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A Formal Analysis of Fraud in Banking Sector

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Abstract

With the proliferation of CBS (Core Banking Service) into various digital channels, the Indian banking sector has witnessed an alarming spectre of fraud. Information asymmetry amongst different agents is the root cause of fraud. In this paper, we propose a logical framework involving multiple agents of different personality types. The agents have different trust quotients for co-agents and information coming from various trust-deficit channels connecting them. A procedural framework based on third party independent authentication on agents' activities is proposed. We also present a case study on customer reimbursement patterns in automobile loan segment. We show how a robust credit appraisal model, coupled with strict monitoring of loan reimbursement and loan recovery strategies achieve reduction of NPA (Non-Performing Assets) of the bank to an acceptable level.

1. Introduction

In a developing country like India, banking activities have leapfrogged on the wings of ICT (Information and Communication Technology) from ledger driven manual operations to pervasive, fully networked and integrated CBS system. This metamorphosis of the banking operations, though beneficial for the ordinary people, brought about a host of challenges in risk management in B2C (Business-to-Consumer) environment, especially in trust-deficit cyber domain. Anonymity of the agents' action (mismatch in identity and transactional behavioural patterns of customers/fraudsters) in different digital channels (e-Banking, m-Banking, ATMs) and payment avenues (credit and debit cards) often causes fraud. It may lead to humongous losses and accretion of NPA for the bank. In this paper, we provide a logic based model of fraud (using deontic, epistemic and temporal logic) that occurs during interactions among multiple groups of agents interchanging goods, services and information. In our model we take into account mental disposition of the interacting agents. In the absence of established prior relationship in a 'low trust, open electronic environment', a trustworthy, safe protocol for interaction is highly desirable. In a multi party ecosystem involving customers, bankers and fraudsters, the first two parties need to exchange additional protocol/information based on independent agent's testimonials, about each other's transactional details, to avoid possible duplicity by the third party.

The paper is organized as follows. Section 2 discusses information asymmetry, trust, control mechanism and risk in the banking transaction. Section 3 expounds a logic based multi-dimensional model of business fraud incorporating swindling, systematic violation and concealment in a low trust open environment. Section 4 summarizes some critical observations of our model. In Section 5 a simulation model of credit scoring of customer on secondary banking data and NPA calculation on the loan disbursed by the bank is presented. In Section 6 limitations of our work is discussed. Section 7 concludes the paper with brief discussion on our future work.

2. Information Asymmetry, Risk, Trust and Control Mechanism in Banking Transaction

When multiple parties exchange goods, commodities, services or monetary instruments using banking channels or they try to obtain loan or any other banking products, information and trust asymmetries between concerned parties fundamentally affect the behavioural patterns, modus operandi as well as business outcomes. These issues form the building blocks of any successful business transaction and if prevaricated, they become instruments of fraud.

Information asymmetry results in a state of non-equilibrium of trust and controlling power among interacting agents, thereby giving rise to scope for (un)observed opportunistic/deceptive behaviour and fraud. Trust is defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trusting party, irrespective of its ability to monitor or control that

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other party"[1][2]. Hence the key ingredients in the definition of trust are risk and vulnerability of the concerned parties which are abused and violated in case of fraud. Trusting agent perceives "that he will be worse off if he trusts and his trust is not fulfilled, than if he does not trust"[3]. Thus vulnerability will arise "while holding the hope that the other party will deliver on their promise"[3][4]. Fraud occurs when precisely this promise is broken or non-kept.

Information and trust asymmetries and their reactions and consequences on an individual vary widely. The ability to repose trust on fellow persons/ environment differs according to personality traits, behavioural patterns, upbringing and educational/cultural background of the concerned individuals.

A five factor personality trait theory called "Five Factor Model (FFM)" is the most celebrated model used to explain trust factors and human behavioural anomalies [5][6]. This model has a strong bearing on the procedural, transactional and individual trust factors we present in this paper. We now describe the individual components of FFM (Agreeableness, Extraversion, Openness to Experience, Conscientiousness and Neuroticism) and its characteristics briefly.

(i)Agreeable personalities espouse "optimistic views" assuming people to be "decent and trustworthy" [5].

(ii)Extraversion personalities are "socially egregious, outgoing, carefree and prone to change viewpoints" [6]. They have higher propensity to trust.

(iii)Open to experience personalities are characterized by "open mindedness", prone to "experimenting with new ideas, as opposed to conservatism and traditionalism [5]." They have greater trust propensity.

(iv)Conscientious people are "dutiful, cautious, deliberate and responsible", carefully weighs "pros and cons of situations before taking any decision" [6]. They have lower propensity to trust than the first three types.

(v)Neurotic personalities are characterized by "emotional instabilities, pessimism, fear and low self esteem [6]" with "high level of anxiousness and emotional vulnerabilities" and find it extremely difficult to trust [5]. Hence they have lowest propensity to trust.

