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Assessing alternative automation levels with corporate actions processing: A quantitative case study

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Universität Zürich
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ASSESSING ALTERNATIVE AUTOMATION LEVELS WITH CORPORATE ACTIONS PROCESSING A QUANTITATIVE CASE STUDY

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Assessing alternative automation levels with Corporate Actions Processing

A Quantitative Case Study

Urs Bischof & Hans Geiger
March 23rd 2007

Preface

The technology in use to process securities pre- and post trading activities manifests one of the fundamental pillars of a financial market's infrastructure: The more sophisticated a technology, the more efficient can trading activities be supported which in turn increases the efficiency of financial markets. One of the most striking processes in terms of resource intensity remains to be corporate actions processing.

Until very recently, corporate actions processing has only been automated to a limited extent. However, Finance professionals have become more and more aware of this subject committing themselves to more investments in automation projects in the future. One of the questions that typically arise though is where to begin? Which steps of the corporate actions processing chain are most suitable to start with? And which types of corporate actions would be most profitable to process automatically? From a business point of view, very clearly, substituting manual steps with automated processes is most beneficial for steps that bear the highest cost savings potential. In this context, empirical evidence hardly exists as to how many resources are involved in an individual step of the corporate actions processing chain. This study aims at contributing to filling this gap. In collaboration with the generous support of a medium-sized bank active in securities trading and processing, workflow charts and relevant figures were meticulously gathered. Subsequently, these figures were standardised with the purpose of transforming bank specific insights into more general statements that could be applied to representative financial institutions with trading and processing activities.

The present study was written between December 2005 and August 2006. It predominately focuses on the cost benefit analysis of automated corporate actions processing. Telekurs Financial Information Ltd. and the Institute of Swiss Banking at the University of Zurich started discussing the automation of corporate actions and eventually set up a project plan to further analyse this subject.

March 2007

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Abstract

In recent years, the number of automation projects has increased throughout the Finance Industry and particularly in securities trading and processing. The same observation can be made for corporate actions automation projects. Corporate actions messages are triggered when specific decisions are taken at the issuer's side which result in cash flows or impact on the capital structure of a security.

The overall objective of this study is to highlight the savings potential of automation projects based on empirical evidence gathered from a medium sized universal bank. The involvement of employees – measured in time units and employee working days respectively – is evaluated and interpreted as savings potential if manual processing was to be replaced with fully automated processes.

The theoretical part of this study explains the method used for the empirical part. This method describes the entire corporate action processing chain and consists of several sub-processes which serve at the same time as a basis for establishing the involved time. Interviews were conducted with experts who deal with corporate actions on a day-to-day basis.

Twelve corporate actions types were selected and their specific sub-processes were examined. In particular for cash flows, the majority of the sub-processes were already automated; hence, for these sub-processes, it was not possible to establish the potential time spent for manual processing with hindsight.

Therefore, the core focus of this analysis lies on how the level of automation can be optimised: first those sub-processes that have only recently been automated, and second, those sub-processes that currently are processed manually but which could be automated. Today, at the bank under review, 60% of the cash flows are fully automated; 23% are partially automated and 17% are processed manually.

As for automated processing, the only manual task derives from error messages that can occur due to false or missing data and that need to be corrected manually. A full overview of IT-related costs such as for the development and installation of automated processing systems is beyond the scope of this study. The savings potential of automated processing shall point out to which extent the costs of automation projects are acceptable depending on the required pay-back time and the number of administered securities.

The study concludes that both dividend payments and interest payments constitute those types of cash flow for which it would be most profitable to increase the degree of automation. Thus, for these cash flow types it would be suitable to apply a full STP. In contrast to cash flows, most corporate actions types have been processed manually. Looking at the selected corporate actions types, "Exchange of security with cash component" and "Name change" related to shares bear the highest savings potential.

To sum up, if the remaining sub-processes were automated and based on the 12 corporate actions types under review, it would be possible to achieve annual savings of approx. 114 employee working days (54583 minutes). The savings potential could be higher, namely by 34 employee working days (16131 minutes), if the automated processes would not necessitate further manual interaction due to conflicting, missing or delayed data. The benefits of automation are substantial for instance when just considering shares: For 1000 shares, 31.6 employee working days could be saved if the 6 corporate actions types relevant for shares would be fully automated. Besides, for only one corporate action type, e.g. dividend payment, that affects 1000 shares and 1000 investment funds on a yearly basis, 23.2 employee working days could be saved. From the corresponding multiple of these intervals of 1000, one can draw conclusions regarding other instrument quantities.

In general, it can be said that for all corporate actions types, the highest potential for automation can be identified for sub-processes at the beginning of the whole processing chain; i.e. the receipt and control of corporate action messages as well as for checking and recording position data. For enhancing automated processes, data providers, custodians and financial institutions alike will have to take further action. Above all, standardisation, data quality and the timely delivery of data are areas that continue to require special attention.

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Glossary

Security life cycle	Spans from trade, settlement and position related activities during the period in which a security is held. The cycle begins when a security is acquired and ends when the security is sold or when it expires.
Trade life cycle	Covers the processing steps from initiation, order receipt to settlement.
S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunication Organisation, a worldwide organisation providing secure message transmission, i.e. of payment and financial information, between financial institutions.
Custodian	An institution that specialises in holding securities and effecting movements of securities on behalf of financial institutions as well as private and institutional investors.
Straight-Through-Processing (STP)	The process of managing the entire trade life cycle in an automated and seamless manner without the need for review or repair.
Corporate action (CA)	A change to the structure of an existing security or cash flows (CF) such as the distribution (by an issuer) of dividends or capital gains to existing shareholders or bondholders.
Employee working day	Sometimes also referred to as “full time equivalent”. In this study, the employee working day is based on 8 hours.

