Cancer and Deadly Infection in Institutions: Developing Use Cases for an MBE Application to Prevent another Enron or Barings

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***Abstract*— One of the deadly diseases in human is cancer. A human cell becomes abnormal when its DNA is mutated and/or its genes are damaged for one reason or another. The abnormal cell produces other cells by division or mitosis. The uncontrollable growing collection of the abnormal cells, called tumor, when invading nearby tissues, is classified as malignant. Malignant tumors eventually proliferate to other organs throughout the human body via the blood and/or lymph circulation, a process called metastasis. Tumors cause serious threats to human health and potentially death. If we think of an institution as a human body, then its employees can be analogously considered as the body's cells. In that sense, the group of "abnormal" or "special" employees led by Jeff Skilling, Andrew Fastow and others in Enron can be considered as a malignant "institution tumor". The group has influenced other organizational units and brought collapse to Enron. Human can also die due to infections caused by a single cell hosting a virus. It is analogous to the case whereas Nicholas Leeson single-handedly brought Barings bank to bankruptcy. We investigate these extreme deadly cases in humans, namely cancer and deadly infection, for insights into the construction of six use cases towards the development of an enterprise-wide MBE-based (management by exceptions) application for the prevention of another Enron or Barings bank.**

Keywords-Management by Exceptions; biologically-inspired system; bankruptcy prevention

I. COLLAPSES OF BUSINESS INSTITUTIONS DURING THE LAST TWO DECADES

In February 26, 1995, Barings bank in the UK bankrupted because its asset was in the $635 million while its liability was around $27 billion [1]. The bank collapsed. It was sold to ING for £1. It started with the last margin call on SIMEX on February 23, 1995. It requested an amount of $835 million, higher than Barings asset, for transfer from Barings London to Barings Singapore due to futures and options positions in Nikkei 225 and SIMEX. It was found that the collapse was due to a single employee of Barings bank, Nicholas Leeson [2].

In October 2001, Enron announced $618 million loss for the 2001 third quarter. During the preceding 9 months, Enron revenues were estimated to be roughly $138 billion [3]. Followed the restatement of 2001 third quarter were the 1997-2000 financial statement reconsolidations. Enron stock went down quickly to 28 cents from roughly $90. Enron filed for protection was December 2, 2001. It was determined that the wrongdoings were done by a group of executives in Enron, led by primarily Jeff Skilling and Andrew Fastow [4].

In March 2002, Adelphia stock dropped 18% from $20+ per share of the day before, after it was disclosed that Adelphia has cosigned a $2.3M loan to the Rigas family business but it did not report in Adelphia books [5]. A few days later, Adelphia acknowledged a possible debt of $500M. During May, Adelphia attempted to sell its assets to reduce debts while reworked its 1999, 2000 and 2001 statements to correct off-the-book debts. Stock price went down to 75 cents in early June. More troubling news surfaced: change of external auditor and more debts revealed. The company filed for bankruptcy on June 25, 2002. It was determined by SEC that the Rigas family committed an elaborate and extensive accounting fraud [5].

In June 2002 WorldCom announced restatement because its expenses were posted as capital expenditures in prior financial statements. The company further admitted irregularities in its reserve accounts in August. WorldCom accounting fraud was found to amount to $11 billion [6]. On July 21, 2002 WorldCom filed for Chapter 11 Bankruptcy Protection. The fraud was committed by a group of executives headed by Bernie Ebbers and Scott Sullivan.

In February 2003, CFO Fuasto Tonna announced a €500M bond issue. He was fired by CEO Calisto Tanzi and was replaced by Alberto Ferraris. Ferraris resigned in November. He revealed he was unable to get access to some of the corporate books. Del Soldato replaced him and only a month later also resigned. In the same month, Parmalat forged paperwork to show it had €3.95B in its Cayman Islands subsidiary, claiming it was back by Bank of America. Bank of America denied. Subsequently, Parmalat defaulted €150M bond. This led to Parmalat bankruptcy on December 24, 2003 [7].

In 2008, Lehman Brothers incurred a substantial loss due to subprime market crisis. Between August and September 2009, Lehman failed to sell its assets to Korea Development Bank, Bank of America and Barclays. The talk with New York Federal Reserve Bank for the possibility of an emergency liquidation of Lehman's assets also failed. In September 15, 2008, Lehman filed for Chapter 11 [8].

