FINANCIAL INFORMATION FORUM

OMS-EMS Study Findings

September 17, 2018

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Contents

1. Background for Study

The requirement to maintain linkages between representative orders and their executions with client orders is particularly problematic when the trade flow to handle these orders are performed across disparate systems. This is the case when client orders are received and managed through Order Management Systems (OMS), but the execution of those orders are performed by separate, and often disconnected, Execution Management Systems (EMS). This issue was first identified when a joint Industry Association subgroup was investigating the framing requirements presented to the industry on February 7, 2018[1] on Riskless Principal. The Industry raised initial challenges with respect to the reporting of underlying linkages to the SROs as part of the Deep Dive Discussion24 March 23, 2018[2].

Following the initial investigation, the extent of the problem and possible solutions needed to be validated. FIF initiated a study[3] with its members to gauge the usage of EMSs, the functionality supported today to communicate (or not) between an OMS and EMS, and an estimate of the impact to implement the new CAT reporting requirements on representative order linkages.

1. Executive Summary

Based on feedback from 25 firms, including 6 vendors, 63% of the firms who participated in this study use EMS systems. Firms that reported no use of EMSs were predominately firms that do not handle their own executions. Firms that use EMSs are also likely to have multiple EMSs, including EMSs from different vendors, and proprietary EMSs. 48 unique pairings (OMS – EMS pairs) were cited by the 12-responding broker-dealers who use EMSs. The functionality supported by the EMSs, the data captured/communicated between the OMS and EMS and the degree of manual intervention supported varied across products. Disconnected OMS/EMS configurations are common. Some firms configure their EMSs for specialized purposes, *e.g.,* handling only agency or proprietary orders, allowing simplified assumptions to be made in the process flow. This varied status of the current environment exacerbates finding a common solution across the product sets and customer base.

The conclusion reached is that the new CAT reporting requirements will impose a large technical challenge in this marketplace, and to completely meet the reporting requirements will necessarily require significant changes in system configurations and business processes, and likely result in severe restrictions on the product sets that support this marketplace. Small broker-dealers, who heavily use EMS systems for fast, efficient and cost-effective executions, will be most impacted, because the price point for EMSs will likely increase to absorb the implementation costs to meet these reporting requirements.

The August 1 proposed SRO CAT Industry Member Reporting Approach requires linkage reporting for only one-to-one representative orders in Phase 2a (go-live November 2019), with the complete linkage

[1] SRO Framing Document – Riskless Principal SRO Framing Document – Aggregated Orders; SRO Framing Document – Representative Agency

[2] Deep Dive Discussion – Rep and Aggregated Order Reporting Models (Aggregated Order representation); Deep Dive Discussion – Representative and Aggregated Orders

[3] *See* Appendix A for the questionnaires that were used for the study.

reporting requirements needed by Phase 2c (go-live September 2021). The phased approach also allows small broker-dealer reporting to begin one year beyond those dates, except for OATS reporting small broker-dealers, which are required to start reporting concurrent with Phase 2a. OATS reporting small broker-dealers follow the same schedule as other small broker-dealers for all succeeding Phases. (This allows rapid retirement of OATS with a minimum period of duplicative reporting for all broker-dealers). This may provide sufficient schedule relief, allowing enough time so that many of the OMS-EMS scenarios can implement the required CAT reporting requirements. Without significant changes in business processes, some disconnected OMS-EMS scenarios will not be in compliance with CAT requirements. This will likely cause some disruption within this marketplace, both in product offerings and pricing. The small broker-dealer will disproportionally feel the impact of these changes.

A series of OMS-EMS vendor meetings were held during the summer of 2018 to further investigate the problems and potential solutions to these new CAT reporting challenges. Participants in these meetings suggested that a Standardized interface could provide a potential solution due to the proliferation of OMS-EMS unique offerings. Although some interest was expressed in exploring that possibility, much work is needed to explore and coordinate this avenue of discovery across all the participants in this marketplace. The conclusion, unfortunately, is that while some OMS-EMS scenarios can be modified to conform to the CAT reporting requirements, a restructure and redefinition of these products, and processes, would be needed so that all OMS-EMS scenarios will be in compliance.

2. Study Objective

The objective of this study was to determine the size and scope of the impact of meeting the CAT reporting requirements for representative linkages in the OMS-EMS marketplace.

In order to gauge the size of this OMS-EMS problem and therefore the impact to the industry, FIF members were asked to respond to a questionnaire about their usage of Execution Management Systems in handling orders and executions within their firms. In addition, vendors and firms which have proprietary EMSs were interviewed to understand the functionality provided, especially relating to providing linkages between client orders, representation orders and their executions.

Specifically, the responses to the questionnaire and interviews were to provide data that would allow answers to the following:

- Estimate the usage of EMSs, the prevalence of multiple OMS/EMS combinations within firms, and especially the use of proprietary EMS systems. These factors would increase industry costs and increase the complexity of potential solutions.
- Estimate the extent of the problem and impact to business processes.
- Outline possible solutions.
- Determine if there was a “generic” fix, *e.g.,* a standard interface that could be defined across the plethora of OMS and EMS systems to allow continued usage of these independent and efficient EMS systems.