1. Introduction

In the area of securities settlement, cost estimates of the sub-processes included in the securities processing cycle are frequently drawn and compared with each other to find out ways of making processing even more efficient. The sub-processes that are carried out manually in the securities processing chain are measured against potential cost advantages of automated processes. The arguments for comparison that are usually stated, include more efficient processing, i.e. higher volume is processed in the same time, and a lower error rate.

These arguments have only rarely been underpinned with concrete, empirically established evidence. Therefore, it was the aim of this project to empirically prove how many resources are involved in one process of a specific area of securities processing. The study focuses specifically on the processing of corporate actions data including cash flows. For a big part of the corporate actions types, the processing steps, spanning from the receipt of the message to the final notification of clients, were described in (sequential) steps. It becomes apparent that each type of corporate action message triggers a series of steps which diverge from each other organisationally and in view of time and hence require bank internal resources.

After these steps were described, the 'resource intensity', i.e. how many resources are involved in processing these steps, was measured and quantified. The relevant indicator was the time a person spends to complete a sub-process. In certain cases, where steps were already automated at the time research was carried out for this study, interviews were conducted to establish as far as possible the number of required resources. Some sub-processes had been automated before 2001; establishing the resource intensity for these cases was rendered impossible.

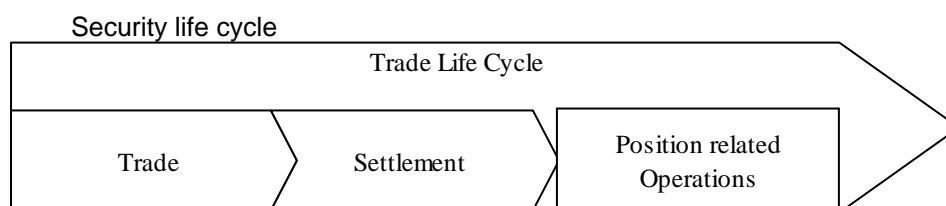
Part 2 of this study deals with the theoretical background in more detail. It is shown how corporate actions types are embedded into the bank internal processing chain. Further emphasis lies on the development potential of automated processing. Part 3 examines the benefits of automated processing by looking at genuine examples, i.e. by evaluating real data as provided by the bank mentioned above. Part 4 concludes with additional comments.

2. Introduction to the administration of corporate actions

2.1 Corporate actions in the security life cycle

One can look at the security life cycle from different angles. In consideration of the quantitative analysis in this study, the security life cycle is described from the perspective of a financial institution operating in securities trading. In this respect, the security life cycle starts with receiving the client's order or a bank internal notification. Subsequently, a process chain evolves that can be divided into three phases, i.e. trading, settlement and position related operations.

Figure 1:



This study concentrates on the process steps involved in the phase 'position related operations' meaning the administration of securities held by a securities trading company. Position related operations differ from the so called "trade life cycle" in as far as the latter always ends with the selling or purchasing of a security; position related operations, however, refer to the administration of securities that are kept in the bank's books.

The following business areas are relevant for position related operations:

- **Funding, Lending & Borrowing:** Funding is the financing of investments through the borrowing of cash on a secured and/or unsecured basis carried out by financial institutions. For example, Repo trades are used as a mechanism to borrow and lend cash on a secured basis. In Lending, securities are borrowed to a third party for money.
- **Accounting:** Accounting as a financial information and reporting system of a securities trading company must fulfil other specific requirements apart from the capturing of trade details relevant in trade and settlement. Above all, it must be possible to calculate at any time realised and unrealised profit based on current market price data.
- **Custody:** As part of their comprehensive range of services, financial institutions operating in securities trading can also take on the role as custodian, i.e. clients can deposit their securities and money with this financial institution. In most cases private investors and in some cases institutional investors take advantage of this service as they do not have direct access to a custodian. The financial institution holds a separate custody account at the custodian to safekeep the client's securities. The steps involved regarding custody include receiving and forwarding the securities for the client and updating the books accordingly in a timely manner. In addition, the client may request an up-to-date valuation of his custody account. Specialised data providers deliver the required data for valuating the client's securities to market prices. The means of communication between the financial institution and the client can vary from segment to segment. In any case, the client is informed about his cur-

rent custody account value and the corresponding documents are sent to him for information.

- **Corporate actions including cash flows:** Corporate actions including cash flows constitute the biggest part of the position related operations. We are dealing with corporate actions, if the issuer of a security distributes capital gains or dividends on an existing security or if the structure of a security changes due to decisions taken on the issuer's side.

The following pages draw attention to the steps involved in corporate actions processing.

2.2 Automation steps

Corporate action messages trigger a series of sequential process steps at the financial institution operating in securities trading.

As a general rule, two information sources shall be available for one specific corporate action: On the one hand, the custodian safekeeping the securities and communicating corporate actions mainly via S.W.I.F.T.¹ and on the other hand, a data provider collecting information on corporate actions and disseminating this information.² As a prerequisite, two machine readable sources must be available so that corporate action messages can be automated. By comparing these two sources, the content and the level of consistency of a message are verified. Concordance as a result of this comparison can be regarded as an equivalent in terms of quality of the "4-eyes-principle" used in manual processing. If the comparison comes up with contradictory or inconsistent data contents, an error message is generated and the particular corporate action must be corrected manually, i.e. resources are required.

In this study, we look at a generic processing chain that can be applied to both cash flow messages and corporate action messages.

