levels can be based on the revenue generated by an asset and/or by the organization as a whole. Expenditure levels at Ontario Hydro are linked to hydro rates. Operating programmes, maintenance costs and capital spending are all directly affected by these rates.
- Expenditure levels are also tied to funds that can be raised for the specific purpose of building works. Parishes of the Archdiocese of Ottawa are responsible for the own regular upkeep. The funds for any major renovation must be raised from the community. Therefore, fundraising ability affects the level of expenditure.

Prioritization Systems

- Prioritization systems are more common for capital expenditure than maintenance. Maintenance is usually for smaller amounts that are allocated on an ongoing basis. A common criterion in all prioritization systems is the supremacy of health and safety concerns.
- Another prioritization criterion is the importance of the building to the organization. For a public organization this may involve a core building that is critical to program delivery, and for a private organization this may be a building that generates high revenue. Research laboratories are typical critical buildings. For example, Queen’s University has a policy to avoid critical failures in its laboratories at all costs because any such failure (e.g. ventilation or electrical system) can result in the loss of years of research efforts.
- Some organizations have developed complex prioritization systems that direct the capital expenditure throughout the organization. The City of Ottawa’s life-cycle renewal programme has five levels:
 - (A) Emergency funding (e.g. unforeseen boiler breakdown that requires replacement);
 - (B) Legislative requirements (e.g. fire code changes to keep the facilities open);
 - (C) Protect asset items that need repair/replacement (e.g. roof replacement to prevent deterioration of the components/facility and defer possible future work costs);
 - (D) Planned life-cycle items (e.g. replacement that a prudent landlord would do in anticipation of it imminent failure in the next six months, one year or two years);
 - (E) Optional items (e.g. recognition of things that are ‘not really’ life cycle, such as extra cash drawer).

The City of Ottawa thinks it has never been funded to the full level and that funds received could only cover items in levels A, B, and C. It tries to maximize the normal planned life-cycles and undertake as many level C items as possible.

- Metropolitan Toronto Housing Authority has a similar prioritization system that has five levels:
 - (A) Immediate danger to life. (e.g. unexpected breakdowns);
 - (B) Structural integrity (e.g. concrete columns);
 - (C) Code requirements (e.g. fire code retrofits)
 - (D) Anything else. (e.g. building envelope and elements, such as brickwork);
 - (E) Energy efficiency (e.g. building insulation)

There is guaranteed funding for all levels A, B, and C items. Any left-over funding is used for level D and then level E items. It is difficult for the MTHA to budget for level A items, so it maintains a reserve fund and, if that reserve fund turned out to be inadequate, it would cut level D items.

Justification of Expenditure

- Planning the long-term needs and future status of individual facilities is very important. When a building will not be needed in the future lower expenditure to maintain it may be justified. For example, the City of Ottawa believes that under certain circumstances a building should be left to run to the end of its life-cycle. At that point the building either gets a new use, with adequate reinvestment, or it is disposed of. Similarly, Ontario Hydro does long-term planning for its service centres, involving the reallocation of staff to optimize the use of existing space. For centres that are potentially surplus (e.g. to be closed in the next eight to twelve months) it would not invest large amounts in capital repairs.
- Lower expenditure levels can actually create a more efficient use of funds. Some argue that if an organization receives all the funds it requests then its facilities would be maintained at a level beyond that which is actually used or needed. For example, the City of Ottawa thinks that a shortfall in funding forces an organization to prioritize its resources towards the most critical areas.
- The timing of component replacement is an important consideration. Maintenance can be over zealous, where a whole building system is taken apart to replace one single component. This increases the “mortality rate” of the whole system. This is particularly worrisome when buildings components are replaced at pre-determined dates, instead of being tied to potential failures. The Metropolitan Toronto Authority is now assessing components as part of its five-year capital plan, instead of replacing them at pre-determined obsolescence dates. This approach aims at extending the life of a system as a way to avoid spending capital costs. This is very different from a

mindset which considers any “deferred” maintenance work as a potential for increased future costs.

