

A Systems-Oriented Analysis of the Corporate Tax Department Data Collection Work Process

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Abstract

System Dynamics modeling techniques are applied to examine underlying dynamics affecting corporate tax department operations. Focusing on the complex work process of collecting data to make “book to tax adjustments,” a model is constructed that illuminates the cause and effect impact on tax department performance of having errors in collected data, and of the iterations required to resolve these errors. The model provides a basis for examining and justifying investment in process improvement alternatives that can not only have a financial impact on the enterprise, but also reduce risk with respect to meeting Sarbanes Oxley imposed standards.

Introduction

Large corporations are characterized by complex legal entity structures that crisscross the managerial structures used for financial reporting purposes. Since taxes are paid according to how legal entities align with government jurisdictions, a significant challenge is presented for corporate tax departments. They must collect financial data from multiple general ledger systems (the “books”), which are typically organized according to managerial interests, and construct a view of operations that is instead organized along legal entity lines. They must then collect supplementary data in order to allow for the differences between the financial accounting treatment of business transactions and the tax accounting treatment of them, known as “book to tax adjustments.” This data collection process is generally known to be time consuming and subject to errors that require multiple iterations between tax and finance departments.

While there is a general recognition that the churn associated with this process is a significant contributor to tax department workload, an explicit appreciation of systemic cause and effect has not been common knowledge. The work presented here describes a System Dynamics-based framework for understanding the interaction of key factors that influence the workload and duration of time associated with collection of data to make book to tax adjustments as part of tax department operations. Though the work presented here breaks no new ground in terms of modeling technique, it does shed insight in a new application domain. Specifically, it represents the beginnings of a tool to enable tax departments to understand root causes that drive their

expenditure of effort, and to then formulate and analyze strategies for improvement, such as process re-engineering or the use of automation. Besides supporting process improvement as a general goal, the understanding gained from the model presented here is all the more relevant given the increasing pressures being experienced by Sarbanes-Oxley inspired standards of financial reporting and process reliability, and by increased IRS scrutiny (Tiazkun 2008).

This paper is organized as follows. The next section provides additional context on the situation experienced in tax departments as they collect the data necessary to make book to tax adjustments. It then describes the model defined to represent key elements of that situation. Subsequent sections present results of exercising the model, first to establish a baseline performance reference, and then to examine the impact of possible improvements in several areas. The summary outcome of this analysis is that a System Dynamics view affords a direct connection between operational experience around data error rates and the compounding effect they have on workload. Furthermore, the analysis points up that modest improvement in these rates can have sufficient impact on tax department performance to warrant a substantial investment in realizing those improvements.

Tax Department Data Collection Situation and Model

In a recent survey of US corporate tax practices (Vertex 2008a), the collection of data necessary to understand differences in business operations from a tax accounting perspective versus a financial accounting perspective (so-called book to tax differences) was found to occupy upwards of 40% of a tax department's staff time overall. With a median size staff recorded in the survey of 6 people, the gathering of this so-called "adjustment data" represents a significant investment in effort, effort which tax departments invariably wish could be applied to higher value pursuits such as tax planning (KPMG 2007).

While the sheer volume of adjustment data is not great relative to some other data classes that a tax department has to manage, the time consuming contributing factor for this data class is that it has been historically resistant to automation in terms of its collection. In many tax departments, adjustment data is collected by sending a set of work papers - each one specific to a data item to be gathered and together referred to as a "tax package" - around the world to corporate finance offices for accountants to complete and send back to the tax department at corporate headquarters. Typically, these tax packages take the form of an Excel workbook with multiple tabs (one per work paper), and are distributed and received back via e-mail.

Given this context, and the reality that finance offices are not typically motivated by or familiar with tax considerations, it is not surprising that tax departments report (or complain about) delays in receiving tax packages back in a timely manner. Worse yet, work papers are often received back that are incompletely filled out or are filled out with erroneous data. A little analysis from a feedback systems perspective and subsequent discussion with some survey participants confirmed that the situation for adjustment data collection via tax packages is well-represented in the diagram below in Figure 1.