Figure 2: Generic processing chain for securities related corporate actions processing

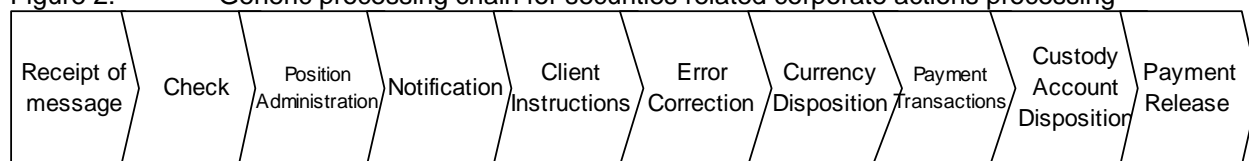


Fig. 2 shows the general process steps that are triggered for corporate actions. The entire spectrum of process steps is taken into consideration bearing in mind that some steps may not be relevant for certain corporate actions types. For example, the distribution of a cash dividend does not require instructions from the client. By looking at this processing chain, it becomes evident that the steps must be processed sequentially.

The process steps depicted in fig. 2 can be described as follows:

¹ Society for Worldwide Interbank Financial Telecommunication. A worldwide organisation providing secure message transmission, i.e. of payment and financial information, between financial institutions.

² Telekurs Financial Information Ltd. is such a data provider. Telekurs Financial's product "Valordata Feed (VDF)" is an example of a financial data feed transmitting master-, price- and corporate actions data in structured and encoded form.

- **Receipt of corporate action message:** Message is received via data feed from a data provider and via S.W.I.F.T. message from the custodian. Both messages enter the corporate action message diary.
- **Corporate action message check:** The messages that are delivered by the data provider are matched with the S.W.I.F.T. messages. The received data is matched against the bank's master data. If the messages provided automatically by the data provider and the S.W.I.F.T. messages are identical, the "4-eyes-principle"³ was applied. Not identical or missing messages constitute a failure to the "4-eyes-principle"; this triggers an error message.
- **Position administration:** Corporate actions and cash flows are opened and released in the system. For each custody account transaction, the system checks if a corporate action or a cash flow message exists. If required the custody account at the custodian is updated and a note is recorded in the system.
- **Notifying the client:** Depending on the type of corporate action, clients must be informed on upcoming events. For example, a bondholder must be informed of a premature redemption.
- **Instructions from the client:** For some corporate actions types, the client must take action. For example, in case of a share dividend payment, the shareholder may have the option to receive a cash dividend or to reinvest the dividend into the subscription of additional shares.⁴ Shareholders must be made aware of their options and must give instructions accordingly.
- **Error correction:** In automated corporate actions processing, errors can occur for many different reasons. If for a dividend payment one of the above mentioned messages is missing or the amounts to be distributed are not the same, back office staff must rectify this error and release the corrected message in the system manually. Error correction is always linked to automated processing. The process of correcting errors itself cannot be automated; as a result, straight-through-processing transmission is disrupted.
- **Currency disposition:** If the transaction is not made in its local currency or big amounts must be settled, the department dealing with foreign currencies must be involved in settlement.
- **Payment transactions:** By monitoring the receipt of payments, it is ensured that the correct amounts are credited to the right account.
- **Custody account disposition:** Includes numerous steps related to the custody account, e.g. administration fees, account bookings, checking balances and accounts.
- **Payment release:** Clients' positions are evaluated and calculated automatically and the corresponding settlement statement is triggered.

³ Due to security regulations in manual processing, at least 2 employees, i.e. 4 eyes, are obliged to check and confirm data.

⁴ Volkart, R.: Corporate Finance, 2003, p.535

2.3 Reasons for increased automation

Until recently, corporate actions processing has only been automated to a limited extent, as in the majority of the cases, messages were processed manually.⁵ However, in recent years Finance professionals are getting more and more aware of this subject saying that they want to invest more in automation projects in future.

In the light of this, there are several reasons for leveraging automation of corporate actions processing:

- Financial institutions operating on an international scale that keep a variety of instruments, usually employ a considerable number of in-house resources for processing corporate actions manually. Manual processing, however, involves significant risks. For example, the financial institution is liable to their clients if it failed to identify corporate action information correctly. As the financial institution has to interact with numerous parties in a time critical environment, there is a high likelihood of communication and interaction errors. Consistency and standardisation in communication and interaction shall minimise these risks.⁶ As automation requires encoded data, encoding helps to improve product and risk management.⁷
- Automation of corporate actions allows financial institutions to meet in a better way the high expectations put on them by clients expecting seamless support services. For example, corporate actions announcements or automated transactions to bank external accounts can be handled in due time. In fact, financial institutions can gain competitive advantage when client expectations are exceeded.⁸
- Since the 1980s, the volume of cross-border traded securities has been growing whilst the spectrum of securities held has become more and more diversified. As a consequence, the number of corporate action messages has risen accordingly. In particular, the number of complex corporate action messages has increased which can be observed for instance, in the area of foreign and structured financial products.⁹ Moreover, the number of real corporate actions has increased, for example in the area of Mergers & Acquisitions.¹⁰
- Due to the rise in complex corporate action messages as described above and the increased cost awareness throughout the industry; financial institutions are getting more and more under pressure to take action and tackle cost-cutting automation projects. With more severe competition in the trading business and profit margins declining due to efficient electronic trading systems, financial institutions are being forced to compete on the cost side.¹¹ First and foremost, financial institutions could reap the benefits of automation projects that boost efficiency and reduce spending for the very resource intensive manual processing. Markets that face high staff costs are leading the way with regards to automation projects. By comparing the monetary value of a trading transaction to its actual handling fees and setting this

⁵ N.N.: Automated Messaging Key for Corporate Actions, 2003, p.10 and Simmons, M.: Securities operations, 2002, p.427

⁶ Kirby, A./ Smith, C./ Howard, W.: Reference Data User Group, 2003, p.13

⁷ Bischof, U.: Kampf der Kostenspirale, 2002, p.65

⁸ Simmons, M.: Securities operations, 2002, p.428

⁹ A structured financial instrument is a combination of two or more instruments and one of them must be a derivative; the result is a new investment product.