As shown in Figure 1 TQ (Trust Quotient) varies from 0% i.e. no trust, to 100% symbolizing full trust. Now TQ between two transacting agents are different for different personality types. PTT (Personal Trust Threshold) that quantifies TQ existing between two parties is a complex function of many factors. TQ is also different for different personality types in FFM. In our model we have introduced three personality traits viz. Trait I, Trait II and Trait IIII based on FFM. Trait I includes the first three personality types in FFM (Agreeableness, Extraversion, Openness to Experience) which basically symbolizes trusting nature. Trait II personalities (Conscientious, who carefully weighs pros and cons before deciding), have lower TQ and PTT than trait I. Trait III personalities (Neurotic, having difficulties in trusting others) have lowest TQ and PTT.

Apart from the personality types, other factors that profoundly influence TQ and PTT are: existence of prior personal/business relationship, knowledge of price and quality of goods and services exchanged, modalities of exchange and payment channels, information asymmetry and un-observable nature of the action of the agents, inter-personnel-relationship, duration of relationship, trust quotient between the concerned parties, the transactional mechanism, valuation of exchanged commodities, physical proximity, reputation, information exchange, potential profit, transactional risk, and individual risk appetite (risk taking, risk neutral, risk averse).

Figure 1 shows how the traits are positioned on the TQ line where TQ = Trust Quotient, PTT = Personal Trust Threshold, TT = Transactional Trust, Trait I = Personality Type (Agreeableness, Extraversion, Openness to Experience), Trait II= Personality Type (Conscientiousness), and Trait III= Personality Type (Neuroticism

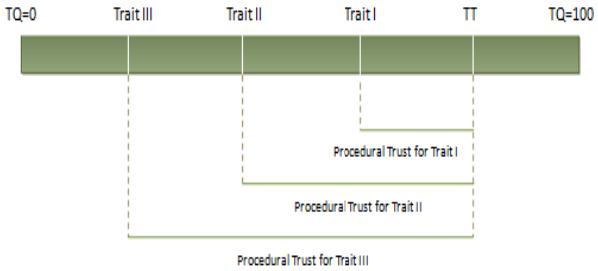

Figure 1. Trust quotient, procedural trust and transactional trust line

People will consider doing business transaction only if and when the reliability of transaction process exceeds their Personal Trust Threshold (PTT) and meets Transactional Trust (TT). This gap needs to be bridged by procedural mechanism to systematically enhance the reliability of genuine transaction, thereby reducing fraud. The relationship between PTT, TT and Procedural Trust (PT) is expressed as

PTT = TT – PT

where PT signifies protocol, control, and third party authentication. (1)

In the next section we discuss how, in the absence of procedural mechanism or third party authentication, information asymmetries and trust-deficit relationship among interacting agents are exploited during fraud.

3. Banking Fraud: A Logic Based Model of Procedural Violation, Swindling and Systematic Deception

From the discussion in the previous section we have identified four cardinal sources of fraud among interacting agents: (i) information asymmetry; (ii) non-uniform distribution of controlling power and trust; (iii) anonymity of agent's actions; and (iv)willful reneging/non-fulfillment of solemn obligatory promises in a contractual set up. Fraud in the context of banking transaction (as formulated by the RBI's Report of the Study Group on Large Value Bank Frauds) is defined as:

'A deliberate act of omission or commission by any person, carried out in the course of a banking transaction or in the books of accounts maintained manually or under computer system in banks, resulting into wrongful gain to any person for a temporary period or otherwise, with or without any monetary loss to the bank'[8].

Formally fraud is marked by the following sequence of events between group(s) of interacting agents:

(a) An agent or a group of agents, on a position of trust and responsibility, perjures about an important statement, fact, action, promise or event in order to gain wrongful benefit (actions by perjurer).

(b) Perjury is believed and taken at its face value by victim(s) (bank, bank customer, and other agents).

(c) The victim takes a deliberate material action upon accepting the word/promise of the perjurer(s) in good faith.

(d) The victim suffers pecuniary loss primarily due to the aforesaid material action taken [10].

As fraud involving an institution like a bank is a multi-party (agents) activity, we have chosen two principal agents viz. a performing agent (who might interact with the bank, ask for loan etc., and may/may not commit fraud) and a receiving agent (who might represent the bank).

The performing agent, who may/may not indulge in fraudulent activities, is influenced by its own mental states which in turn are influenced by the factors we described above. The compliance/non-compliance information of its activities/credentials is passed on through physical/logical/virtual channel to the receiving agent. The receiving agent, in turn, is influenced by its own personality traits, historical experience and experience/impression of channel properties. Physical channel carries more trustworthiness than logical/virtual channel due to user's direct personalized experience which is unlikely to be replicated in a virtual/logical environment. Receiving agent's belief influences its decision and action (δ, if the belief=TRUE; and δ', if belief=FALSE) resulting in genuine case, anomalous case, detected, or non-detected fraud. It sometimes causes monetary loss to the receiving agent or the institution it represents. A real life example could be the acceptance/rejection of automobile loan applications from applicants (performing agent) by competent banking staff (receiving agent). Acceptance/rejection criteria is based upon (i) applicant's creditworthiness; and (ii) banking staff's belief in the genuineness of the documents (proof of age, identity, income, education, etc.) submitted by the applicant through physical/digital channel. Banking staff's belief and subsequent decision on acceptance/rejection of loan has direct bearing on the economic health of the bank. Any bad loan (due to low credit cut off score) will contribute to NPA (Type II error) while any rejection of genuine applicants (due to stiff credit cut off score) will result in losses for the bank from opportunity cost (Type I error).