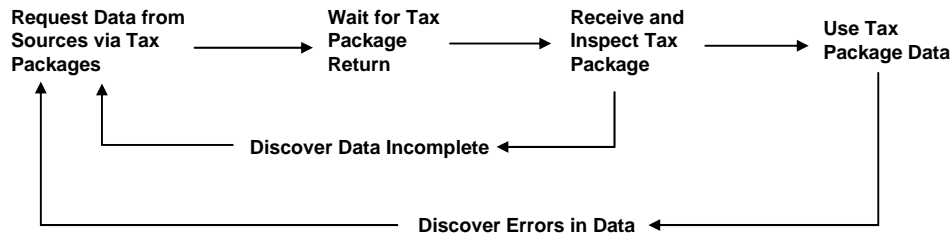


Fig. 1. Adjustment Data Request Cycle

As indicated in the figure, a data request in the form of a tax package is made to a source data provider (i.e. a local finance department), and the tax department goes into wait mode until the response is received back. Upon receipt, the package’s work papers are inspected for completeness (or for other readily apparent errors). If a problem is detected, the package (or the offending work paper) is returned to the source data provider as a follow-up data request. On the other hand, if the package is found to be complete, it is passed on to be used for the tax department’s purposes. It is not uncommon, however, that errors in the data are discovered once a tax specialist begins to analyze and work with the data. Such a discovery also engenders a follow-up request to the provider for data.

Tax departments surveyed readily identified with the phenomenon that multiple iterations are necessary to get the data right, which is implied by the figure’s two loops. In fact, they were also readily able to provide estimates of their department’s experience with rates of completeness and rates of error. Expressed as percentages, rates with values of 80% and 40% for completeness and error, respectively, were not uncommon (Vertex 2008a).

Though tax departments could estimate these rates on a per tax package basis and also had a general notion that the iterations they led to were causing additional work, the full impact, including the cumulative impact across multiple tax packages, was not intuitive. To better understand these impacts, the System Dynamics model shown in Figure 2 was constructed. In structure, the model reflects the two-loop structure shown in Figure 1 and incorporates the well-known project management dynamics work cycle of undiscovered rework (Lyneis and Ford 2007).

Specifically, at the beginning of the tax data gathering cycle for adjustment data (say, to support the annual preparation of the tax return), a workload level of tax packages to be completed (“Tax Package Fill-in Work”) is established. According to the “Average Tax Package Completion Time,” tax packages flow into a “Completed Tax Package” state. The “Tax Package Return Rate,” together with an “Average Number of Work Papers per Tax Package,” then determines an accumulation of work papers to be processed by the tax department, beginning with an inspection (“Work Papers for Inspection”). A good portion of the work papers received has no errors of any kind. These work papers then flow to the “Work Papers Done” accumulation, incurring a nominal amount of effort by a tax department analyst in the course of being processed into the tax return.