¹⁰ Bischof, U.: Kampf der Kostenspirale, 2002, p.65. and cp. Simmons, M.: Securities operations, 2002, S.429 and Günzer, M.: Cross-Border Equity Trading, Clearing & Settlement in Europe, 2002, p.16

¹¹ Wilbraham, M., Delaney, A.: Reference Data Now, Business Drivers and Approaches To Data Management, 2004, p.10

against the monetary value of a corporate action compared to its handling fees, a huge difference can be made out. The ratio between the trade value and the handling fees is a great many times higher than the ratio between the monetary values of a corporate action in relation to its handling fees.¹²

2.4 Demands and limitations of automation: In how far is STP a reasonable solution for corporate actions processing?

Standardisation plays a key role both in the trade life cycle and in corporate actions processing. For automation, explicit data referencing and uniform formats for the tools involved in data transmission are essential. Standards for the communication between the involved institutions has been requested more and more from different sides showing that the financial institution depends on the other market participants when it comes to implementing a Straight-Through-Processing environment, i.e. a fully automated seamless processing chain without media disruptions.¹³

Besides the lack of standardisation, the regulatory differences especially in the fragmented European market pose an obstacle to automation projects. Processing corporate action messages mirrors national legislation and market practice; not until harmonisation of the described differences can be achieved, it will be possible to process corporate actions data more efficiently.¹⁴

Apart from external restrictions, it must be examined in how far fully automated processes would be economically reasonable. In this context, the frequency and complexity of a corporate action message must be taken into consideration. Implementation of an automated processing logic will only pay off if the same processing steps occur on a continuous basis. If complexity is low, meaning that the automation logic is relatively simple, and the investor does not have to take action, automating this specific corporate action would be an advantage. Corporate actions types with a less complex structure and high frequency include dividend payments, coupon payments or the redemption of bonds.

Gradual implementation of automation projects is advised as they are not only very time intensive but also bear considerable uncertainties. As a first step, the corporate action messages with high frequency and low complexity shall be automated. Automating corporate actions types that come up very rarely such as the insolvency of an issuer would hardly be profitable from an economic point of view, as these messages are very complex and moreover not very frequent.¹⁵

Hence, it is doubtful that Straight-Through-Processing applied to corporate action processing would be feasible in a way that it would replace human interaction completely. More importantly, automation shall render the work of employees more efficient, by giving them more time for corporate actions types that need special attention due to their complexity or very rare frequency.¹⁶

¹² Simmons, M.: Securities operations, 2002, p.428

¹³ Simmons, M.: Securities operations, 2002, p.431

¹⁴ N.N.: Automated Messaging Key for Corporate Actions, 2003, p.10

¹⁵ Bischof, U.: Kampf der Kostenspirale, 2002, S.66 and N.N.: Automated Messaging Key for Corporate Actions, 2003, p.10

¹⁶ N.N.: Automated Messaging Key for Corporate Actions, 2003, p.10

3. Quantitative study on the savings potential of automated corporate actions processing

3.1 Data collection and status quo at the bank under review

All data used in this study was established on the basis of interviews conducted with bank employees and by using historical records or records created especially for this project.

Based on the findings of the interviews with back office staff combined with statistical material on the frequency of the specific security type and the corporate action type, conclusions could be drawn as to the time spent for manual processing. Historical data had to be used particularly in those cases where individual process steps had been automated a long time ago and thus no interviewees were available. In addition, error messages that were triggered in automated processing had to be checked and recorded.

The time spent on the processing steps of a specific corporate type was based on the statements of bank professionals who work in corporate actions processing on a daily basis.

Apart from the time spent on a specific process step, the interview findings shedded light on further details:

- There are steps that are currently carried out manually but that could be automated;
- There are steps that cannot be automated. These steps require client interaction and manual intervention for correcting errors;
- There are some corporate actions types for which steps had already been automated.

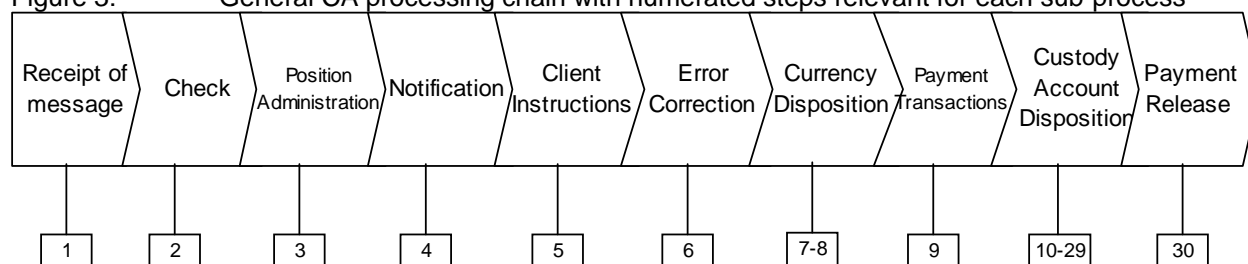
As cash flows are automated gradually, the time spent for the manual processing of cash flows could only be established for steps that were automated after 2001.

In this study, for steps that today are already automated, it is assumed that no resource time is required, so the time spent is zero. However, manual intervention is inevitable in cases where error messages occur. Given the fact that errors must be corrected manually, automated processing is disrupted. Today, at the bank under review, around 60% of all cash flows are fully automated, 23% are partially automated and 17% are handled manually.

3.2 Subject matter and applied method for data collection

The compiled data refers to the entire processing chain of corporate actions processing as depicted in fig. 2. The interviews covered all steps involved for one specific type of corporate action. Some sub-processes involve multiple steps as shown in fig. 2. For certain corporate actions types, however, some steps are not applicable.