Performing agent's mentality influences one of the five decisions/actions they are likely to take (i) perfect action plan (ii) fraudulent violation plan (iii) incapacity planning (iv)derelict action plan (v) mistaken action plan. Among these, the second and third types of actions are likely to enhance NPA for the bank. The following sequences of events take place. (Vide Figure 2). The whole logical flow of operations and corresponding 42 cases (some cases are deliberately omitted) are fully expounded in the Appendix.

(a) One agent, called the performing agent, is obliged to perform a certain duty (primary_task).

(b) The performing agent's mental framework influences actual performance of the duty (actual_task).

(c) The performing agent informs the other agent (receiving agent), through communication channel, about the completion of task (communicate_task).

(d) The receiving agent believes/does not believe the veracity of the received information according to its mental traits, historical experience, chosen criteria and information content (believe_task).

(e) The receiving agent is obliged to perform counter action according to its belief/non-belief of the compliance of the primary task by the performing agent.

(f) The receiving agent performs the counter action (counter_task).

The crux of the problem, as discussed earlier, lies in multi party interaction with asymmetric information in a trust-deficit contractual eco-system. It can be best described in a logical framework involving deontic logic (concerned with states of obligation, permission and prohibition in contractual set up) [11] and dynamic logic (which involves temporal events)[12]. This logic based framework will be used to structurally model

fraudulent situations involving broken obligation, deceitful performance and deliberate concealment.

The framework as shown in Figure 2 is composed of five different blocks. In each block, the actual task as well as the mental states of the agent behind it , are critically evaluated.

(a) **Actual task** This task is committed by the performing agent depending upon its mental state. The mental state can be in five different dispositions: (i) conscientious commitment to perfect action plan; (ii) willful violation of obligations; (iii) dereliction of duties; (iv) un-intentional mistakes; (v) incapacity of action.

(b) **Communication Channel** Trust of the communication channels and its message content (compliance/non-compliance) has strong bearing on the receiving agent. Receiving agent's perceived conception of regulatory, legal/technical environment, security and privacy of the communication channel as well as the agent's past experience of the reliability of the channel and performing agent influences its belief systems and subsequent actions [13].

(c) **Personality Trait** Receiving agents having three different personality traits (Trait I, Trait II and Trait III which are adapted from FFM) conform to three distinct positions in the credit rating band. Receiving agents with Trait I (believing disposition)/Trait III (suspicious) personalities will opt for lowest/highest points in the credit rating band respectively while receiving agents with Trait II personalities (conscientious) will conform to middle position.

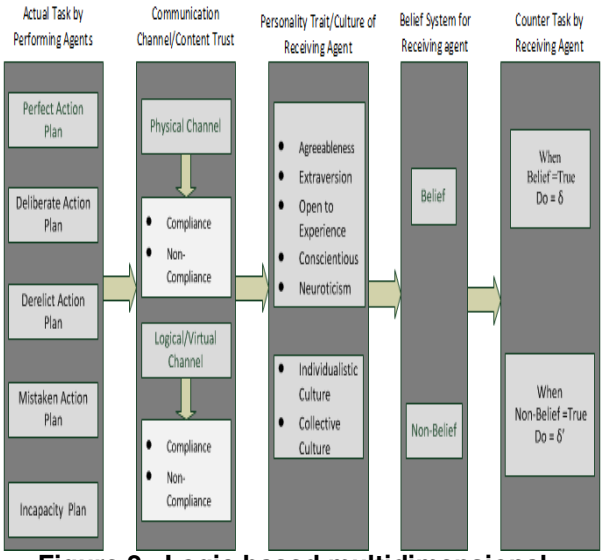

Figure 2. Logic based multidimensional model of fraud in banking domain

(d) **Counter Task** Counter task by receiving agent is influenced by its mental state of belief/non belief of the performing agent's perceived action and receiving agent's trust on information content of the channel. Positive/negative belief leads to task δ or δ' respectively.

4. Banking Fraud Model: Some Remarks

We make the following observations with regard to our fraud model.

(i) In Table 1, we present a multi-agent system possessing of the traits enumerated in our fraud model. In the second column of the table we present the various mental states of the performing agent while in the third column we indicate whether this state leads to fraud or not. Column four lists the mental traits of the receiving agent and columns five, six, seven and eight indicate whether the cases received by the receiving agent are genuine, anomalous, or fraud (detected/undetected). Column nine shows the names of relevant cases and equation numbers (equations 10 to 51) which are directly taken from the Appendix . Figures 3 and 4 are constructed by using results from Table 1.

Mental states used in Table 1: Perfect Action Plan (PAC), Deliberate Violation Plan (DVP), Derelict Action Plan (DAP), Mistaken Action Plan(MAP), Incapacity Plan(IP).