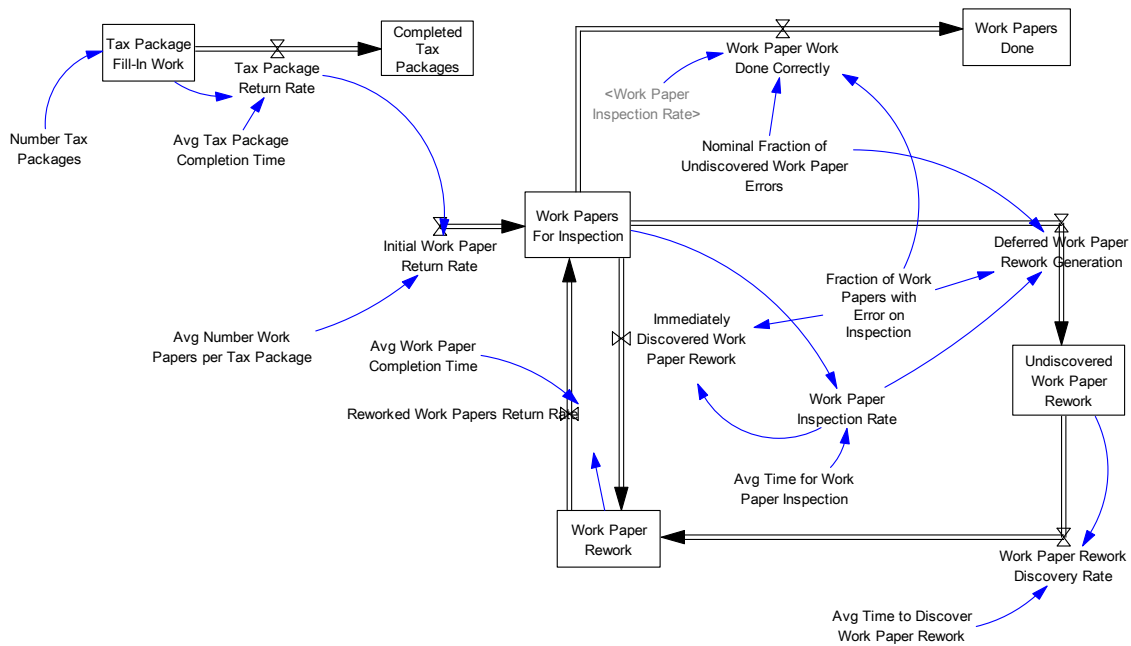


Fig. 2. Work Paper Data Collection Model

Many work papers, however, are incorrect on their face, which is hereafter referred to as being “incomplete.” The extent of this occurrence is modeled as a “Fraction Work Papers with Errors on Inspection.” Being flagged as incomplete, they move from the Work Papers for Inspection store to the “Work Papers Rework” store, according to a rate tied to the underlying “Average Time for Work Paper Inspection.” Note that Work Paper Rework is a task for the source data provider and that the model assumes that rework data requests are done on a work paper basis, not on a tax package basis. There is, therefore, an “Average Work Paper Completion Time” introduced to reflect this assumption.

Finally, some work papers pass inspection but are subsequently found to have errors once a tax specialist begins to work with the data that they contain. This case is a third flow from the Work Papers for Inspection store, which is governed by the fraction assumed for such errors (“Nominal Fraction of Undiscovered Work Paper Errors”). In this case, however, the flow is not directly to the Work Paper Rework store. Rather, there is an assumption that it takes some additional time to discover such errors. (The tax specialist has to work with the data before its lack of validity is apparent.) Thus, there is an accumulation of “Undiscovered Work Paper Rework,” from which a flow exists to the (discovered) Work Paper Rework store, according to an average time assumed for that discovery to take place.

Values for model parameters were assumed as indicated in Table 1. While they do not represent directly measured quantities, these values are representative of tax department experiences as drawn from survey indications (Vertex 2008a) and from direct interaction with corporate tax managers (including specific feedback on earlier versions of this work received in June 2007 from the Vertex User Steering Committee). It is acknowledged that variability in these values

will affect absolute values of calculated effort and elapsed time in the model experiments. It is also the case, however, that the modeling interest in this paper is elsewhere, specifically in characterizing the effects of data collection churn. Since these effects are governed principally by incomplete and error fractions, the values for parameters in Table 1 are therefore unchanged for the analysis presented in this paper.

Note that a distinction is made in the model between the elapsed time to perform a given activity and the effort applied when doing it. This is to account for the reality that tasks in a workflow such as this may not be acted on immediately, but rather queue up with other tasks that are on the source data provider’s or tax analyst’s to do list (but not in scope for this model).

Table 1 Model Parameter Values

Average Tax Package Completion Time (days)	10	Initial Work Paper Fill-In Effort (hours)	2
Average Work Paper Completion Time (days)	2	Rework Work Paper Fill-In Effort (hours)	1
Average Work Paper Inspection Time (days)	0.5	Work Paper Inspection Effort (hours)	0.3
Average Time to Discover Work Paper Rework (days)	2	Work Paper Rework Discovery Effort (hours)	0.7
		Work Paper Work Done Correctly Processing Effort (hours)	1.5

Finally, the basic workload for adjustments to be processed is defined by the total number of work papers and their grouping into tax packages. For this analysis, fifty tax packages are assumed, each with twenty work papers. Both values are in line with industry norms for tax departments in large corporations.