3. Current OMS – EMS Environment

Execution management systems (EMSs) are software applications designed for fast (and best) executions supporting connections to many execution venues. EMSs include support of multiple asset

classes, display of market data, execution automation and customization of the business process flows. There are several vendors[4] who provide EMSs. In addition, many firms also have their own proprietary EMS(s). Based on the interviews with a number of these vendors and firms, there is a wide degree of differences in functionality, support, interfaces provided across these vendors, especially regarding the capture of data that will be required by CAT. There is broad usage of EMS systems across the industry.

EMSs are often used for specialized purposes. For example, some broker-dealers only use EMSs for proprietary trading; other firms use EMSs for agency only trading. EMSs can be structured to handle only one asset class – *e.g.,* equities or options.

"Standardized" interfaces between Order Management Systems and Execution Management Systems currently do not exist. There is a wide variety of vendor and proprietary EMS systems, many existing pairings of OMS and EMS systems, and customization of function and processing across the existing product set – all of which would make it very difficult to create a new common interface for these systems. This also increases the complexity and costs associated with making fundamental changes to OMS and EMS configurations – each pairing can represent a unique interface definition, requiring individual customization and testing across each pairing supported within a firm and by a vendor.

4. OMS-EMS Problem Statement

The order processing flow can be executed across multiple applications and servers. The communications between these systems were designed to enforce the previous regulatory requirements (OATS, in particular) and do not support, to various degrees, the current CAT regulatory requirements regarding the reporting of linkages between customer orders, their representative orders, and their corresponding executions. One prime example of this problem is the use of Execution Management Systems for trade executions. Although this study focused specifically on the OMS-EMS configuration, other examples of the problem of meeting the CAT reporting requirements on representative orders are highlighted in the summary of Study/Interview Feedback in Sections 5 and 6 and summarized in Section 9.

The process flow between an OMS and an EMS can differ widely across the existing systems, and how it is customized within a firm. These differences will affect how difficult and costly it will be for OMS and EMS systems to implement the new CAT reporting requirements.

If an OMS passes an order to an EMS and the EMS executes that order and passes the information on the execution back to the OMS (tightly coupled) then it is likely that the OMS and EMS systems can be extended to capture the new information required by CAT on representative order linkages. Although still costly to implement, the structure is in place so that the linkage information can be established between the customer order and any representative orders created to process the customer order, and its associated executions.

However, a common scenario today is that an OMS and EMS are not tightly coupled. Rather, the OMS and EMS processes can be independent or disjoint, with little or no communications between the two applications. For example, a salesperson can receive an order from a customer over the phone. While

[4] Some of the vendor products cited in the study include: Fidessa's OMS/EMS, Wolverine's WEX, Bloomberg's EMSX, Nasdaq's PrecISE, Thomson Reuter's REDI, Flex Trade, ITG's Triton.

the order is being placed in an OMS system, the salesperson can notify a trader of the customer order and the trader can start working an order through an EMS system, through creation of a representative order(s). When the representative order(s) are executed, there are a variety of means to communicate the fills back to the OMS system. However, the linkages between the customer and representative orders are not directly known by the OMS or EMS systems.

When an EMS is not tightly coupled with an OMS (common today) then there is no linkage between the market facing order and the customer order. The software development cost, time to implement due to cross vendor/firm coordination and business process changes appear significant. Defining a standard interface between independent OMS and EMS systems (both proprietary and vendors) does not appear practical, at this point, based on the study data, given the differences between the function set and processing provided by the various EMS.

To create linkages between the original customer order and the representative order and its executions, some OMS-EMS solutions today require the salesperson or trader to manually enter information about the order or the executions as a mechanism to link the two independent systems. These solutions, while not ideal, do provide rudimentary linkages between the systems. Some solutions provide independent displays of orders and executions across the two systems and allow the salesperson/trader to select the chosen pairing of orders and executions. Others require manual entry of the information, and in some cases, do not even require this step to be taken by the salesperson or trader, requiring middle office/back office personnel to clean-up during end of day processing. When a position is returned which will result in partial fills of multiple client orders, the trader may need to manually specify the order ids for each fill.

For a synopsis of various OMS-EMS workflows, see Appendix B.

The CAT reporting requirements on representative order linkages will further complicate these manual processes or expand the use of these manual processes because of the additional information which must be passed between the systems. Business process changes requiring sales persons and traders to manually enter order information during order handling and trade execution may be required. This will require the sales person and/or trader to communicate orderID (for the client and representative orders) and entry of other information into either or both systems. This is error-prone plus time-consuming, which can jeopardize best execution for the client. It affects the reliability and accuracy of the data reported.

Providing a solution for this problem will especially impact small broker-dealers (*i.e.,* providing a linking solution between OMS and EMS) because it will likely result in a cost increase in an OMS/EMS pair which could be upwards of a few thousand dollars each month. The potential cost increase is exacerbated because a broker-dealer may require multiple OMS/EMS pairs for their firm. The solution to the CAT reporting requirements could result in restructuring of OMS/EMS software solutions, *i.e.,* requiring the elimination of independent, efficient, specialized EMS systems because tight integration with OMS systems would be required to maintain the required linkage information for CAT reporting. Some small broker-dealers choose to use uncoupled OMSs and EMSs today because of cost considerations. Requiring these broker dealers to use a tightly coupled OMS/EMS may cost more than they feel they can pay, and thus disadvantage the small broker-dealer.

Many firms felt that it is difficult to assess the complete impact to a broker-dealer's costs, proprietary EMSs and business processes without a final definition of the CAT reporting requirements and the functionality and system interfaces to be supported by the OMS and EMS products.