After Enron, there were investigations after investigations. They resulted in multiple articles, reports, books, lessons learned as well as a number of proposed

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solutions and recommendations based on *who* did *what*, *why*, *when*, *where* and *how*. One of the main objectives was to arrive at the prevention of future Enron-like as well as Baring-like institutions from bankruptcy.

Among the solutions and recommendations proposed and implemented, there were Sarbanes-Oxley Act in 2002 [9] for stricter accounting standards, Higgs report [10] on non-executive directors, and resolutions from AICPA [11]. At the US House Energy and Commerce Committee Hearing, B. Dharan suggested several recommendations to SEC and FASB (Financial Accounting Standard Board). The latter involved pro-forma earnings reporting, a complete set of financial statements and modifications to the mark-to-market (MTM) accounting methodology, among others. Also others investigators have proposed changes to the roles, processes, practices, controls, reporting, and the like.

One would think that it would be very hard for another Barings or Enron to occur. The reality is that (1) 13 years later, Jerome Kervial single-handedly over three days of trading drove Societe Generale to a loss of €3.9 billion, and (2) the list of wrongdoings grew longer for two decades since the Barings case. The latter included some important scandals: Madoff, Tyco International, HealthSouth, HIH Insurance in Australia, Daiwa Bank in Japan, Liu Qibing in China, and others [12]. A few of them escaped bankruptcy, however.

Nevertheless, one cannot help wonder whether all the proposed solutions and recommendations have been collectively effective and/or enough. It appears that they are all good but obviously not enough since the collapses of institutions continued to persist. One can speculate that either the problems were rooted too deep that the prevention measures became ineffective or regardless of any new rules, regulations etc. somebody was able to break it.

Our work approaches the solution from a perspective different than most. The idea is to look at the collapses in institutions in a fashion analogous to the death caused by a cancer in humans. The main thrust is to address prevention from collapse by detecting early symptoms much like in cancer prevention. This in turn suggests a known scheme of enterprise-wide management by exceptions (MBE) [13] to be revisited for the detection of significant symptoms of wrongdoings in time to take appropriate decisions. To that end, we propose in Section 2 a partially biologically-inspired MBE solution for prevention. Section 3 is reserved for the development of use cases, the topic of this paper, towards such a solution. We include a discussion and present our concluding remarks and future work in Section 4.

II. APPROACH TO PREVENTION AND SYNOPSIS OF A PARTIALLY BIOLOGICALLY-INSPIRED MBE SOLUTION

We start with the assumption that symptoms of wrongdoings in an institution are always there, just as cancerous symptoms in a human body. They are either ignored, or went undetected. When the symptoms surface the situation is that it will be commonly too late. In effect when cancer is detected, it is already in later phases, and therefore quite often death is practically unavoidable.

Cancer is one of the deadly diseases in humans. Cancer is generally described as follows. The human body is made up of many types of cells. These cells grow and divide in a controlled way to produce more cells as the body needs to keep it working and being healthy. When cells become old, they die and are replaced with new cells, except maybe brain cells [14]. A human cell becomes abnormal when its DNA is mutated and/or its genes are damaged for one reason or another (internal or external).

The abnormal cell produces other cells by division or mitosis. The uncontrollable growing collection of the abnormal cells, called tumor, when invading nearby tissues, is classified as malignant. Malignant tumors eventually proliferate to other organs throughout the human body via the blood and/or lymph circulation, a process called metastasis. Tumors cause serious threats to human health and potentially death [15].

When an institution is considered as analogous to a human then the institution's employees can be analogously considered as similar to biological cells. "Institution tumors" in turn can be viewed analogously as groups of employees in the organization which grow uncontrollably and start some wrongdoings. When funded to do their way, they can influence other organizational units and may become "malignant". They could become seriously harmful to the institution health, and potentially lead it to bankruptcy. The analogy to cancer is elaborated for Enron case as follows.

We equate Jeffrey Skilling and Andrew Fastow and other Enron executives as "special" or "abnormal cells" in the institution body. Skilling used an accounting practice which he convinced SEC to approve. In a sense, Enron's MTM practice to accounting is analogous to a mutation to general accounting practices much like a mutated DNA/gene of a cell; therefore it is affecting its growth. The 360-degree review [16] is analogous to a mutation to human resource hiring/firing policy/process. Special purpose entities (SPE) and accounting schemes can be viewed as mutations (changes or deviations) to commonly practiced SPEs and GAAP.