Channels: Physical Channel (PCH), Logical/Virtual Channel (LCH))

Table 1. Agents' characteristics of fraud model

	Performing Agents' Mental States	Fraud(F) / Non-Fraud(NF) Perpetrated By Performing Agents	Characteristic Traits of Receiving Agents	Genuine Cases Obtained By Receiving Agents	Anomaly/ Mistakes by Receiving Agents	Fraud / Anomaly Detected by Receiving Agents	Fraud/ Anomaly Undetected by Receiving Agents	Relevant Cases /(Equations) from the Appendix
1.	PAC	NF	Trait I	PCH,LCH				Ia(10),Id(13)
2.	PAC	NF	Trait II	PCH	LCH			Ib(11),Ie(14)
3.	PAC	NF	Trait III		PCH,LCH			Ic(12),If(15)
4.	DVP	F	Trait I				PCH,LCH	IIa(16),IId(19)
5.	DVP	F	Trait II			LCH	PCH	IIe(20),IIb(17)
6.	DVP	F	Trait III			PCH,LCH		IIc(18),IIf(21)
7.	DAP	NF	Trait I	PCH,LCH				IIIa(22),IIId(25)
8.	DAP	NF	Trait II	PCH,LCH				IIIb(23),IIIe(26)
9.	DAP	NF	Trait III	PCH,LCH				IIIc(24),IIIf(27)
10.	DAP	F	Trait I				PCH,LCH	IIIg(28),IIIj(31)
11.	DAP	F	Trait II			LCH	PCH	IIIk(32),IIIh(29)
12.	DAP	F	Trait III			PCH,LCH		IIIi(30),IIII(33)
13.	MAP	NF	Trait I		PCH,LCH			IVa(34),IVd(37)
14.	MAP	NF	Trait II		PCH	LCH		IVb(35),IVe(38)
15.	MAP	NF	Trait III			PCH,LCH		IVc(36),IVf(39)
16.	IP	NF	Trait I			PCH,LCH		Va(40),Vd(43)
17.	IP	NF	Trait II			PCH,LCH		Vb(41),Ve(44)
18.	IP	NF	Trait III			PCH,LCH		Vc(42),Vf(45)
19	IP	F	Trait I				PCH,LCH	Vg(46),Vj(49)
20	IP	F	Trait II			LCH	PCH	Vk(50),Vh(47)
21	IP	F	Trait III			PCH,LCH		Vi(48),Vl(51)

(ii) Trait I is least prone to committing Type-I error (non-fraud cases wrongly accepted as fraud) but it is highly prone to commit Type-II error (fraudulent cases being accepted as genuine).

(iii) Trait III characteristics are susceptible to commit Type-I error but almost never commits Type-II error.

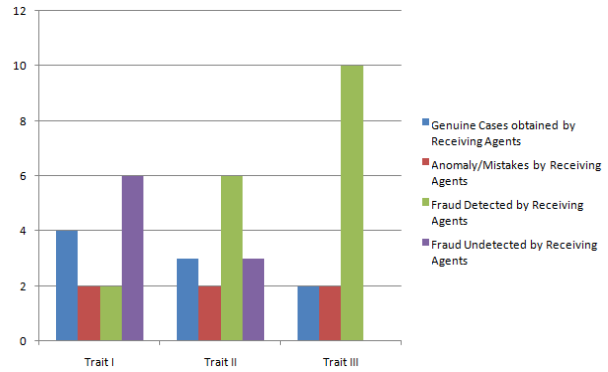

Figure 3. Receiving agent's performance based on personality traits

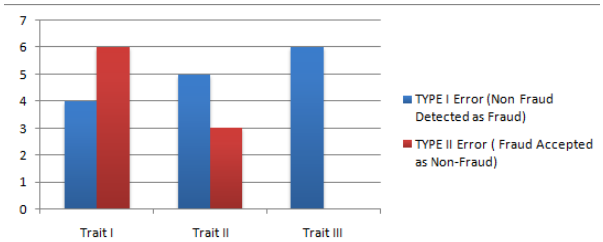

Figure 4. Type-I and Type-II errors committed by receiving agent based on personality traits

(iv) Further refinement of the model is undertaken when witness of an independent third party who is privy to the activities of the performing agent is conveyed to the receiving agent, who may have doubt on the performing agent as well as communication channel. It thereby enhances procedural trust (as shown in Figure 1). Procedural trust helps diminish both Type- I and Type-II errors. This is explained in Equation 52 in the Appendix.

(v) Various agents' performance vis-à-vis their personality traits are illustrated in Figure 3. Figure 4 depicts Type I and Type II errors committed by agents having different personality traits.