Figure 3: General CA processing chain with numerated steps relevant for each sub-process



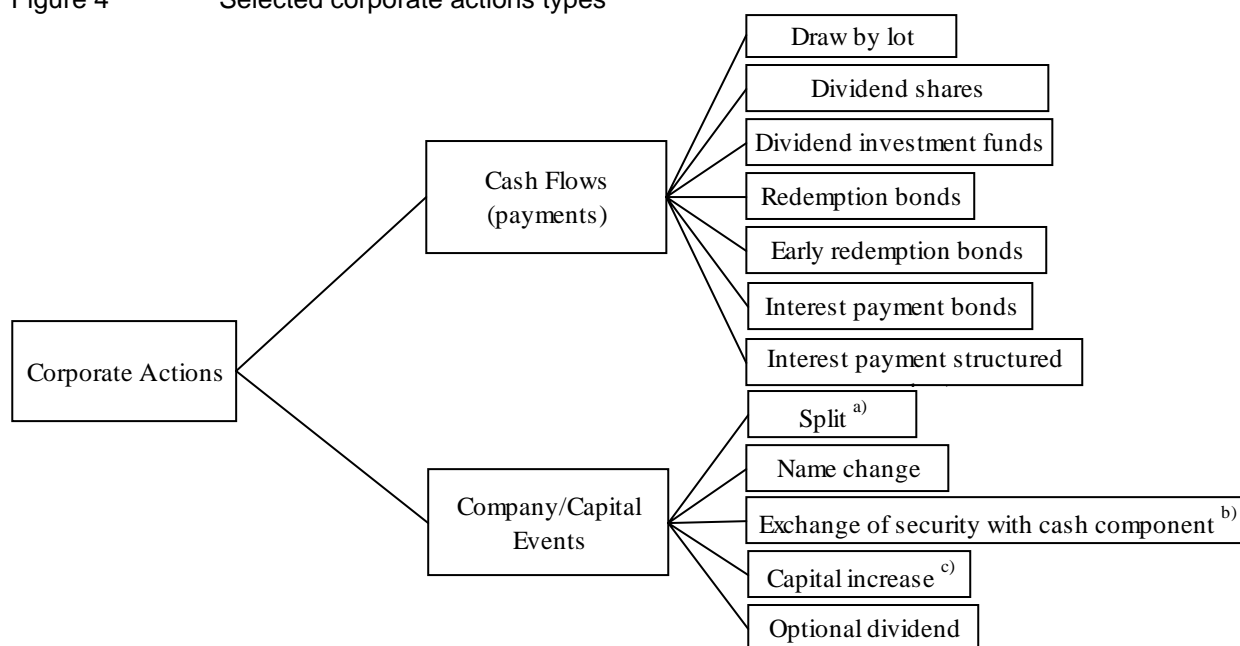
The aim was to establish the time spent for each step that is processed manually. Methodically, a questionnaire was created that listed all possible steps. With the help of these questionnaires specialists were interviewed about the corporate action types in question.

3.3 Types and frequency of the corporate actions under review

The corporate actions types that are analysed in this study are a selection of the most important corporate actions types at the bank under review. An evaluation of all possible corporate actions types would be beyond the scope of this study.

Fig. 4 shows a summary of all evaluated corporate actions types that were grouped according to cash flows and corporate action processes. Whilst cash flow payments have to be made to the owner of a security, corporate actions affect the security's structure.

Figure 4 Selected corporate actions types



a) Split or reverse split / with conversion

b) Merger and exchange of securities with cash settlement component

c) Capital increase with entitlement

In contrast to the corporate actions processes that today are mainly carried out manually, the evaluated types of cash flow have been automated to a high extent.¹⁷ For ex-

¹⁷ In contrast to cash flows, the receipt and control of corporate action messages is not automated; the "release" of a corporate action, however is automated, this job runs overnight.

ample, process steps regarding position keeping; currency disposition and payment transaction have been automated for all cash flow types that were analysed.

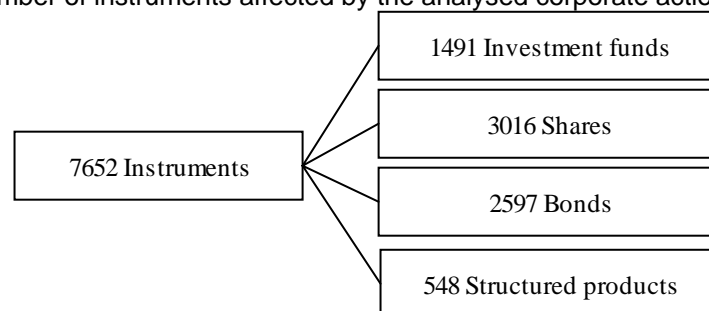
The analysed corporate action types were established for the year 2005 and indicate the frequencies as listed in the table below.

Figure 5: Frequency of analysed corporate action types

	Corporate action	Instrument type	Frequency (p.a.) 2005
Cash Flows (CF)	Draw by lot	Bond	0
	Dividend	Share	4896
	Dividend	Investment fund	1546
	Redemption	Bond	642
	Early redemption	Bond	45
	Interest payment	Bond	5035
	Interest payment	Structured product	477
Company/Capital Events	Split/Rev. Split / with conversion	Share	140
	Name change / with conversion	Share	254
	Exchange of security with cash component	Share	360
	Capital increase	Share	76
	Optional dividend	Share	16

The corporate action types refer to different security types. In this study, we are looking at shares, investment funds, bonds or structured products. At the bank under review, the sum of active instruments relevant for this study amounts to 7652 instruments. Fig. 6 shows the breakdown of these 7652 instruments by type of security.

Figure 6: Number of instruments affected by the analysed corporate action types



3.4 Frequency of error messages in automated processing

Error messages are defined as a disruption to automated or partially automated processes. Hence, they can only occur in connection with cash flows as those are automated.