Baseline Performance

Given the above context and associated model, attention can now be focused on the impact of incomplete data in returned work papers and/or inaccuracies discovered in that data later when the tax department is processing it. Using the nominal values cited earlier for fraction of work papers with errors on inspection (“incompletes”) and fraction of work papers with data errors discovered later (0.2 and 0.4, respectively), the model yields the performance traces shown for Work Papers Done and Effort in Figure 3, where cumulative Efforts for Tax Department and Source Data Providers are calculated as the integral of their respective associated rates:

$$\begin{aligned} \text{Tax Dept Work Paper Collection Effort Rate} = & \\ & \text{Work Paper Inspection Effort} * \text{Work Paper Inspection Rate} + \\ & \text{Work Paper Rework Discovery Effort} * \text{Work Paper Rework Discovery Rate} + \\ & \text{Work Paper Work Done Correctly Processing Effort} * \text{Work Paper Work Done Correctly} \end{aligned}$$

$$\text{Source Data Provider Effort Rate} = \text{Initial Work Paper Fill-In Effort} * \text{Initial Work Paper Return Rate} + \text{Rework Work Paper Fill-In Effort} * \text{Reworked Work Papers Return Rate}$$

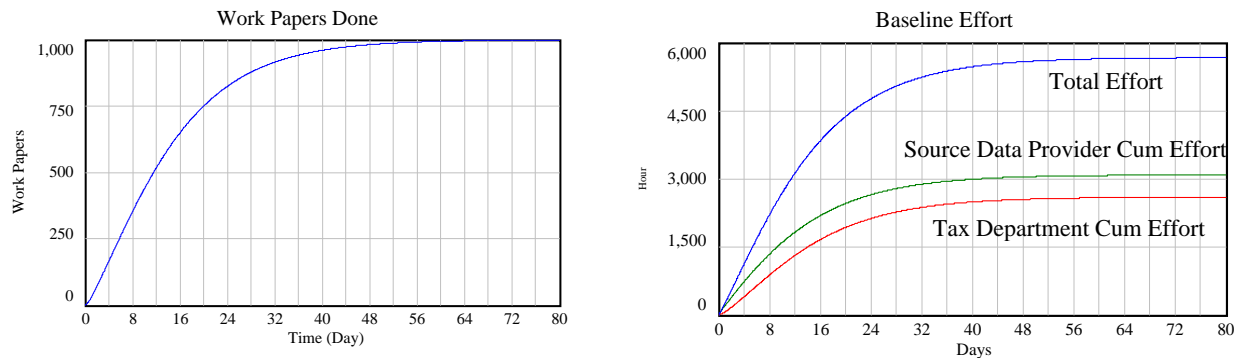


Fig. 3. Baseline Data Collection Performance: Elapsed Time and Effort

Using 99.5% as the standard for declaring work paper processing completed, in the baseline case it takes about 61 working days to get the job done. The effort applied during this time is about 2590 hours for the tax department and 3081 hours for source data providers, for a total of 5671 hours.

With respect to “reference modes” inferred from survey input, these outcomes are consistent with tax department experience in the preparation of the annual tax return (US domestic and US international). In particular, tax departments report that about 50% of their total effort is devoted to preparing the tax return, with about half of that effort going to the collection of adjustment data. For an average sized department of around 6 people, this amounts to a cumulative effort that is in line with that depicted by the baseline performance of the model. Similarly, the elapsed time of 61 working days depicted to fully collect adjustment data is consistent with the 8 months or so that a tax department typically takes overall in elapsed time to complete and file the annual tax return.

Sensitivity Analysis

Against this baseline performance, and with the general feeling in mind that errors and incompletes in data are time consuming and costly in terms of effort, interest now turns to investigating the impact of improving the quality of the data. As an illustration, results of several experiments are provided in this section, in which the values of the two error fractions were varied as shown in Table 2.

Table 2 Performance Parameters for Data Collection Experiments

Experiment	Incomplete Fraction	Error Fraction
Baseline	0.2	0.4
Fewer Incompletes	0.05	0.4
Fewer Errors	0.2	0.2
Less of Both	0.05	0.2

Operationally, these improvements could be achieved by several means. One is by simply training and educating source data providers on the importance of “getting it right the first time” and securing their cooperation in doing so. A second approach is to incorporate “check rules” into work papers (e.g. conditional statements attached to Excel workbook cells), which will examine data entries for integrity and warn of potential errors. Since varying degrees of investment are required using either approach (training time or technology development), an assessment of the performance impact of improving error rates would be a valuable input in judging the extent of such investment justified.