EXPENDITURE LEVELS AS SOLUTION TO RUST-OUT

Higher Expenditure Levels

Most organizations believe that higher expenditure levels (maintenance and/or capital) are needed to avoid even greater expenditure in the future. They feel that additional funds are also needed to address the “effects” of the build-up of deferred works due to historically low expenditure levels. But they also recognize that there are alternatives, some of which are discussed here.

Charge-Back Systems

- Building maintenance, operating and capital costs are charged to the program using the facilities, and/or to the users themselves. These “user-charges” can then be applied to building maintenance. As well, this is supposed to increase use efficiency. When the building users are made aware of the full costs, they will use the buildings more appropriately (e.g. not over use), reduce the number of buildings used, and consolidate the uses within individual buildings. The Ontario Realty Corporation is in the process of developing a charge-back system based on different building types, with a market- comparable rent structure. This will then become part of the program cost to any users.

Reasonable Expenditure

- There is a “minimum” (life-line) maintenance/operation/capital need, depending on a combination of factors (age, type of construction, use, etc). An organization (as well as the agency responsible for approving and allocating funds) should ensure separate funds are set aside for building maintenance and capital work outside of the programme costs. For example, Queen’s University has its maintenance budget approved separately from the capital budget. But the capital budget for life-cycle renewal is mixed with the budget for one-time capital works, such as building extensions. Therefore, capital renewal costs have to be ‘fought’ for on a project by project basis, competing against other demands.

Procedures and Practices

- Preventive maintenance programs seek to maintain buildings at peak efficiency through inspection and timely repair. This is supposed to improve the effectiveness of maintenance and capital spending by focusing on ongoing tasks rather than having to deal with deferred works. Many organizations have preventive maintenance programs that include the use of operating manuals, minimum standards for replacement, and

procedures for component monitoring. Ontario Hydro is currently developing a new maintenance program for each facility. In the past, there was no preventive maintenance program, other than the normal janitorial work and fixing a component when it failed. The standard of maintenance varied, depending on the experience and awareness of the local building managers. The new system will provide uniform maintenance procedures, reporting of expenditures by individual facilities, and regular evaluations. The evaluations are used to develop the capital program as well as update the maintenance program.

- Procedural adequacy is needed to ensure building managers do follows expenditure guidelines. The Ottawa-Carleton School Board observes that with no overall school board strategy from the province, different school boards in Ontario do things differently. Some boards have good systems and others do not. Consequently, the procedures and the expenditure prioritization are inconsistent among school boards.

Database Systems

- The development of database systems for cost tracking and reporting has the potential to increase the efficient use of funds. Such systems can be used to monitor and evaluate expenditure levels on different components and buildings. The findings can be used to modify future allocations. Ontario Hydro developed a system in 1997 to collect and record costs by component type for each part of a facility (e.g. warehouse, administration centre, and yard). It is used to support a proactive approach to building management and to track costs for both maintenance and capital.
- Benchmarking is also important. Benchmark levels can be developed from theoretical life-cycle models, which are then used to compare components and buildings. The City of Ottawa has "experimented" with benchmarking but has not yet implemented a system (primarily because of time and cost constraints). It is quite excited about the advantages of benchmarking, such as enabling the comparison of building performance and providing direction on building disposal (based on predicting future life-cycle costs).

SUMMARY AND CONCLUSIONS

This study has two goals: (i) an overview study of the contributing factors to rust-out and their relationship to asset management decision making; and (ii) an in-depth study of expenditure levels as one contributing factor to rust-out.

We have explored the complexities of rust-out and identified some of the contributing factors and solutions. With respect to expenditure levels we have uncovered some insights, but only scratched the surface with our quantitative analysis. This is due primarily to data limitations. The data limitations reflect the complexity of the problem, which is only partially understood. Systems and procedures to report data for analyses and monitoring do not yet exist.

SUMMARY OF FINDINGS

Part I: Factors Contributing to Rust-Out.