5. A Simulation Model of Credit Appraisal and NPA in a Bank

In this section we will apply our fraud model on a real life customer data (about 10000 customer records taken from a secondary source) for a retail (car) loan segment of a bank in a western country. The basic strategy of the bank is to maximize profit by offering credit facility while minimizing NPA. Once the customers apply for loan, their eligibility is scrutinized by the bank personnel before offering loan. The credit appraisal system is a multi-discriminatory model involving twenty-two variables (age, sex, qualification, income, property valuations, amount of loan/down payment, etc.) with different relative weights attached. Individual eligibility is based on personal credit score being above a minimum cut off limit. The loan disbursement pattern of individual customer closely follows five types of actual behaviour committed by performing agents (perfect action plan, unintentional mistake, derelict action plan, incapacity of action and willful violation) described earlier.

There are seven major components in our loan processing model: (i) loan application; (ii) credit appraisal; (iii) loan approval/rejection; (iv) loan disbursement; (v) credit monitoring; (vi) loan recovery; and (vii) NPA calculation. In our simulation model there are several banking agents who deal with credit processing: (a) receiving agent for loan appraisal, credit checking; (b) verifying agent for verifying applicants' credential, monitoring and appraisal of loan installment payment; (c) monitoring and recommender agent for keeping repository of historical record of loan applicants/defaulters, customer profiling; (d) recovery agent for recovering loan by collateral management; (e) legal agents for advising management over legal issues; (f) managerial agent for decision on credit management and NPA. The overall credit flow process is shown in Figure 5.

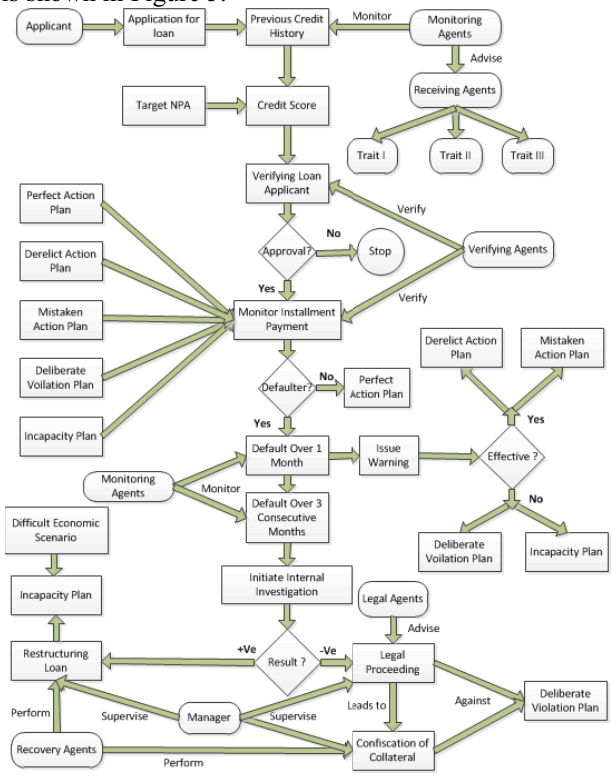

Figure 5. Banking credit flow process

The credit appraisal process with a subset of data (20 out of approximately 10000 customer records) is shown in the Figure 6. Credit appraisal cut off limit is

chosen to be 80. Any customer with personal credit scores less than the cut off limit (e.g. customer number 7 and 18) will have his/her application rejected. The credit score and NPA are inversely related. Higher the credit score cut off limit, lower is the probability of any ineligible person inadvertently getting the loan (which may later convert into NPA). The higher management sets a target for loan disbursement and the maximum allowable NPA limit for the bank for maximizing profit and thereafter credit score limit is suitably adjusted.

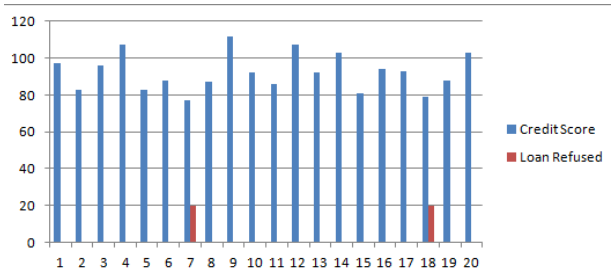

Figure 6. Customers' Credit Appraisal

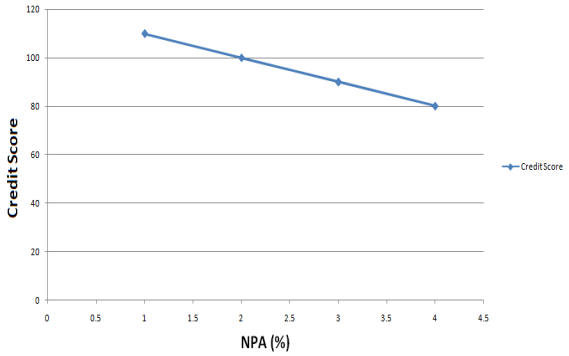

Figure 7. Banking NPA vs. credit score

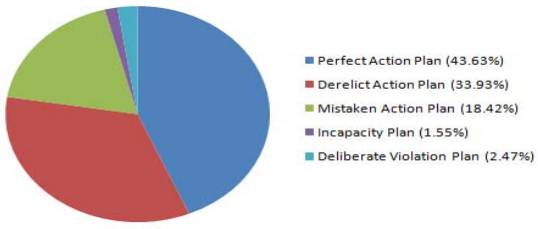

Figure 8. Various customer segment's performance chart (4.02% NPA)

Figure 7 shows NPA vs. Credit score limit for the banking loan applicants' data. Credit score cut off limit 110 and 80 corresponds to 1% and 4%NPA respectively. Figure 8 shows the distribution patterns of various types of applicants' performance (of total loan amount disbursed, 1.55% incapacity plan and 2.47% deliberate violation plan together constitute 4.02% NPA) on a pie chart. In the banking sector NPA less than 5% of loan advanced is deemed acceptable.