5. Study Responses

This section summarizes the data received from the FIF Study and interviews on OMS-EMS usage.

5.1 Firm and Vendor Profiles

25 firms responded to this study, either by submission of the questionnaire or via interview or both. Of these 25 firms 19 were broker-dealers and 6 were vendors.[5] All of the broker-dealers were large broker-dealers. Institutional, retail firms and clearing firms were represented in the study, as well as equities and options trading firms. Most of the broker-dealers use multiple EMS systems. It was common to use an EMS for a specialized purpose, e.g., prop trading, agency trading.

	Broker-Dealers		Vendors
	Use EMS	Don't use EMS	
# of firms	12	7	6
% of firms	63%	37%	

Of the broker-dealers in this study who use EMSs, most firms use multiple EMSs and multiple EMS/OMS pairings. 79% use at least one proprietary EMS, with 21% of the firms using proprietary EMSs exclusively. Of the 12 broker-dealers who reported usage of EMS systems, they reported 48 unique pairings of OMS – EMS products, including proprietary products. Use of proprietary EMS products increases the difficulty and complexity of defining reasonable cost solutions to this problem. With no standardization across these applications and the plethora of different applications in use in the marketplace, it increases the cost of replicating solutions and testing multiple solutions for each firm and OMS vendor.

The firms that reported no use of EMSs were predominately firms that do not handle executions (e.g., clearing firms or retail firms that route to other brokers for executions).

79% of the broker-dealers who use EMSs reported usage of EMSs for both equities and options business.

EMSs are often used for specialized purposes. For example, 21% of the broker-dealers only use EMSs for proprietary trading. Other firms use EMSs for agency only trading.

Some firms said that they already had linkage between a client order and the representative order and resultant trades, so they did not envision serious problems with complying with the CAT reporting requirements.

5.2 EMS Interface

	Yes	**No**	**Sometimes**
Does EMS capture a client order ID?	60%	20%`	28%

[5] Of the 6 vendors, some were also broker-dealers but, for purposes of this study, they are classified as vendors.

Does EMS pass back a rep order ID?	44%	28%	28%

These answers are another indicator of the variety of solutions that exist in the marketplace and the differences in the connectivity between OMS and EMS products, especially in the flow of information back to the OMS.

5.3 Impact to Business Workflow

What changes will be required to business workflow to meet CAT reporting requirements?		
Scenario	Electronically Linked	Manual Intervention
If OMS routes order to EMS:	Order information can be passed to EMS; EMS can add order id to market-facing orders. EMS can provide CAT reports including linkages	
When the client gets print for print fills,	Simple data (e.g., client identifier or order id) can be passed between an OMS and an EMS.	
When the scenario is more complicated	Information about client could be sent to EMS and added to market-facing orders.	Information about the client would need to be manually added to market-facing orders. This includes traders creating a position and then filling one or more client orders on a riskless, principal or agency average price basis.
		Traders would have to identify which representative orders were linked to which client orders. The desk would need to manually enter into ticketing system
Disconnected OMS and EMS	It would require manual intervention for a salesperson or trader to instruct the systems on client and the fills.	It would require additional manual intervention for a salesperson or trader to instruct the systems on client and the fills.

5.4 Impact to Software

What software changes would be required to meet these CAT requirements for representative orders?

Firms were reluctant to speculate on needed software changes without a final definition of the CAT reporting requirements and the functions/interfaces to be supported by their OMS/EMS vendor.

One likely outcome of these new CAT reporting requirements would be to change the landscape of OMS/EMS solutions making it extremely difficult to have stand-alone, non-integrated EMS products, and could shrink the market for this class of products.

5.5 Other Impacts

Have you identified other process flows that would be difficult to capture the required CAT reporting linkages between representative orders and client orders?

Today, no linkage exists for Risk Trades (executed as principal) or Riskless Principal (not required by OATS). It would be difficult to assess possible impacts/solutions without a detailed specification on the CAT reporting requirements.

Net Trading represents another challenging area lacking the linkages required by CAT. There is no linkage between firm principal trading activity and executions being provided to customers. If required, it will be difficult to capture the linkage information in scenarios where firms take risk – e.g., Guaranteed Market on Close, Guaranteed VWAP, Blind Principal Basket Trading.

In addition to the challenges of capturing representative order linkages, firms were also very concerned with the support that would be required to report aggregated orders.

Can you describe a solution that would allow capture of the required data for CAT reporting purposes?

Following are some comments provided:

- It is premature at this point to offer solutions, but an ideal goal would be an automated solution to identify when a representative order was created for a client and to match the client and firm side orders.
- These new CAT reporting requirements will increase the complexity of EMS products and raise the barrier to entry in onboarding vendor OMS/EMS systems.

6. Vendor/Firm Interview Feedback

Vendors that provide EMS products plus firms that have their own proprietary EMS solutions were interviewed to better understand the extent of change that might be required to satisfy the CAT reporting requirements.

The significance of the feedback was that there was a wide variety of responses indicating the breadth of different solutions employed, and the specialization of the solutions. This complicates the likelihood of identifying common solutions across all of these products.

Some of the feedback received is provided below.

Functionality

- EMS is an efficient execution platform – also used as a smart order router and algo.
- OMS allocates to orders automatically based on previously defined rules.