Errors cannot be allocated directly to specific types of corporate actions. For example, an erroneous “payment amount” can be attributed to dividend payments as well as to redemption payments or to interest payments. Bearing this in mind, one should look at how error messages can be broken down to the single type of corporate action. In this context, we estimate that the error messages are proportional to the frequency of a corporate action. So, the time spent for correcting error messages can be allocated to the relevant corporate action message.

First of all, for calculation, relevance must be defined. It must be verified if the error message in question can occur in connection with a specific corporate action. Secondly, a yearly total of all corporate action types that can indicate the same error is calculated. Thirdly, by now dividing the annual frequency of an error message by the number that was just calculated, a quotient is calculated which can be multiplied with the annual frequency of any other corporate action type that is defined as relevant. Thus, a quantitative allocation of the error message to the individual corporate action types could be realised.

The table below gives an overview of the annual error frequencies listed by each corporate action type.

Figure 7: Annual frequency of error messages and their allocation to the analysed CAs

Error message	Frequency in 24 days. (11.7.05-5.8.05)	Annualised frequency (observed frequency / 24*360)	Draw by lot (Bond)	Dividend (Share)	Dividend (Investment fund)	Redemption (Bond)	Early redemption (Bond)	Interest payment (Bond)	Interest payment (Structured product)
			error min. p.a.	error min. p.a.	error min. p.a.	error min. p.a.	error min. p.a.	error min. p.a.	error min. p.a.
Day count convention			0	0	0	0	0	0	0
Number of interest days	2	30	0	0	0	0	0	54	6
Ex-date	6	90	0	68	22	0	0	0	0
Pay-date			0	0	0	0	0	0	0
Tax rate	20	300	0	122	39	0	0	254	24
Taxable amount			0	0	0	0	0	0	0
Taxable amount %			0	0	0	0	0	0	0
Payment amount	54	810	0	329	105	82	6	341	32
Payment amount %	1	15	0	0	0	3	0	14	1
Currency	13	195	0	79	25	20	2	82	8
incl. Tax rate			0	0	0	0	0	0	0
No redemption stock	2	30	0	24	8	15	0	65	5
Redemption stock differs from notional amounts	31	465	0	378	120	118	10	588	57
Currency in deposit missing	6	90	0	73	23	9	0	76	8
Cash flow without tax (Italy)	6	90	0	0	0	0	0	164	16
SWIFT problem due to tax	31	465	0	0	0	0	0	850	80
Interest period missing			0	0	0	0	0	0	0
SWIFT amount negativ (stock)			0	0	0	0	0	0	0
Cash flow custodian position differs from deposit position	27	405	0	823	261	103	10	850	80
SWIFT: Taxable amount/rate	1	15	0	6	2	0	0	12	2
Cash flow: only from SWIFT	29	435	0	1639	520	393	30	0	0
No currency account available	2	30	0	24	8	3	0	26	2
SWIFT message can not be allocated to Cash flow messages	28	420	0	854	271	107	10	883	85
Old (not computer readable) Cash flow message	122	1830	0	2757	876	2	26	0	0
Cash flow: no message from SWIFT	13	195	0	396	126	50	5	410	40
Annual total error handling minutes per corporate action type			0	7575	2405	906	100	4668	447

The different types of errors can be grouped according to the measures to be taken due to the interruption of the automated processes.

These results can be summarised as follows:

- **24%** errors are due to **wrong values** (ex-date, payment amount etc.) indicated in the source. As a required measure, the value must be corrected manually.
- **31%** errors are due to **delayed cash flow messages**. As a required measure, the value must be corrected manually.
- **19%** errors are **in connection with position data**. As a required measure, the value must be released manually.
- **18%** errors are due to **contradictory data content** provided by the two sources. As a required measure, the value must be checked manually.

- **8%** (or 31 observed, respectively 465 annualised) errors are related to ***SWIFT-problems due to tax data***. As a required measure, the message must be released manually.

3.5 Analytical evaluation

3.5.1 Assumptions

The assumptions that were made for the evaluation of the analysed data are the following:

- All data collected for the year 2005 was annualised in a linear way, in cases where data was not available on an annual basis.¹⁸ The observation period for error messages was set to just under one month. In order to base analysis on comparable data, the observation period for the corporate actions' frequencies must be the same as the one for error messages. Therefore, we are calculating in years as orders of magnitude.
- For instruments, it is assumed that they remain constant with regard to their relative quantity.
- For steps that are already automated, the time spent for human interaction is zero, as no resources are required.
- If an error message occurs in an automated process, the processing chain is disrupted which necessitates manual intervention and therefore requires resources.
- "Error messages" can only occur in connection with cash flows, as at the bank under review, the other corporate action types have not been automated yet.
- Error message types that can be the same for several corporate action types (e.g. "payment value") are allocated to the individual corporate action types in a way that the error messages are proportional to the annual total frequency of a corporate action type. This makes it possible to allocate the error messages that cause manual intervention to the respective corporate action message.
- For calculating minutes into employee working days, the calculation is based on a working day of 8 hours.

3.5.2 Time spent for each corporate action in manual processing

By evaluating the interviews as described under point 3.2 and 3.3, the time spent in minutes for each corporate action type and the corresponding sub-process that is processed manually (or partially manual processing) could be determined.¹⁹ The minutes correspond to the maximum savings potential for each corporate action, if sub-processes would be automated and no longer be carried out manually. The time spent

¹⁸ This assumption can be restrictive for certain corporate action types such as dividends that normally occur in recurrent given periods.

¹⁹ As cash flows are automated gradually, the time spent for the manual processing of cash flows could only be established for steps that were automated after 2001.

on error messages that can occur in automated processing must be compared with and deducted from the savings potential. In the table below, the time spent on such errors has not been taken into account, but will be considered in section 3.5.3.