- Rust-out can be viewed at the component, building or portfolio levels.
- A rust-out problem can be critical or non-critical. Criticality is a function of building conditions and programme mandate. As such, a rust-out problem can be critical at the component or building level but non-critical at the portfolio level.
- Factor contributing to rust-out can be considered singly or, as more often the case, in combination with other factors. This makes the causes of a rust-out problem complex (involving a number of issues and factors), subtle (no one obvious cause), and interconnected (involving questions not immediately related to rust-out, such as corporate strategies).
- Heritage is a significant factor because maintenance and repair work is more costly, and will become more costly in the future. There is an aversion to do any renovation work because of stringent heritage regulations, which may actually end up aggravating the rust-out situation because an organizations is deterred from doing the proper maintenance/repair work.
- Technological upgrading is expensive and has limitations. It may be cheaper to replace a building or relocate the use. The situation gets worse for heritage buildings.
- Code and regulation compliance can mean minor or major expenditure, depending on building age and type. Again, heritage buildings are at a disadvantage. Early compliance, especially before the passing using of a health/safety/fire legislation, may result in lower expenditures or, at least, better planned expenditures.

- User and client demands can change in response to changes in demographics, market, technology, etc. This calls for long-term planning with options such as conversion and asset disposal. In the short-term, these demands put additional stress on buildings.
- Organizations have to recognize that reinvestment is unavoidable. Some view it as an opportunity for reuse. Mothballing has carrying costs, and presumes possible future use. It has to be considered together with demolition. Leasing offers flexibility. Disposition is becoming a popular solution, but it only works with a portfolio approach guided by long-term strategic goals.

Part II: Expenditure Levels as Both a Cause and Solution to Rust-Out.

- The distinction between maintenance and capital works can be theoretically clear, but in practice, it is quite confused. Sometimes it is just an accounting procedure that has no reality (e.g. when a dollar threshold is used to distinguish between maintenance and capital expenditure). In fact, these can be considered as two sides of the same coin--both are needed to make the building adequate to fulfill its functions.
- Deferred expenditure can simply be defined as an unfulfilled wish list, any budget shortfalls between what is requested and what is approved, and critical and emergency work.
- Accounting peculiarities aside, organizations have different expenditure patterns for their maintenance and capital work expenditures, ranging from a 30/70 split to 90/10 split.
- The famous 2+2 formula (2% of replacement cost of the building to be spent annually on each of maintenance and capital) is not something enshrined by the Building Owners' and Managers' Association (BOMA). BOMA puts out average cost per square foot for different building types, based on field observations and building life cycles, from which a roughly 2 + 2 formula can be deduced.
- We have no concrete findings (although our informants were quite adamant about it) that suggests “deferred maintenance” expenditure will lead to “higher capital” expenditure (nor higher future maintenance expenditure). Intuitively, our informants talked about an "escalation factor" or a "grapevine effect" that translate deferred maintenance into higher future costs. However, we have not factored in legal liabilities, which may indeed show that deferred maintenance leads to higher future costs.
- More and more, the tendency is towards patching up rather than replacement. Also, some argue that by deferring maintenance it may be possible to do all the needed work together, thus saving costs and reducing disruption to users. Over-zealous replacement of building components can actually damage the overall building system.

Some argue that lower expenditure levels actually promote more efficient asset use and better management skills.

- Our very limited quantitative analysis suggests that there is no clear relationship between the amount of maintenance spending and capital spending. The total expenditure (maintenance and capital) for our case analysis hovers around 2%, whatever the split between maintenance expenditures and capital expenditures.
- The setting of expenditure levels has been based on some formula (cost per square foot and percentage of replacement value), as well as on revenue potential/generation of the asset.
- The prioritization of funds has been mainly based on health and safety concerns and importance of the asset to the mandate of the organization. There are a number of different prioritization systems.
- Long-term planning is clearly the preferred approach to reinvestment, focusing on the actual conditions of buildings and their use rather than any pre-determined work schedule.
- Other than increasing the expenditure levels as a solution to rust-out, informants talked about setting a life-line maintenance budget, applying a charge-back concept, embarking on preventive maintenance, developing uniform reporting and monitoring procedures, and establishing appropriate benchmarks and data bases.