When Arthur Anderson was influenced in the mishandling accounting audits [17], due to its dual role of external consultant and internal auditor, the institution "tumor" in fact has proliferated to the other institution's "organs and organ systems" (i.e. finance division, accounting, legal counsel, etc.). Cancerous symptoms started to surface: Skilling's replacement of Lay as CEO, followed by Skilling's resignation after only 6 months, followed by the cancellation of deals with Blockbusters and later with Dynegy [18]. SEC began its inquiries and the revision of financial statements from 1997-2000 was initiated [19-21].

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Discoveries of wrongdoings in SPEs required Enron statements to include Chewco consolidations as well as those of other projects. Enron stock prices slipped. The consolidations showed Enron debts and liabilities were previously off balance sheets. This caused additional stock price slips and cash shortfalls. Within just 60 days, the company's stock went down to 28 cents per share. Enron filed for bankruptcy protection [11].

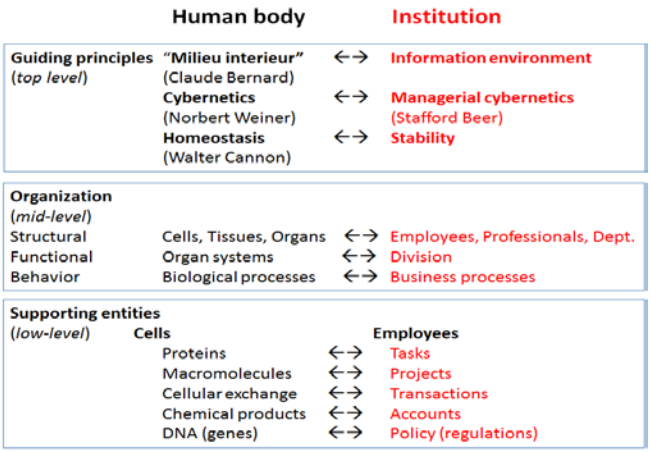

Figure 1. An analogy between human body and institution

The analogy to cancer motivates us to look into Enron structural, functional and behavioral organization within its business model and its underlying operations, in a fashion analogous to the human body for insights into cancer prevention. At the top-level of Figure 1 (top box), the first guiding principle in human is derived from the concept of "*milieu interieur*" (or *internal environment*) of the body in which all cells bath as stated by Claude Bernard [22]. Analogously, there exists an *information environment* in which all employees of an institution live in and act upon.

Next is the principle of *cybernetics* dealing with feedback and control, a concept owned by Norbert Weiner [23]. This concept is further exploited and applied to business management discipline, termed *managerial cybernetics* by Stafford Beer [24]. Cybernetics is to maintain *homeostasis* (equilibrium) in the human body. Homeostasis is a principle by Walter Cannon [25] originated from Ernest Starling [26] and expanded by Sherwin Nuland [27]. We can equate *business stability* as analogous concept to homeostasis.

The human tissues, organs, organ systems made up the structure, functionality and behavior of a human (mid-level, middle box) are determined by the constituent cells. Likewise, the employees are grouped into professionals, departments and divisions, across which run the business processes.

At the lower level (bottom box), it appears that the biological processes involve the basic constructs created by the cell's organelles: the protein synthesis. Analogously, the tasks performed by the employees in the institution are much like the proteins created in the cells. The transactions created between employees are like the cellular exchanges at the cell membranes. Similarly the tasks to the projects and the transactions to the accounts in an institution are like, respectively, the proteins to macro molecules and cellular exchanges to the chemical products.

The organizational analogy in Figure 1 does not suggest how we can address prevention, however. Therefore, we rearrange the guiding principles linking them to the supporting entities in terms of *activities*, *events* and *control mechanisms* (shown in the right side of Figure 2). The green dotted box shows business entities analogous to those entities in the human body. The red dotted lines and red entities exhibit the basic elements involved anomalies or wrongdoings.