Figure 8: Time spent in minutes for each CA and sub-process in manual or partially manual CA processing (Findings of the questionnaires)

	Receipt of message	Check	Position administration	Notification	Client instructions	Error correction	Currency disposition	Payment transactions	Custody account dispositions	Release	TOTAL Min.
Draw by lot (bond)	10								2	1	13
Dividend (share)	2	1 ^{a)}							1	1	4
Dividend (Investment fund)	2	1							6 ^{b)}	1	4
Redemption (bond)										1	1
Early redemption (bond)	3									1	4
Interest payment (bond)										1	1
Interest payment (structured product)	3									1	4
Split/Rev. Split / with conversion	3	15	9								27
Name change / with conversion	3	15	9								27
Exchange of security with cash component	3	15	9							10	37
Capital increase	3	15	9								27
Optional dividend	3	15	30						13		61

- a) For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend. In total, there are 100 of these cases per year. This correction has not been taken into consideration in the table above but is highlighted and corrected in the next table (fig. 9) in column "Exceptions".
- b) Only applies to Swiss investment funds; i.e. approx. 25% of all investment funds. This correction has not been taken into consideration in the table above but is highlighted and corrected in the next table (fig.9) in column "Exceptions".

Sub-processes that do not indicate any details on the time spent are any of the following ones:

- Processes that had already been fully automated and hence no information as to manual processing was available, or
- Processes or steps that are not relevant to a specific corporate action type – i.e. not applicable from a financial/banking point of view, or
- Processes that cannot be automated.

3.5.3 Total time spent on manual processing per year

If the time spent in minutes per corporate action type, as shown in fig. 8, is multiplied with its frequency, the total annual time spent in minutes for each selected corporate action is calculated. The time spent in minutes corresponds to the theoretical maximum savings potential, if the indicated manual sub-process would be automated.

However, the time spent for correcting errors manually (due to inconsistent and contradictory data) must be deducted from the maximum savings potential. The annualised error minutes for each corporate action type, as shown in fig. 7, are also deducted from the annual total of the time spent for each corporate action.

Figure 9: Annual totals of time spent in minutes for each corporate action type

	Receipt of message	Check	Position administration	Notification	Client instructions	Error correction	Currency disposition	Payment transactions	Custody account dispositions	Release	Exceptions	Remark (ref. to column "Exceptions")	TOTAL in min.	TOTAL in days
Draw by lot (bond)	0	0	0	0	0	0	0	0	0	0	0	For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	0	0
Dividend (share)	9792	4896	0	0	0	-7575	0	0	4896	4896	2000	For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	18905	39.4
Dividend (Investment fund)	3092	1546	0	0	0	-2405	0	0	9276	1546	-5798	For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	7257.5	15.1
Redemption (bond)	0	0	0	0	0	-906	0	0	0	462		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	-444	-0.9
Early redemption (bond)	135	0	0	0	0	-100	0	0	0	45		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	80	0.2
Interest payment (bond)	0	0	0	0	0	-4668	0	0	0	5035		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	367	0.8
Interest payment (structured product)	1431	0	0	0	0	-477	0	0	0	477		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	1431	3.0
Split/Rev. Split / with conversion (share)	420	2100	1260	0	0		0	0	0	0		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	3780	7.9
Name change / with conversion (share)	762	3810	2286	0	0		0	0	0	0		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	6858	14.3
Exchange of security with cash component (share)	1080	5400	3240	0	0		0	0	0	3600		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	13320	27.8
Capital increase (share)	228	1140	684	0	0		0	0	0	0		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	2052	4.3
Optional dividend (share)	48	240	480	0	0		0	0	208	0		For Swiss registered shares, a part of the credited amount is paid by the share register. In this case, the time spent for manual intervention increases by 20 minutes for each dividend.	976	2.0
													54583	113.7

Fig. 9 shows the total aggregated, annual time spent for the manual processing of each corporate action type; this total is to be interpreted as the theoretical maximum savings potential. The annual savings potential for the bank and the relevant 12 corporate action types under review would be approximately 54'500 minutes or 114 employee working days.

3.6 Interpretation of results

The calculations that were pointed out so far always refer to the specific circumstances at the bank under review, as the time spent per year is inevitably related to the number of instruments maintained at the bank (fig. 6).


Thus, for the purpose of a general statement, the measured time spent for the different corporate actions types shall now be calibrated to a number of 1000 instruments.


The annual total time spent in minutes (fig. 9) is divided by the number of instruments affected by the specific corporate action and this result is multiplied with 1000: for example, at the bank under review, the required time spent for 3016 shares amounts to 18905 minutes which are related to the settlement of dividends. The 18905 minutes are recalculated in a way that they correspond to 1000 shares, i.e. $18905/3016 \times 1000$. The result is the annual time spent in minutes which can also be expressed in employee working days. The same is done for each sub-process with the aim of achieving the total annual time spent for a specific sub-process that is carried out manually based on 1000 instruments. Details on multiples or fractions of this standardised number of instruments can be established accordingly.


Figure 10: Annual time spent in days on the basis of 1000 instruments

	Receipt of message	Check	Position administration	Notification	Clients instructions	Error correction	Currency disposition	Payment transaction	Custody account disposition	Release	Employee working days
Drawing by lot	0	0	0	0		0	0	0	0	0	0
Dividend (sh.)	6.8	4.8*				-5.2			3.4	3.4	13.1
Dividend (fund)	4.3	2.2				-3.4			4.9*	2.2	10.1
Redemption						-0.7				0.4	-0.3
Early redemption	0.1					-0.1					0
Interest (bond)						-3.7				4	0.3
Interest (str.prod.)	5.4					-1.8				1.8	5.4
Split	0.3	1.5	0.9								2.6
Name change	0.5	2.6	1.6								4.7
Exchange sec./cash	0.7	3.7	2.2							2.5	9.2
Capital increase	0.2	0.8	0.5								1.4
Optional dividend	0	0.2	0.3						0.1		0.6

* "Exceptions" (fig. 9) are taken into account.