CONCLUSIONS

What can this study of rust-out from the viewpoints of provincial, municipal and other quasi-public agencies inform federal departments? From the federal viewpoint, there are two parts to the question: the determination of the magnitude and urgency of the rust-out problem, and the allocation of funds among departments in order to deal with the problem.

At the beginning of this report we stated that the purpose of this research is to assist the federal government departments to (i) analyze the factors contributing to rust-out, (ii) provide justifications for reinvestment, and (iii) devise best management practices that can help avoid future problems. The following are some tentative thoughts.

With respect to the identification of contributing factors to rust-out, the findings point to the portfolio approach as the preferred approach. This approach can better handle the complexity and subtlety of causes and issues. Indeed, the problem of rust-out may well be interconnected with the corporate mandates and goals of an organization. The individual contributing factor of heritage, technology, code and regulation requirements, and user/client needs are common among organizations, federal or non-federal. What is important to know, though, is there is no agreed ranking of their relative significance.

Everything depends on the physical conditions of the assets and the organization's goal, mandate and culture.

Everyone agrees that reinvestment will always be necessary. The question is how much. We found that there is no practical distinction between maintenance and capital in that they are different but related expenditures to keep a building in a reasonable operating shape. There is also no discernable relationship between historical expenditure levels. In other words, deferred maintenance does not seem to have created heavier future expenditure. Of course, part of this can be explained readily by the fact that organizations always seem to be able to come up with the money when the conditions deteriorate to dangerous levels, but before the system collapses.

As a result, the stop-and-go expenditure pattern only reflects a management-by-crisis mindset. As long as the system does not collapse (in our case, as long as buildings do not begin to crumble or people getting seriously hurt), there is no real measure of the cost of deferred maintenance.

Notwithstanding the above, we found a 2% total expenditure (maintenance and capital) to be a rather stable figure. This may suggest that our present “problem” is a manifestation of spending deficits in the past.

There is pressure for spending wisely (both in the amount of money to be spent and its allocation). But we must recognize that there is a “cost” in setting up elaborate systems of reporting, monitoring and evaluation. There is also a “cost” in devising sophisticated models to plan and manage. These costs may not be overtly monetary, but they are nonetheless real in terms of people’s energy and morale.

It seems that a central agency such as the Treasury Board may want to consider a simple norm or formula (a total maintenance and capital expenditure as a percentage of total replacement value of assets) and let the asset managers devise their own way to allocate the funds between maintenance and capital, and among the assets.

Future rust-out problems can never be avoided totally because the definitions of what constitutes a problem keep changing (heritage, technologies, code and regulations, user/client demands, etc). But too sophisticated a monitoring and allocation system can be costly, and there is no guarantee that it will do the job. It may be well to keep things simple and flexible.

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APPENDIX 1
INFORMANTS

APPENDIX 1: KEY INFORMANTS

Marie-Louise Chartrand (Manager/Comptroller of Finance), Peter Taylor (Manager of Plant), Udo Friesen (Supervisor of Design Construction and Maintenance). Ottawa-Carleton District School Board.

John Tsangaris (Manager, Maintenance), Bora Zekavica (Manager, Corporate Accounting), Reinier Van Der Wagan (Manager, Capital Projects). Metropolitan Toronto Housing Authority.

Bob Evans (Land Asset Manager), Brian Lennard (Manager of Technical Services and Facilities Asset Management). Ontario Hydro Services Company.

Brian Scovill (Operations Manager, Physical Plant Services), Tom Morrow (Director of Physical Plant Services). Queen's University.

Steve Fillamore (City Architect, Asset Management Branch), Robert Vaillancourt (Senior Architect, Asset Management Branch). City of Ottawa.

Stan Golt (Property & Leasing Specialist). City of Kingston.