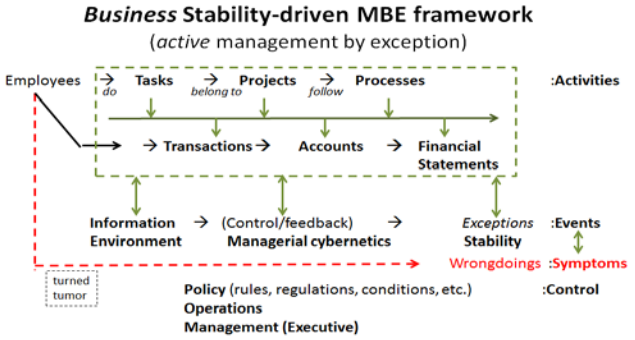

Figure 2. Institution model

More specifically, the operational, tactical and strategic activities of an institution are realized in the tasks (biologically analogous to proteins produced by cells) of projects (analogously carried out by macromolecules in tissues, organs, organ systems) to be executed following predefined business processes (biological processes) by the employees (cells). Transactions (amounts or volume of exchange or release of chemicals in cellular exchange) of various accounts (chemical products) are related to tasks (proteins produced by cells) within the projects (macromolecules) and among them.

Lastly, policies are statements that govern all entities and guiding principles. They can be specific, detailed, and measurable at the operational level of the organization. In fact, there is an operational process/procedure defined on anything and everything such as evaluating a loan application, startup a server, make a reservation for meeting room, etc. These processes grew from simple procedures defined at the start-up of the institution and become mature as the institution grows.

The policy can become sketchy, unstructured and robust at higher level (strategic level). The high-level plan and process (we call it strategy) for defining and achieving company's business objectives can be considered as policy since it is about how to compete within a predefined scope.

We present above how a set of concepts are identified towards the formulation and realization of an approach to a partially biologically-inspired MBE solution. In the

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following, we focus on the development of use cases for such application,

III. DEVELOPING USE CASES FOR DETECTION OF CANCEROUS SYMPTOMS: ENRON CASE

In this paper, we show only the Enron case in our example implementation: We review the chronological wrongdoings (as we now known) in Enron for the capturing and detection of symptoms indicating wrongdoings which could lead to bankruptcy. For inputs, we classify them under the business entities defined in the MBE model: project, policy, account, task and transaction. Outputs are the exceptions detected by the said MBE.

A. Strategy (business plans) and projects

The first strategy was Jeff Skilling's MTM strategy with the concept of gas bank. MTM as a trading model was new in the sense that it was an energy derivative where Enron would act as an intermediary "bank". As such, Enron assumed the risks to buy gas from suppliers and to sell it to consumers at contractual fixed prices and service fees [3]. Skilling and Fastow used MTM to achieve two successful Projects: Cactus 3 with GE Credit Corp and other banks as partners, and JEDI with CalPERS partnership [28].

There were other strategies, e.g., the shift from Asset-heavy to Asset-light [29] and those nicknamed Death Star, Load Shift (creating appearance of electric power congestion), Get Shorty (buy low, sell big, buy back low, etc.), Fat Boy and Ricochet (California's energy market) [30] [31], and a diversification strategy. The latter was to extend Enron to businesses other than gas and electricity (water, broadband, etc.). The said strategies were realized in many subsequent projects: Dabhol, Bolivia, Azurix, Blockbuster, etc. Funds from Chewco, JEDI II, LJM Cayman, LJM 2 and LJM 3, Braveheart, Raptors, etc. in *SPEs partnerships were used to off-balance its liabilities. Many of these projects were managed mainly by Fastow with SPEs created to avoid consolidation in financial statements.*

B. Policy and regulations

To support the MTM strategy and others further, Skilling set out to hire the best and the brightest traders. Skilling devised a new policy on performance review called "360-dregree review" and a new mantra (RICE) for Respect, Integrity, Communication and Excellence. Skilling successfully convinced the internal counsel, Andersen accounting audit and SEC to approve the MTM change to accounting practices. The Enron Board of directors also approved Fastow to have a dual role: Enron CFO and SPE manager in 1999. *The above are considered as mutations to policy and regulations on common practices.*

C. Finance and Accounting

All together, the MTM trading model, the group of top traders, the expansion to all other businesses, the bull market during 1990's facilitated investment opportunities. Also included was the use of the Enron Online (EOL) developed by Louise Kitchen and promoted by Michael McConnell since the end of the 1999. The EOL was an electronic, real-time trading site. At its peak in 2000, EOL was handling $335 billion in online commodity [11]. Until then, there were all success stories, at least on the surface.