Performance results for the several experiments are shown in Table 3, along with the Baseline case for comparison purposes. In general, of course, fewer trips through the “request data cycle” yields less effort required to generate and process the data by providers and tax departments, respectively, and the whole process concludes sooner. That said, it is notable that even the simple (and presumably low cost) improvement of taking the time to completely fill in a work paper when first presented has a measurable impact, saving on the order of 10% of the source data providers’ collective effort (hundreds of hours). Reducing the undiscovered error fraction has even greater leverage, in part since it saves tax professionals the unproductive effort expended in finding those errors.

Table 3 Model Experiment Results

Experiment	Completion Time (working days)	Effort				
		Tax Dept (hr)	Source Data Providers (hr)	Total (hr)	% Change in Total vs. Baseline	Potential Monetary Savings (\$)
Baseline	61.2	2590	3081	5671	-	-
Fewer Incompletes	59.3	2491	2753	5244	-7.5	\$21,300
Fewer Errors	56.3	2143	2561	4704	-17.1	\$48,300
Less of Both	55.3	2069	2315	4384	-22.7	\$64,400

Overall, the 22+% reduction in effort corresponds to an absolute magnitude of hours that is interesting from a return on investment point of view as process improvements are contemplated. As an example, assuming a modest hourly rate for staff time of \$50 the last column in Table 3

shows how this reduction in effort translates into potential monetary savings. Even at this rate, it is evident that saving hundreds of hours of effort in collecting adjustment data might justify substantive investment in, say, supporting technology to achieve better tax department performance through reduced error rates. Moreover, by the reckoning of some Tax Directors, the impact of this investment can be even greater than simple cost savings, since the staff time saved can now be deployed to higher value tax planning work, which will yield bottom line benefits to the business (Vertex 2008b).

Finally, it is worth noting that any monetary savings or performance improvement indicated here is notional. The promising prospect, however, is that the structure of the system dynamics model is representative of tax department situations in general and that it can be used as a tool to examine a given tax department's specific situation (e.g. its number of tax packages, error rates, etc.) and thereby its potential for improved performance.

Work Paper Submission on an Individualized Basis

One of the practical limitations of contemplating the inclusion of check rules in Excel-based tax packages is that these rules are easily circumvented in the field. For this and other reasons, some tax departments are looking to deploy data collection capabilities that are web-based. In this situation, source data providers are able to access their tax packages on a work paper by work paper basis (one web page per work paper). Such a deployment supports the enforcement of check rules that cannot be circumvented, since they are embedded on web pages delivered from a remote server.

Not only does this approach have the potential to improve error fractions, it also has the likely effect of improving overall completion time for work paper processing. Though not readily apparent at face value, taking a System Dynamics perspective provides this insight. With reference to the model shown in Figure 2, the initial issuance and filling out of tax packages takes place on an all or nothing basis. That is, a source data provider typically receives its tax package (at a location away from the tax department) and passes it around the local office for its work papers to be filled in by those with the relevant knowledge. In practice, then, the tax package is not returned to the tax department until all work papers in it have been addressed. This is the situation depicted in the Figure 2 model.

The situation where work papers are filled in on an individual basis – and therefore available for processing on that basis – is depicted in the enhanced model shown in Figure 4. In the model, the situation where work papers are returned individually is now an alternate source, and a switch has been added that determines the source and rate of inflow for work papers to be inspected.