6. Limitations of our Work

We made a tacit assumption in our fraud model about trustworthiness of the banking agents. We did not consider the multi party fraud involving collusion between banking agent(s) and fraudsters during credit appraisal, loan recovery and NPA calculation. Type I error (banks forfeiting opportunity cost by denying genuine customers credit facility because of high credit cut off score) has not been studied due to lack of relevant data.

7. Conclusion and Future Work

After the banking activities went online from the manual operations in a major way, proliferation of multifaceted fraudulent activities have mushroomed .In this paper, a deontic logic based framework is proposed to contain fraud. As knowledge based systems are well known to be very efficient in many real life applications, our framework with third party authentication coupled with strict monitoring and robust procedural control is likely to be effective in containing the fraud menace in the banking sector.

In future we intend to incorporate tacit collusion between banking agents and fraudsters into our model. This case is extremely difficult to detect/prove and potentially hazardous for the bank. We further intend to study multiple credit segments (home loan, personal loan, two/four wheeler loan, education loan etc) from different nationalized/private banking sectors in India and compare individual performances of the banks vis-à-vis credit appraisal process and NPA management, over a period of ten years. This study will help us quantitatively calculate compliance measurement (or lack of it) between stipulated banking guidelines and procedures followed in day to day banking practice. We also intend to design a prototype recommender system with self learning capabilities which will monitor customer reimbursement patterns and help the management devise suitable credit policies.

Appendix

First we will define some deontic and temporal modal operators for construction of the aforementioned logical structure. In the following sets of equations i, j ∈Agent, γ,∈ Actions, **ξ**∈ States, B, K, O, A ∈ Operators

etc. Some of the representations on fraud cases in derelict action plan and incapacity plan are omitted.

Actions γ is executed if state ξ holds else action δ is executed. It is represented by conditional operator /

$\xi \rightarrow \gamma/\delta)$ (1)

Agent k testifies to agent j that the agent i has performed action γ with χ (compliance/noncompliance)

$testify(k,j,i,\gamma,\chi)$ (2)

Agent j trusts i about the performance of the action γ

$trust(j,i,\gamma)$ (3)

Agent i can witness agent j to perform action γ with χ (compliance/noncompliance)

$witness(i,j,\gamma,\chi)$ (4)

Agent i performs action γ which is the primary task of the agent i

$primary\_task(i,\gamma)$ (5)

Agent i who is obliged to perform action γ for the agent j ,performs actual_task depending upon its own mental state Ψ∈{perfect action plan, deliberate violation plan, derelict action plan , mistaken action plan, incapacity plan}

actual_task(i, j, γ, Ψ) (6)

Agent i communicate through the communication channel Ξ (physical channel, logical/virtual channel)to agent j about the compliance/non compliance of action γ denoted by χ∈ {compliance, non-compliance}

$communicate\_task(i,\Xi,j,\gamma,\chi)$ (7)

Agent j having personality trait ж(trait I, trait II, trait III) after receiving information about the compliance/non compliance of action γ from i either believes/not believes the information which is denoted by и ∈ {belief, non-belief}

$believe\_task(j,ж,i,\gamma,и)$ (8)

Agent j performs action δ which is the secondary task of the agent j iff $((\chi = \text{compliance})\&\ (и = \text{belief}))$ holds. Otherwise δ` is executed by j

$counter\_task(j,\big((\chi = \text{compliance})\&(и = \text{belief})\big) \rightarrow \delta/\delta`)$ (9a)

Agent j performs action δ` which is the secondary task of the agent j iff $((\chi = \text{compliance})\&\ (и = \text{non} - \text{belief}))$ holds. Otherwise δ is executed by j

$counter\_task(j,(\chi = \text{compliance})\&(и = \text{non} - \text{belief})) \rightarrow \delta`/\delta$ (9b)

Agent j performs action δ` which is the secondary task of the agent j iff $((\chi = \text{non} - \text{compliance})\&\ (и = \text{belief}))$ holds. Otherwise δ is executed by j

$counter\_task(j,((\chi = \text{non} - \text{compliance})\&(и = \text{belief})) \rightarrow \delta`/\delta$ (9c)

Agent j performs action δ which is the secondary task of the agent j iff $((\chi = \text{non} - \text{compliance})\&\ (и = \text{non belief}))$ holds. Otherwise δ` is executed by j

$counter\_task(j,\big((\chi = \text{non} - \text{compliance})\&(и = \text{non} - \text{belief})\big) \rightarrow \delta/\delta`)$ (9d)

CASE I:Perfect Action Plan

Agent i is obliged to perform primary_task and actual_task is being performed by agent i according to perfect action plan and compliance information is communicated to agent j through communication channel (physical, logical/virtual). The information upon being received by agent j, accurate counter task δ, obligatory on the part of agent j ,is being performed.