- Some OMS/EMS pairs today provide functionality that the trader explicitly specifies the pairing of orders and fills. *I.e.,* the OMS provides a screen which lists the outstanding orders, and the trader specifies which EMS executions gets assigned to an order. In some OMS/EMS pair solutions, the trader would manually enter the order pairing information.
- Another solution would be that the executions from the EMS result in an accumulated position in an average price account which is then allocated back to the client.
- One firm reported significant use of the OATS bunched reports functionality.
- Some vendors do not support the cancel/replace function in their EMS, and some vendors do not support the ability to split up orders in EMS.
- Some vendors support the systematic flip of every execution on the street to the customer order.

Other Scenarios

- The CAT reporting requirements need to be defined for when an EMS order is not executed. What is the reporting obligation for this scenario?
- Some vendors only support routing on Principal. Agency option reports (routes) are common. Some use EMSs for proprietary trading only.
- When used in agency capacity, some firms establish a one to one relationship between client order and representative order and fill which proves less problematic for representative order linkage reporting.
- A few firms did provide information on the expanded study questions included in Questionnaire 2. Similar problems exist outside of the OMS/EMS scenarios in that the representative order linkages are not maintained. Net trading was sited in one response. Another firm indicated that for GVWAP orders, they build out the portfolio and once completed they flip back the whole order to the client. (It may be possible that this type of scenario can be covered with the proposed rep order model, e.g., backward linkage, but there may need to be significant development work needed to add this type of reporting into the current flow).

Impact

- Even with integrated products, there is still significant support required. E.g., 3 customer orders received, which results in 1 rep order to work those 3 client orders. Fill goes back to avg. price acct and allocated to customer orders. Reporting of these aggregated orders, which might be many levels deep will become quite complicated.
- One vendor reported that all these new reporting requirements were doable.
- Some firms think they can handle the CAT reporting requirements, because their usage or functionality is more restrictive and then automatically provides a more direct linkage between the client orders and the resultant representative orders and executions.
- Some firms pass client /order id information to EMS and some pass back order id information to OMS.

Challenges

- Problem is when trades are done principally (but were kicked off due to a client order), and a position is built – there is no specific link to the customer ticket. The client ticket gets filled from position, with no link to street side executions.

Possible Solutions

- There is a function in FIX, a FIX merge function, which allows an electronic FIX order to be merged with a manual order (this handles the situation where a client calls in an order, a manual ticket is generated and the order starts to get worked, including generation of a rep order thru the EMS system) and in the meantime, the client sends in an electronic FIX order and expects that the fills will be returned electronically via FIX and associated with the electronic FIX order. Perhaps a similar "EMS merge" function is needed – to merge the EMS representative order flow with the client order flow.
- When the trader is unlinked to the street, display all trades and manually apply executions to customers or find all representative trades and apply to customer.

Questions

- What are the reporting requirements for this scenario – a firm book accumulates position with intention to fill client order, but in the end, the positions are not used to fill the customer order. How should this be reported?
- Another scenario is that a client order A is entered and rep order A is created to fill client order A. Then client order B is entered and rep order B is entered. But in the end, rep order B is used to fill client order A. How should this be reported?
- For Good Till Canceled (GTC) orders where there is a required quantity that must be obtained, the order is on the books until filled. Throughout the day, the quantity is accumulated. If the quantity is not met for that day, all the position is put on the firm's inventory, and they start again tomorrow trying to accumulate position. How does this get reported?
- Some firms are very worried about the complexity of aggregation. Perhaps there should be some flexibility in reporting? E.g., build up an order, which might go through many iterations before the "final" solution is assigned to the client. Maybe only report the "final" solution and not all the intermediate steps to get there. It was recognized that the firm does need to record (for their own tracking purposes) all of the intermediate steps, which maybe justifies why it might be better just to report all the intermediate steps to CAT.

7. Cost Estimates

7.1 Firm Responses on Cost Estimates

Nine firms provided a high-level estimate of the cost and calendar time needed to implement the new CAT reporting requirements. As can be seen from the chart below which lists the responses, there is a wide variety of estimates. The variation can be attributed to the dependence of a firm on the vendor provided implementation, the use of proprietary systems, and the number of unique OMS-EMS pairings in any firm. The median case from these estimates is between one to two programmer years in implementation cost and between one to two years in calendar time. There are some outliers for which the cost and time would be significantly more.

Some firms did not provide any estimates, indicating that they could not accurately size the effort to provide representative order linkage reporting in the absence of a CAT final reporting specification. In addition, some firms said that it would be difficult to accurately estimate size or cost of solutions without knowing what functionality would be provided by OMS and EMS vendors to support these CAT

reporting requirements. All firms that provided estimates said that their estimates were "heavily caveated" given the state of CAT definitions and OMS/EMS product definitions at this point.