Since 1997, however, Enron profits were squeezed due to new entrants and other smaller competitors: Dynegy, Duke Energy, El Paso and Williams, etc. [3]. Enron began to lose the competitive advantage. To be financially able and to maintain high credit ratings, Enron started to devise the use of SPEs to access capital and hedge funds as they entered into new mergers and acquisitions. The company has become more a hedge fund than a trading company [11].

SPEs were the shell partnerships sponsored by Enron, supposedly funded by independent financing. Two conditions must be satisfied in order to keep the SPEs separate from Enron: at least 3% equity and 50% or more control of financial interest given to the independent investors. SPEs were used to purchase forward contracts with producers and to sell under long-term contracts to consumers [18]. However, in Chewco for example 3% was owned and actually controlled by Enron executives. *Fastow began to hide losses in SPEs, thousands of which were created for that purpose*.

D. Deals and Transactions

The introduction of SPEs model and practice had brought successful results to the two first projects: Cactus 3 and JEDI [28]. SPEs became problematic in subsequent projects [32].

As we know now, Fastow, the master mind behind all SPEs, used them as a way to transfer losses off Enron's books. Thus, he was able to book profits, and maintained good credit ratings by reducing debt-to-total-assets ratio. He used thousands of SPEs in subsequent projects, e.g. Chewco, LJM Clayman, LJM 2 [11]. Using SPEs, Enron was able to obscure disclosures on Enron financial statements by taking advantages of the non-consolidation requirements.

It was reported [32] that in a deposition, Fastow confirmed that by transferring assets and loss off balance sheet, risks of the transactions were transferred to investors, therefore investors earned a return from the risks. As such, Enron rating would not be hurt. Fastow assured that he worked very closely with outside accountants to not violating any rules.

As later discovered and reported in various sources [18], starting from October 2001, *$287M for Azurix (acquired in 1998), $180M for broadband with Blockbuster, and $544 for others, a total of 22% of Enron expenditures from 1998-2000 were write-offs. Portland General Corp (acquired in 1997) was sold for $1.9B at $1.1B loss*.

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E. Wrongdoings and symptoms

Some symptoms leading to wrongdoings can be accounted as follows, extracted from happenings of (*A-D*):

1) The initial success with Cactus 3 and JEDI with hedge fund from CalpPERS, as shown in financial statements of 1992 did not go unquestioned. *Toni Mack, in her Forbes' article "Hidden Risks" in 1993 has pointed out some risk issues related to MTM strategy*.

2) The next symptom was *the lawsuit by Bernard Glatzer in 1997* that his business model was stolen by Enron in moving assets of Enron into partnerships via SPEs.

3) The symptom which followed and should be noticed was the *Enron's Board's approval of Fastow's dual role in 1999*, with the condition that the task of monitoring the deals was given to Skilling, COO, Causey (CAO – accounting, and CRO - risk). There were also *concerns raised by David Duncan and Thomas Bauer of Andersen's Houston office in February 2001* however these were not disseminated outside of Anderson.

4) Another (now known) symptom was a *confidential memo from Jordan Mintz in May 2001 to Skilling*, but Mintz got no response. The next major symptom was the *resignation of Skilling citing personal reasons* 6 months after he became Enron CEO. Ken Lay resumed the CEO position on August 2001.

5) Followed was the *anonymous letter to Ken Lay* in late August (later known as being written by Sharon Watkins, an Enron VP) in August 2001, and subsequently a meeting was held between Lay and Watkins on accounting irregularities. Following the anonymous letter, Vinson and Elkins, Enron legal counsel, who helped draft the documents of some partnerships, *was advised not to look into accounting by Arthur Andersen* when the heart of the problem was really there [32]. It was known that an Andersen lawyer advised the Houston office *not to retain documents* which were no longer needed. Andersen auditors shredded documents subsequently by order of David Duncan of Andersen.

6) Meanwhile there were other symptoms during the last part of 1990's:

- *Top management's large amounts of compensation*, Excessive executive compensation as a result of financial successes as stock options reached almost 100M shares by end of 2000,
- *Huge amount of management fees* for Enron executives (Fastow alone was paid $30M)

7) Arthur Andersen's *conflict of interest acted both as external auditors and consultants*. Corporate Audit Committee failed to recognize those symptoms.