CASE Ia: Perfect Action Plan , Perfect Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait I)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = perfect\ action\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel,j,\gamma,\chi =$ compliance$)\Lambda\ believe_task(j,ж = trait\ I,i,\gamma,и =$ belief$)\Lambda\ O(counter_task(j,(\ (\chi =$ compliance $)\&(и = \text{belief}))\ \rightarrow \delta\ /\delta`)\ ))$ (10)

CASE Ib: Perfect Action Plan , Perfect Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait II)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = perfect\ action\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel,j,\gamma,\chi)\Lambda\ believe\_task(j,ж = trait\ II,i,\gamma,и =$ belief$)\Lambda\ O(counter_task(j,(\ (\chi =$ compliance $)\&(и = \text{belief}))\ \rightarrow \delta\ /\delta`)\ ))$ (11)

CASE Ic: Perfect Action Plan , Perfect Communication and Imperfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait III)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = perfect\ action\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel,j,\gamma,\chi)\Lambda\ believe\_task(j,ж = trait\ III,i,\gamma,и =$ non − belief$)\Lambda\ O(counter_task(j,(\ (\chi =$ compliance $)\&(и = \text{non} - \text{belief}))\ \rightarrow \delta`/\delta)\ ))$ (12)

CASE Id: Perfect Action Plan , Perfect Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait I)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = perfect\ action\ plan)\Lambda\ communicate\_task(i,\Xi = logical/virtual\ channel,j,\gamma,\chi)\Lambda\ believe\_task(j,ж = trait\ I,i,\gamma,и =$ belief$)\Lambda\ O(counter_task(j,(\ (\chi =$ compliance $)\&(и = \text{belief}))\ \rightarrow \delta\ /\delta`)\ ))$ (13)

CASE Ie: Perfect Action Plan , Perfect Communication and Imperfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait II)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = perfect\ action\ plan)\Lambda communicate\_task(i,\Xi = logical/virtual\ channel,j,\gamma,\chi)\Lambda\ believe\_task(j,ж = trait\ II,i,\gamma,и =\ \text{non} - \text{belief})\Lambda\ O($

$(counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{non} - \text{belief}))\rightarrow \delta`/\delta)\ ))$ (14)

CASE If: Perfect Action Plan , Perfect Communication and Imperfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait III)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = perfect\ action\ plan)\Lambda communicate\_task(i,\Xi = logical/virtual\ channel,j,\gamma,\chi)\Lambda\ believe\_task(j,\text{ж}_{\text{ç}} = trait\ III,i,\gamma,\text{и} =\ \text{non} - \text{belief})\Lambda\ O(\ (counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{non} - \text{belief}))\rightarrow \delta`/\delta)\ ))$ (15)

CASE II:Deliberate Violation Plan(Fraudulent Cases)

Here the motive of the performing agent is suspect and it tries to deceive the receiving agent by wrongly sending the compliance information. But in some cases the receiving agent, especially of Type-III are not duped.

CASE IIa: Deliberate Violation Plan , Perfect Communication and Imperfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait I)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = deliberate\ violation\ plan)\Lambda communicate\_task(i,\Xi = physical\ \ channel,j,\gamma,\chi\ =\ \text{compliance}\ )\Lambda\ believe\_task(j,\text{ж}_{\text{ç}} = trait\ I,i,\gamma,\text{и} =\ \text{belief})\Lambda\ O((counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{belief}))\rightarrow \delta\ /\delta`)\ ))$ (16)

CASE IIb: Deliberate Violation Plan , Perfect Communication and Imperfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait II)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = deliberate\ violation\ plan)\Lambda communicate\_task(i,\Xi = physical\ \ channel,j,\gamma,\chi\ =\ \text{compliance}\ )\Lambda\ believe\_task(j,\text{ж}_{\text{ç}} = trait\ II,i,\gamma,\text{и} =\ \text{belief})\Lambda\ O((counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{belief}))\rightarrow \delta\ /\delta`)\ ))$ (17)

CASE IIc: Deliberate Violation Plan , Perfect Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait III)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = deliberate\ violation\ plan)\Lambda communicate\_task(i,\Xi = physical\ \ channel,j,\gamma,\chi\ =\ \text{compliance}\ )\Lambda\ believe\_task(j,\text{ж}_{\text{ç}} = trait\ III,i,\gamma,\text{и} =\ \text{non} - \text{belief})\Lambda\ O((counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{non} - \text{belief}))\rightarrow \delta`/\delta)\ ))$ (18)