Estimates for Time/Cost to implement CAT rep order linkage in OMS/EMS			
	Implementation Cost	**Implementation Calendar Time**	**Comments**
Multiple firms	Defer to vendor	Defer to vendor	Dependent on vendor proposal
1 firm	Could contain changes		Uses proprietary OMS and EMS
3 firms	6 to 12 pm	6 to 12 pm	
1 firm	>1py	<1y	
1 firms	>1py	>1y	Median case
1 firm	~2py	~ 2y	
2 firms	Much greater than 2py – could be between 5 to 10py	Much greater than 2y	Due to number of proprietary EMS systems deployed and difficulty in establishing OMS/EMS links

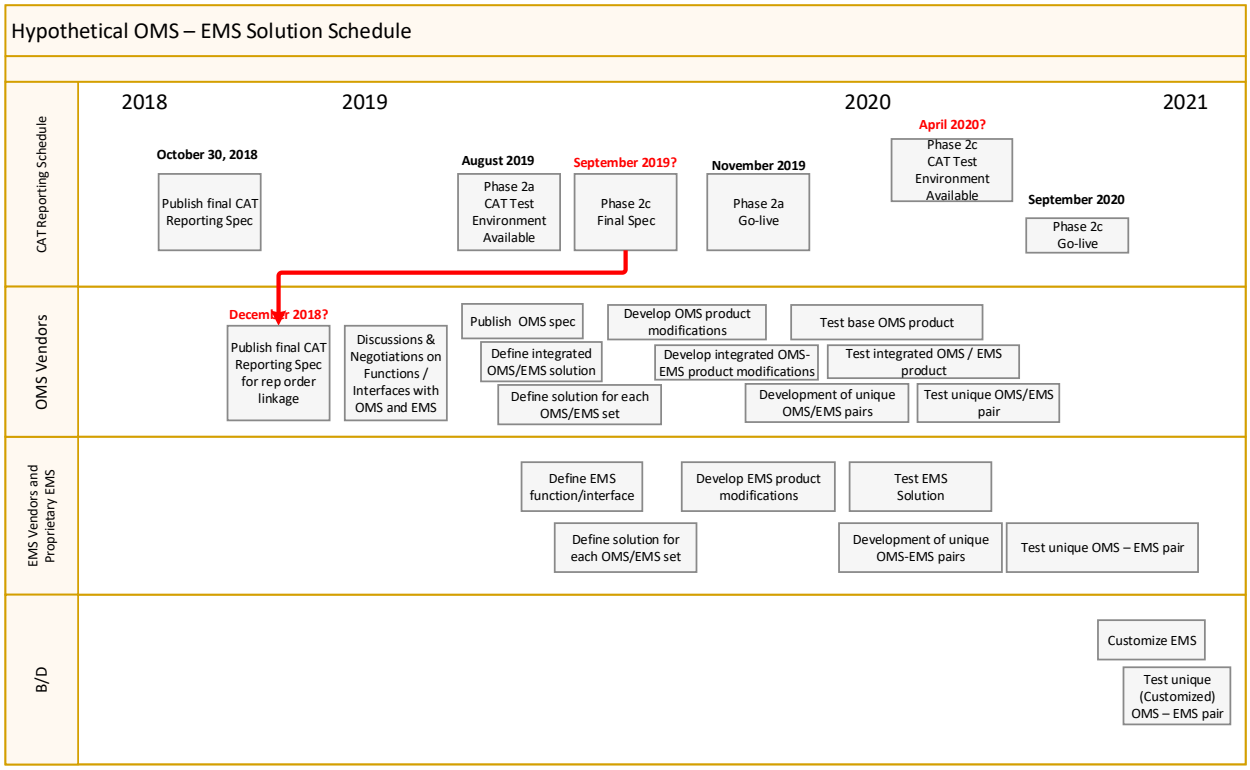
7.2 Factors to Consider for an Implementation Schedule

When firms responded in the study to the question asking how much implementation time was needed for incorporating CAT reporting requirements into their OMS or EMS system, they were considering a more narrow view - the implementation time to develop and test the new reporting requirements into their own product, and not the time required to get interface definitions from or joint test with dependent products. When determining the calendar time needed to define, implement and test OMS – EMS solutions across the whole industry, additional factors need to be considered.

- A definitive solution including interface definitions cannot be defined for either OMS or EMS products until a final (and approved) CAT reporting specification is published.
- Proprietary and vendor EMS solutions cannot be defined until OMS vendors publish final specifications for their products and interfaces, or in some cases (for widely distributed OMS and EMS products) that the vendors of both product sets have negotiated functions and interfaces across each of their product sets.
- OMS and EMS products can do some level of unit and function testing independently, but at some point the two product sets must do joint testing, and both products will be dependent on the testing schedule of the other.
- Proprietary EMS products are very dependent on the functions and interfaces to be adopted by the OMS products. Their design and specification phase cannot start until they are certain on their OMS' function/interface definition. If the OMS' definition is insufficient to meet their needs, the proprietary EMS must consider defining and implementing OMS like functionality into their proprietary EMS solution. They will need to wait for the OMS product to be completed function testing before the firm can test their proprietary EMS product with an OMS product.

- Because of the current need for installing multiple combinations of OMS/EMS product sets, the testing calendar will be serial (to some degree) to test the various combinations of OMS/EMS/Proprietary products that are planned for use within a firm.
- Due to the specialization in many firms, these firms will also need to test these many product combinations and customizations within their shop.