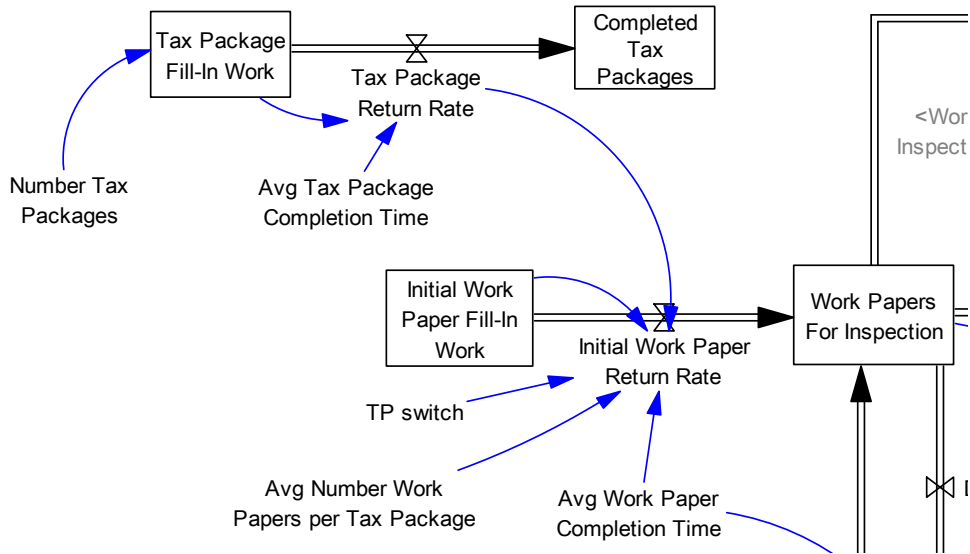


Fig. 4. Modeling Work Paper by Work Paper Data Collection

To demonstrate the effect of receiving and processing work papers as they are completed, 1000 work papers were established as the “Initial Work Paper Fill-In Work” level and a new experiment for the values of the “Less of Both” case was conducted. Figure 5 shows the Work Papers Done traces for both experiments. (Since the workload and error fractions were unchanged, altering the sourcing strategy did not alter the impact on effort for either the source data providers or the tax department.)

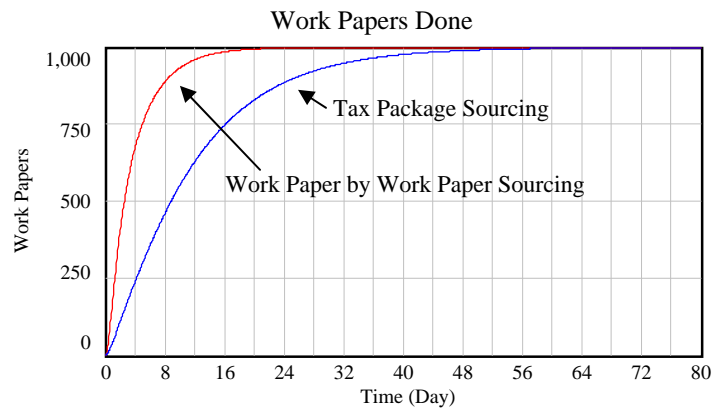


Fig. 5. Comparison of Completion Time for Work Paper by Work Paper Sourcing

It is evident from the traces that the work paper by work paper sourcing method considerably improves overall completion time. By the 99.5% standard, the number of working days is reduced by over half to about 20 working days. The reason is that the “all or nothing” practice associated with the tax package sourcing method is effectively letting the last work paper to be completed in a tax package limit the availability of those work papers already completed. By enabling each work paper to be processed as soon as it is filled in, more of the tax department’s

workload can be completed sooner. Though this effect is perhaps readily apparent when taking a systems point of view, it represents a significant insight to tax departments that are anchored in the use of tax packages as a standard practice.

Conclusion

This work has applied basic System Dynamics analysis methods to illuminate the underlying dynamics in a situation typical of the large corporation's tax department - that of gathering specialized tax data from around the corporation. In doing so, a tangible cause and effect linkage has been demonstrated that shows how a commonly experienced frustration in dealing with errors in data collection has a significant impact on tax department performance. Early work with this linkage looks to be a promising basis for a tool to justify and focus investment in process improvements that will not only benefit the tax department from a cost perspective, but will also improve the reliability of its processes as the department responds to Sarbanes-Oxley imposed standards and IRS audit scrutiny.

Finally, this work has examined only one area of tax data management, that of adjustment data collection. Though significant, there are other data management areas in tax operations whose work processes and interactions with the rest of the corporation lend themselves to additional systems-oriented analysis. Given the insights obtained with the analysis to date, the expectation is that a comprehensive model can be developed that provides additional insights into improving overall tax department performance.

References

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