8) Two days after Lay stepped down as CEO, *Clifford Baxter, Vice Chairman committed suicide*.

The first official wrongdoing which brought everybody's attention was the *press release of Q3 2001* (October 16, 2001) without the balance sheet disclosure until after the markets closed. It revealed a $1.2B charge against equity [33]. Breakdowns of footnotes were detailed in Chatterjee [29]. Roughly one week later, SEC inquired about the SPEs. Also, faced the pressure from Wall Street, in November 2001, *Enron admitted buried hidden losses in the SPEs*, and *posted the re-statements for 4 years* (1997-2000). They were accounting fraud.

The discovery of wrongdoings, re-statements of financial report in the third quarter of 2001, accounting frauds, and financial consolidations resulted in the Enron stocks from $90+ to the 28 cents within a couple of months [34]. It brought the company to collapse in November 2001.

The classification of the above entities (*A-D*) was to summarize and to suggest that if attention was paid to these entities as entries to the MBE, the symptoms in (*E*) would have yielded important indicators of wrongdoings. The summary we cite here is not be a complete and totally accurate account of what really happened and how they happened but we thought it is sufficient for us to illustrate the possible discovery of wrongdoings based on observed symptoms.

We show a typical output produced by our initial prototypical MBE application in Figure 3 (*at the end of the paper after references*). If such exception report is produced and made transparent to all responsible parties, some attention would be given, and some decisions be reached.

IV. DISCUSSIONS AND CONCLUDING REMARKS

Recall that our proposed model in Section 2 is *employee-centered* much as an organism is *cell-centered*. Everything in the institution is considered as product of the employee's *tasks* much as everything in the human body is the product of the cell's organelles as *proteins*. The products are described not only in terms of tasks but also projects, transactions or accounts, and are not limited to other entities the institution might use.

Secondly, the system is *policy-driven* across all level of organizations much like *gene-driven* in a human body, to measure results against "faulty strategy, managerial mishandlings, intended wrongdoings, diverted tasks within projects, out-of-the-ordinary transactions hidden in financial accounts and underreporting statements". These are either supported by existing policy and/or regulations or questionably violate them as we mentioned earlier in Enron case.

Thirdly, the system is geared towards evaluating and labeling exceptions in terms of severity level as a set of relevant symptoms for diagnostics of wrongdoings as shown in Figure 3. All records have drill-down and roll-up capability, and sideway links. Thus, the MBE system is capable of displaying the set of information on a particular issue as complete as possible including all analyses (as background calculations or evaluations, not addressed here) substantiating it, and all actions/decision for or against it (overriding decisions). Such transparent MBE scheme, with highly vertical and horizontal integration and correlation among the business entities can help detect symptoms

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towards wrongdoings. Implementation of this MBE enterprise-wide is difficult, time consuming and complex because it will involve many existing applications. However, it can be done in increment.

The six collapses we consider for the development as use cases are complex. They all had sophisticated strategies and processes, huge projects, complicated transactions in numerous areas of business from trading to CDO's, from SPE to Repo 105, and the like. The Enron illustration shown here is highly simplified to convey the idea. There are a lot more in each and in future cases. We believe however it does suggest an improved internal control toward prevention. Future work is on the mechanisms, partially biologically-inspired for the detection and reporting of symptoms leading to collapses, for managerial decisions.

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ID	Related entity	Entity type	Date	Severity	Link to	Action by	Override		
							Date	Reason	Severity
P-003	SPE creation	Policy	1991		P-003	Fastow	1991	Partnership	
E-191	Rhythms Net	Project	1999		PR-99	Skilling	1999	Investment	
E-192	Financial analysis	Task	1999		PR-99	Kaminski	1999	Risk	
E-193	LJM Cayman	Account	1999		A-099	Fastow	1999	Hedge	
E-194	Cayman Islands	Transaction	1999		TR-99	Fastow	1999	Enron stock	
E-195	FS-1999	Others	1999		O-199	Skilling	1999	Statement	
...	...	...	...	...	...	...	...	...	
E-211	FS-2001 Q3	Others	2001		O201	Skilling	2001	Consolidation	
E-212	SEC inquiry	Others	2001		T-991	Fastow	2001	Consolidation	

Figure 3. Partial exception list in Enron Rhythms NetConnections project