As can be seen from the above checklist of factors, the total implementation cycle for OMS/EMS solutions will be quite long because many of these steps must be serial in nature, elongating the time needed for development and test. Below is a hypothetical implementation schedule, using the most recent August 1 SRO Proposed Master Plan checkpoints, to deliver the OMS – EMS solutions for CAT reporting requirements across the industry:



As illustrated by this hypothetical calendar, given the phased implementation approach and the scoping of Phase 2a to only include one-to-one representative orders which are already electronically linked with order ids, the OMS-EMS "problem" has shifted to Phase 2c. The scoping of Phase 2c includes reporting of all representative order linkages with client orders. We have assumed, in this schedule, the final CAT specification for Industry Member reporting for Phase 2c will be available on September 2019, one year prior to go-live of Phase 2c. To complete all of the steps needed to define, implement and test the OMS-EMS product sets, combinations and customizations, FIF roughly estimates at least a 24 to 30-month cycle. To start that process, some early definition of the Phase 2c representative order linkage must be available in 3Q18 to meet the Phase 2c schedule (see red line in above diagram), not the planned September 2019 date. Alternatively, the specification for the representative order linkages could be made available earlier,

or schedule relief could be provided to allow extended development and test time for implementing the multiple OMS/EMS unique combination of product offerings.

8. Impact to Small Broker Dealers

There were no small broker-dealers who responded to the study. Although solicited, we were not successful in getting small broker-dealers to respond to the questionnaire. However, the study did include vendors who said that their products were heavily used by small broker-dealers. FIF worked with the OTC community in June to distribute this draft study to small broker-dealers for their review and comments, so that their feedback could be incorporated into the overall conclusions. We did not receive any feedback, either supportive or contradictory to the study results. Without specific feedback from small broker-dealers it is difficult to quantify any unique impact to that community.

9. Other Examples of Disconnected Processes

A few firms provided feedback on other areas of their business flows that also use disconnected processes and could experience similar problems in capturing representative order linkages to the OMS-EMS scenarios. E.g., Risk Trades (e.g., Basket Trading) and Net Trading represents other challenging areas lacking the linkages required by CAT. Today, there is no linkage between firm principal trading activity and executions being provided to customers. Although it is expected that these processes will present difficult challenges to firms in implementing the required CAT reporting linkages, they do no present the unique challenges that exist in the OMS-EMS marketplace with the preponderance of different EMS products and proprietary offerings and the multiple combinations of OMS-EMS products in use, which exacerbate the development/test time needed to incorporate any changes for CAT reporting.

In addition to the challenges of capturing representative order linkages, firms were also very concerned with the support that would be required to report aggregated orders.

10. Conclusions

Note: Since the Study was untaken in the spring, there have been on-going discussions with the SROs highlighting some of the challenges in the OMS-EMS environment and considerable evolution of the CAT Plan by the SROs. FIF has updated the conclusions to reflect these changes, incorporating the most recent August 1 SRO Master Plan, which includes a phased approach, as well a very limited scoping of CAT reporting requirements for Phase 2a. Both factors help in providing more time to allow implementation of the CAT rep order linkage requirements into an OMS-EMS solution.

Although this study cannot claim any statistical basis for general industry projections, we did reach some observations or conclusions regarding OMS – EMS usage and the possible impact of the CAT reporting requirements on this marketplace. These findings are outlined in this section.

There is broad usage of Execution Management Systems across large and small broker-dealers for fast and efficient executions. Multiple deployments are common in one firm, with tailoring of the systems to meet specialized needs, including broad use of proprietary implementations. Multiple OMS and EMS

products, including proprietary EMSs, are typically configured within one firm. Because there are no standardized interfaces, or even function sets, across EMS product sets, many OMS – EMS pairing must be individually configured by vendors and firms. In addition, many Execution Management Systems are customized or installed to handle a segment of order types (*e.g*., agency orders or prop orders). The OMS and EMS product sets, of course, have been developed to support the current set of regulatory reporting requirements (*e.g.,* OATS).

Given this product landscape, FIF did not see an easy and quick opportunity to create standardized interfaces for this product set without redefining the base architecture. The CAT reporting requirements could fundamentally reshape this product marketplace, driving the elimination of standalone EMS systems and forcing more tightly coupled OMS-EMS systems because tracking of linkages between orders and executions, as well as the logic needed for management of order aggregation will be difficult for stand-alone EMS systems. Manual intervention, having traders and or/salespersons enter the needed order and/or fill information, used today by some EMS systems to capture information, will need to be expanded to capture the additional information and linkages required for CAT reporting. This will become more problematic, error-prone, time-consuming and interrupt the fast pace of best execution. This is contrary to the CAT objective of not fundamentally changing the current business processes.

FIF believes that the estimates provided by firms (see Section 7.1) regarding the cost and time needed to fully implement these CAT reporting requirements is underestimated because the complete scope of reporting requirements is not understood sufficiently to capture the complexity of what will need to be developed to completely meet all of the requirements. In addition, the nature of this marketplace will require serial development and testing, as explained in Section 7.2, as illustrated by the hypothetical OMS-EMS implementation schedule, elongating the time needed to fully implement the OMS-EMS solutions across the marketplace.

Extended implementation time will be needed for OMS and EMS vendors and firms which have developed their own proprietary systems to define and implement solutions to capture required linkage information for CAT reporting. Specific solutions cannot be defined for an OMS-EMS linkage until after CAT final specs are published (for Phase 2c, expected to be September 2020). Please note that one solution for the entire spectrum of OMS/EMS products is highly unlikely – there is no standardization today between OMS and EMS systems, there are multiple EMS products, there is specialized usage of EMS products, there is high usage of multiple OMS and EMS products within one firm and there is high usage of EMS proprietary systems. For all of these reasons, specialized solutions will likely be developed across the multiple OMS/EMS combination of productions, including the proprietary systems. All of this increases the cost and time needed to define and develop the multiple solutions needed for the reporting of these linkage requirements.