Jule Dagenais (Business Manager). Catholic Church-Archdiocese of Ottawa.

Francis Chang (Building Science Adviser). Ontario Housing Corporation.

Mike Burns (Planning Consultant). Ministry of Health.

Frank Raposal (Director of facilities, SouthWest), Bill Hart (Financial Business Planner). Ontario Realty Corporation.

Spiro Viontos (Supervisor Building Engineering). (City of Toronto, formerly Metropolitan Toronto).

Kevin Gallagher (Manager, Property Maintenance Facilities and Real Estate). City of Toronto.

APPENDIX 2:
INTERVIEW FORMAT

RUST-OUT PROJECT

Queen's Land Forum

Interviewee Name:
Organization/Title: Date:

Preamble:

I am Master's student in the School of Urban and Regional Planning at Queen's University. I am working on a research project for the Queen's Land Forum, which is a non-profit group that brings together academics and representatives from different federal departments and organizations to research common issues and problems.

This research project is looking at how the private, quasi-public and public (municipal and provincial) sectors deal with the issue of "rust out". Which is defined as: "the deterioration of a real property asset, which limit or prevents the ability of such asset to serve the purpose for which it is retained." Specially, there are two research areas:

Maintenance Expenditure and Capital Investment

The relationship between deferred (withheld) maintenance and capital reinvestment. This includes identifying the rules of thumb, methods of cost estimation, and any speculative and/or financial relationship.

Asset obsolescence

The factors causing obsolescence and their relationship to asset management decision making, including the impact of deferred maintenance, changing use and client demand, new standards and regulations, and technological change.

The purpose of this conversation is for me to learn about your views and ideas, and the practices and procedures of your organization – basically, I would like to use your knowledge and expertise in my research. I would like to tape our conversation so that I can focus on our conversation now and then play it back later on. I hope that's OK with you. If you want me to turn it off at any point, please just say so.

1. Is there a "rust-out" situation in your organization?
2. How big a problem is rust-out? (Money? Numbers? Impacts?)
3. Is deferred maintenance (withheld expenditure) a factor? How?
4. What are the impacts of deferred maintenance?
5. What types of maintenance are often deferred? (For type of assets is maintenance often deferred?)
6. Does your organization estimate deferred maintenance? (Accumulative or yearly estimate. How is it estimated?)

7. What percentage of the total estimated maintenance costs is deferred yearly?
8. How does your organization calculate how much money is spent on maintenance?
9. And, what criteria does it use to allocate this money? (Yearly amount per asset, component replacement?)
10. Do you have any idea where Rules of Thumb for 'correct' levels of maintenance come from? (How do you think these Rules of Thumb came about? - 25 year life-cycle, past experience, etc.)
11. What is the solution to deferred maintenance?
12. Is money the only solution?
13. If you had to speculate, what do you think the financial relationship would be between maintenance spending and capital spending over a number of years?
14. Has your organization done any research to calculate or better understand this relationship?
15. Does deferred maintenance lead to additional costs in the future?
16. Are there any situations when deferred maintenance is justified? (Short life spans, rapidly changing technology)
17. Are there any legal implications of deferred maintenance?
18. How do you deal with the "rust-out" of heritage buildings?
19. Is technological change a factor in "rust-out"?
20. What about changing standards and regulations? (Health and safety, environment, disabled access).

21. Is deferred maintenance a factor in rust-out?
22. Are changes in use and client requirements a factor?
23. Are there any other factors that cause rust-out?
24. At what point to rust-out factors (technology, deferred maintenance, changing demand) lead to disposition of the asset? Other strategies?
25. Does your organization have minimum maintenance standards, a preventive maintenance program, and maintenance procedure?
26. What do you think that the federal government can learn from your organization? (Do you have any lessons for the federal government?)
27. Any other thoughts?
28. Is there anyone else within your organization, or any other organization that it would be useful to talk to about this research?

Is it possible to see you again?

Thank you for your thoughts and insight