 Already automated. Sub-process was automated a long time ago. Therefore, no time spent for manual processing and no number of resources could be established.

 Not relevant. Process not relevant to the corporate action type under review.

 Automation not possible.

All sub-processes that indicate the annual time spent in minutes in fig.10 can be automated. Therefore, it is possible to interpret the annual time spent in minutes as the possible savings potential from which the time spent for the correction of errors is deducted (see negative amounts in fig.10).

It must also be mentioned that we are looking at variable costs, i.e. costs that depend on the number of instruments: IT related costs for the development or installation of automated processing systems were deliberately left out. From this perspective, the baseline for potential costs of automation projects depends on the number of instruments and the expected *pay-back* time. From an economic point of view, the savings potential measured in employee working days constitutes opportunity costs in relation to the existing IT resources. For practical reasons, it needs to be pointed out once again, that this study focuses on a limited number of corporate actions types. Thus, no ultimate conclusions on investments can be made based on analysed data in this study.

Positively speaking, figure 10 highlights several interesting points that may be summarised as follows:

- In most cases, cash flows such as interest and redemption payments for bonds had already been automated in the past. Therefore, the focus lies on increasing the level of automation of specific sub-processes (receipt and checking corporate action, custody account disposition and payment release). From this point of view, it can be said that in the case of the bank under review the savings potential is the highest for sub-processes in dividend payments and interest payments for structured products. Therefore, increased automation in the form of introducing a full STP should be prioritised. By comparing figure 8 with figure 9, we see that the high priority to further automate dividend and interest payments originates more from their volumes rather than from their complexity or work intensity per event.
- Corporate action types other than cash flow payments predominantly require manual intervention. From the corporate action types under review, "Exchange of security with cash component" and "Name change/with conversion" have the highest savings potential. In contrast to cash flows, the time consumed for manual processing is rather high with 37 minutes and 27 minutes respectively (fig. 8). Other corporate action types such as "Optional dividend" or "Capital increase" include some sub-processes that cannot be automated as they involve client instructions that are relevant to the sub-processes in many ways.
- For the 12 corporate action types under review, one would benefit from increasing the level of automation in as far as 47 employee working days could be saved for a hypothetical portfolio of 4000 instruments, i.e. 1000 shares, 1000 bonds, 1000 investment funds and 1000 structured products. On the basis of an instrument universe of 1000 shares alone, 31.6 days could be saved.
- The corporate action type "Redemption" (bonds) indicates negative savings of -0.3 employee working days as this corporate action type had almost fully been automated before. Error messages of these corporate action types required slightly more manual intervention compared to the only remaining sub-process "payment release" which could also be automated.
- For some corporate action types, the time consumed for manual processing is inversely proportional to their frequency: for example, with 61 minutes (fig. 8), optional dividends are one of the most time intensive corporate action types when it comes to manual processing. However, automation would not be recommended (only 0.6 employee working days could be saved for 1000 shares) as the possibilities of automation are limited and frequencies are very low.
- In general, one can conclude that the potential for automation for all types of corporate actions would lie in the sub-processes that are at the beginning of the processing chain; i.e. for the receipt and checking of corporate action messages as well as for updating position data in the custody account. With the aim of further automating these processes, data providers, custodians and financial institutions should take action. Last but not least, it is of great importance to keep enhancing data quality as well as timeliness and standardisation of data.

4. Concluding notes

The analysis of personnel costs in an environment that traditionally is resource intensive and predominantly characterised by manual processing is a core element of this study. However, a calculation of all costs would be beyond the scope of this study as costs for automation and infrastructure would have to be taken into consideration.

Nonetheless, by comparing automated versus manual corporate actions processing, some striking conclusions can be drawn:

Looking at most corporate action types, increased automation would result in substantial time savings. This was even more the case if the causes for exceptions and error messages would be thoroughly analysed and settled.

The results drawn from this study can be generalised under the assumption that other securities trading companies have similar processes with a comparable degree of automation in place. Although financial institutions usually differ in the quantity of instruments they keep, the impact of automation on resources can be easily adapted.

Bibliography

- Bank for International Settlements: A glossary of terms used in payments and settlement systems, Basle 2003, <http://www.bis.org/publ/cpss00b.htm>, 9.10.2005
- Bischof, U.: Kampf der Kostenspirale, in: Schweizer Bank, Vol.10, 2002, p. 65-67
- Güntzer, M.: Cross-Border Equity Trading, Clearing & Settlement in Europe, Deutsche Börse Group/Clearstream International, Frankfurt/Main/Luxembourg 2002
- <http://www.swissbanking.org/home/glossar.htm>, 10.10.2005
- Kirby, A., Smith C., Howard, W.: Reference Data User Group: Industry Reference Data Issues, 2003, p.10,
<http://www.fisd.net/referencedata/20030210rdugindustryissues.pdf>, 12.12.2005
- Lannoo, K., Levin, M.: Clearing und Settlement in der EU: Strukturen und politische Optionen, in: Aktuelle Themen: EU-Finanzmarkt Spezial, Deutsche Bank Research Nr. 258, 2003, p.1-19
- N.N.: Automated Messaging Key for corporate actions, in: Securities Industry News, Monday, September 1, 2003, pp.10
- Simmons, M.: Securities operations, Wiley Finance Series, West Sussex, 2002
- Timmermans, L.: Message and processing quality – the backbone of payments STP solutions, 2003, http://www.swift.com/index.cfm?item_id=42498, 25.10.05
- Volkart, R.: Corporate Finance: Grundlagen von Finanzierung und Investition, Versus Verlag, Zürich 2003
- Wilbraham, M., Delaney, A.: Reference Data Now: Business Drivers and Approaches To Data Management, Reference Data Review, London, 2004