10.1 Possible Solution - Schedule Relief

Prior to the SROs' new Master Plan which includes a phased approach, the recommendation based on the Study findings was to recommend schedule relief through a phased implementation plan, with full representative order linkage requirements included in Phase 2c. In fact, the SROs' Master Plan does support this – full rep order linkage is included in Phase 2c. Phase 2a only requires reporting of one-to-

one representative orders where there is electronic linkage of the client and representative orders and the process is fully automated. This new Phase 2a scoping should be doable by the OMS – EMS product sets.

Although the Phase 2c requirement for full reporting of rep order linkages has been moved out by 2 years with the November 2017 SRO Plan date to November 2019, FIF believes it is still insufficient time to incorporate all the implementation and testing steps needed for this marketplace, because the gating factor (availability of the Phase 2c final specification) is not published until September 2020. 14 months is insufficient time to design, implement and test solutions in this marketplace.

The only relief request to the SROs that has been identified to date is the request for phasing of the implementation of the CAT reporting requirements for OMS-EMS solutions. As shown in the hypothetical implementation calendar in Section 7.2, to completely develop and test the solutions across all of the products and firms is well beyond the projected implementation calendar for the first deliverable of CAT. FIF is requesting consideration of one of two possible changes to the SRO Master Plan to accommodate the OMS-EMS products:

- Provide a "final functional specification" for the representative order linkage reporting requirement earlier than September 2019. and
- Provide schedule relief for the OMS-EMS products to meeting the representative order linkage reporting requirements at least 2 years beyond when the Final Industry Member Reporting Specification is published for Phase 2c. That should allow sufficient time to design, implement and test the various configurations in this marketplace.

10.2 Possible Solution – Flag indicating Rep Order linked to Customer Order

A second area for possible exemptive relief should also be explored. For business scenarios that prove particularly difficult to establish linkages, indicate on a CAT report that the representative order is linked to a client order but that the specific linkage information cannot be supplied. This would at least provide the regulators with valuable information that the principal trade is related to a client trade and is not doing proprietary business, even if specifics of that client linkage cannot be provided via CAT reports. Those linkage details would need to be made available to regulators via a follow-on inquiry. This might be a more practical solution in those OMS-EMS scenarios where the systems are configured to handle only certain types of orders, so that it is configured to always handle customer representative orders. The CAT reports for these types of configurations could always be flagged as rep orders; however, the linkage information would need to be researched and provided in any follow-up regulatory inquiry.

Some concern was expressed that even providing a representative order indicator would require manual intervention so it wasn't clear how much relief this proposal would provide for firms. Additional study would be required to determine if there was actual relief in use of the "rep order linked to client order" flag.

10.3 Possible Solution – Other Scenarios

Additional discussion is needed on the following cases – if they represent relief for OMS-EMS scenarios, and if they would be reasonable asks to the SROs.

- For OMS-EMS scenarios where manual interventions are required, these cases could be considered a manual order and therefore, reporting of linkages would not be required.
- For the scenario where the executions are not filled, there would be no “end point” of the representative order and no linkage back to client order. It is not clear how this could be reported by disconnected OMS-EMS systems.
- The EMS could be modified to put firm account, and Rep Order indicator on Rep order, and OMS could be modified to put firm account on client fill report.

11.Follow-on Steps

The following steps have been or will be undertaken:

1. The conclusions and recommendations included in this report were reviewed by a broader audience. The study was reviewed with the FIF CAT Working Group, the Riskless Principal subgroup (which originally raised this issue), the FIF CAT Leadership Group and the OTC subgroup.
2. The study was shared with SIFMA so that it could be reviewed with their Small Broker-Dealer group.
3. All feedback received have been incorporated into the conclusions/recommendations of this study.
4. FIF has held a series of meetings with the OMS and EMS vendors and firms with proprietary EMS products to better understand the impacts of the CAT reporting requirements, discuss and assess possible solutions to this problem, and gain consensus on what relief should be requested from the SROs.
5. The study will be shared with the SROs and the conclusions and recommendations presented to the Industry Member Tech Spec Working Group

Appendix A. OMS-EMS Questionnaire

Questionnaire #1 (OMS-EMS Questionnaire031518.docx) was updated on March 29 and redistributed as Questionnaire #2 to the FIF CAT WG. It asks additional questions beyond OMS- EMS linkages to determine if problems in capturing representative order linkages back to client orders was broader than just OMS-EMS connections. A few firms that answered the March 15 study responded again to the new questionnaire.

Appendix B. OMS-EMS Scenarios

Following are examples of order flows that are processed by an Order Management System, an Execution Management System or a combination OMS/EMS pair, and if the required CAT linkage data would likely be captured for reporting purposes.

B.1. Riskless Flow

1. Order is routed or split out to market on a riskless basis from an OMS – resulting trades are automatically allocated to client order on a riskless basis.
    a. Linkage exists between client order and order routed to the street
    b. Linkage exists between fill of client order and order routed to the street
    c. The linkage exists whether market facing order is filled or not
2. An EMS (linked to an OMS) Principal Order is routed to market – resulting fills are automatically allocated to client order(s)
    a. Linkage exists between order routed to the street and client order(s)
    b. Linkage exists between fill of client order(s) and order routed to the street
    c. If market facing orders are not filled a moderate amount of development work might be required to create the link
3. Non-Proprietary EMS Principal Order (not linked to an OMS) is routed to market – resulting fills are automatically allocated to client order(s)
    a. No linkage exists between client order and order routed to the street
    b. No linkage exists between fill of client order(s) and order routed to the street
    c. Linkage could be created between fill of client order(s) and order routed to the street if EMS enriches order fill message with details of order resulting in fill (order ID and other information required by CAT) effort involved unknown, likely moderate
    d. If market facing order is not executed then it is unlikely a linkage could be created unless a new interface was created where a User, post order creation, enriched market facing order messages with information identifying client order(s) it was intended the market facing orders represented
4. Trades resulting from market facing orders using a linked OMS/EMS create a position. After a position is created the trader manually fills a client order with capacity of riskless.
    a. No linkage exists between market facing orders and client fill. New interfaces and work flows would be required to create a linkage – there are various approaches to this problem but likely significant development work required as well as changes in trader

behavior. If the trades originate in a non-proprietary system then additional work would be required by both systems so that the trade records include the necessary order information. It would be even more difficult to identify and correctly link orders that did not result in trades, especially if those orders originate in non-prop systems.

5. Client order is "Worked" (proprietary work flow). A position is created in a segregated trading ledger for a specific client order. The client order is manually filled by the trader on a riskless basis.
    a. There is a link between the market facing orders and the client order – however, if part of the order is filled on a riskless basis and part on a principal basis then some development work will be required to link the specific street side fills and related orders to the client fill. The trader will be required to identify the market side trades offsetting the client fill.

B.2 Principal Flow

1. Client order is "Worked". A position is created in a specific trading ledger for a specific client order. The client order is manually filled by the trader on a principal basis from the same trading ledger.
    a. There is a link between the market facing orders and the client order – however, if part of the order is filled on a riskless basis and part on a principal basis then some development work will be required to link the specific street side fills and related orders to the client fill. The trader will be required to identify the market side trades offsetting the client fill.
2. A position is created using a linked OMS/EMS in a market making book or facilitation book used for multiple purposes and to work multiple orders. The client order is then filled on a principal basis.
    a. No linkage exists. Significant development work required to create linkage – most likely trader would need to identify the trades that offset the principal fill. If the trades result from orders sent using a non-prop OMS/EMS then additional work would need to be done by those products so that trade messages are enriched with order information.
    b. If principal orders were not executed then it would be even more difficult to link to the client order they were supposedly representing. Perhaps the trader would need to identify the client order somehow on each order.

Appendix C. Compendium of Industry Dialog with SROs on Rep Orders

C.1 SRO response to Industry Recommendations

The Industry Member Tech Spec Working Group responded to the industry recommendations on May 17, 2018. Their recommendations are contained in this document - SRO Feedback on Representative Orders.

C.2 SROs' Answers on Reporting Requirements

- For representative orders that are not filled – is it necessary to link to the representative order to the customer order(s)?
  Answer: Yes

- For principal or riskless principal executions, are firms required to report execution events for all executions related to the client fill?
  Answer: Yes, the execution of the customer order must be reported.

- Orders are not typically placed as riskless principal, but are instead filled as riskless principal. Is it supportable to require identification of an order as RP, or just the executions/assignments?
  Answer: Only the execution must contain the capacity of RP.

- Orders are not required to have a capacity. This should be an optional field or conditional when routed to an exchange. It should be noted that orders can be filled in a mixed capacity basis. If this remains a required field it must be defined – does it mean the capacity the sender intends to fill the order in, or the capacity it intends the receiver to fill the order in?
  Answer: Capacity is not required on the order, only on the execution.

- For representative orders that are not filled – is it necessary to link to the representative order to the customer order(s)?
  Answer: Yes

- For principal or riskless principal executions, are firms required to report execution events for all executions related to the client fill?
  Answer: Yes, the execution of the customer order must be reported.

- Orders are not typically placed as riskless principal, but are instead filled as riskless principal. Is it supportable to require identification of an order as RP, or just the executions/assignments?
  Answer: Only the execution must contain the capacity of RP.

- Orders are not required to have a capacity. This should be an optional field or conditional when routed to an exchange. It should be noted that orders can be filled in a mixed capacity basis. If this remains a required field it must be defined – does it mean the capacity the sender intends to fill the order in, or the capacity it intends the receiver to fill the order in?
  Answer: Capacity is not required on the order, only on the execution.

- Orders are not required to have a capacity and are not meaningful when the order is received from a customer. If the order is received from another broker-dealer then capacity may represent the capacity in which the contra broker-dealer intends to fill the order and may be used for trade reporting purposes.

- Traders may work a Not Held order over the day and decide, after accumulating a position, when filling the order, whether to fill it on a principal or riskless basis. Must BDs decide after the

fact whether the market facing order was placed by the broker in anticipation of this riskless execution? (risklessorderIDs is required on riskless trade reports)
Answer: if the order was originated specifically to facilitate execution of the customer order, it must be linked to the customer order.

C.3 Industry Response to SRO Feedback

The industry had a second-Deep Dive Discussion on July 13, 2018 with the Industry Member Tech Spec WG on the one-to-one representative order requirement for Phase 2a, plus some additional questions on the SRO feedback on May 17. *See* (July 13 Representative Order Deep Dive Discussion Document and attached spreadsheet "AggregatedOrderRepresentation7.13.18-final") for which scenarios are in-scope and out-of-scope for Phase 2a reporting of one-to-one representative order linkages.