CASE IId: Deliberate Violation Plan , Perfect Communication and Imperfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait I)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = deliberate\ violation\ plan)\Lambda communicate\_task(i,\Xi = logical/virtual\ channel,j,\gamma,\chi = compliance)\Lambda\ believe\_task\ (j,\text{ж}_{\text{ç}} = trait\ I,i,\gamma,\text{и} = \text{belief})\Lambda\ O(\ (counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{belief}))\rightarrow \delta\ /\delta`)\ ))$ (19)

CASE IIe: Deliberate Violation Plan , Perfect Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait II)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = deliberate\ violation\ plan)\Lambda communicate\_task(i,\Xi = logical/virtual\ channel,j,\gamma,\chi = compliance)\Lambda\ believe\_task\ (j,\text{ж}_{\text{ç}} = trait\ II,i,\gamma,\text{и} =\ \text{non} - \text{belief})\Lambda\ O(\ (counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{non} - \text{belief}))\rightarrow \delta`/\delta)\ ))$ (20)

CASE IIf: Deliberate Violation Plan , Perfect Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait III)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = deliberate\ violation\ plan)\Lambda communicate\_task(i,\Xi = logical/virtual\ channel,j,\gamma,\chi = compliance)\Lambda\ believe\_task\ (j,\text{ж}_{\text{ç}} = trait\ III,i,\gamma,\text{и} =\ \text{non} - \text{belief})\Lambda\ O(\ (counter\_task(j,(\ (\chi =\ \text{compliance}\ )\&(\text{и} = \text{non} - \text{belief}))\rightarrow \delta`/\delta)\ ))$ (21)

CASE III:Derelict Action Plan

Here the performing agent i is derelict in its action plan. Two cases may arise (a) if the agent is honest (s)he will send non-compliance report to receiving agent j (b) agent i is fraud and will send compliance report.We will deal with the cases in two different sub-sections—there is no fraud (IIIA) and fraud (IIIB).

SUB SECTION IIIA:NON-FRAUD CASE (DERELICT AGENT SENDS NON-COMPLIANCE REPORT)

CASE IIIa: Derelict Action Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait I)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = derelict\ action\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel,j,\gamma,\chi = non - \text{compliance})\Lambda\ believe\_task(j,\text{ж}_{\text{ç}} = trait\ I,i,\gamma,\text{и} = \text{belief})\Lambda\ O(counter\_task(j,(\ (\chi = \text{non} - \text{compliance}\ )\&(\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (22)

CASE IIIb: Derelict Action Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait II)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = derelict\ action\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel,j,\gamma,\chi = non - \text{compliance})\Lambda\ believe\_task(j,\text{ж}_{\text{ç}} =$

$trait\ II, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{non} - \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (23)

CASE IIIc: Derelict Action Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait III)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = derelict\ action\ plan) \Lambda\ communicate\_task(i, \Xi = physical\ channel, j, \gamma, \chi = \text{non} - \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ III, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{non} - \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (24)

CASE IIId: Derelict Action Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait I)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = derelict\ action\ plan) \Lambda\ communicate\_task(i, \Xi = logical/virtual\ channel, j, \gamma, \chi = non - \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ I, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{non} - \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (25)

CASE IIIe: Derelict Action Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait II)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = derelict\ action\ plan) \Lambda\ communicate\_task(i, \Xi = logical/virtual\ channel, j, \gamma, \chi = non - \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ II, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{non} - \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (26)

CASE IIIf: Derelict Action Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait III)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = derelict\ action\ plan) \Lambda\ communicate\_task(i, \Xi = logical/virtual\ channel, j, \gamma, \chi = non - \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ III, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{non} - \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (27)

CASE IV:Mistaken Action Plan

Here the agent i sends a compliance report mistakenly but without any malicious intention which may/may not be detected at the receiving agent's side.

CASE IVa: Mistaken Action Plan , Compliance Communication and Imperfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait I)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = mistaken\ action\ plan) \Lambda\ communicate\_task(i, \Xi = physical\ channel, j, \gamma, \chi = \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ I, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta/\delta')\ ))$ (34)

CASE IVb: Mistaken Action Plan , Compliance Communication and Imperfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait II)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = mistaken\ action\ plan) \Lambda\ communicate\_task(i, \Xi = physical\ channel, j, \gamma, \chi = \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ II, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta/\delta')\ ))$ (35)

CASE IVc: Mistaken Action Plan , Compliance Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait III)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = mistaken\ action\ plan) \Lambda communicate\_task(i, \Xi = physical\ channel, j, \gamma, \chi) \Lambda\ believe\_task\ (j, \text{жç} = trait\ III, i, \gamma, \text{и} = \text{non} - \text{belief}) \Lambda\ O(\ (counter\_task(j, (\ (\chi = \text{compliance}\ ) \& (\text{и} = \text{non} - \text{belief}))\ \rightarrow \delta`/\delta)\ ))$ (36)

CASE IVd: Mistaken Action Plan , Compliance Communication and Imperfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait I)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = mistaken\ action\ plan) \Lambda\ communicate\_task(i, \Xi = logical/virtual\ channel, j, \gamma, \chi = \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ I, i, \gamma, \text{и} = \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{compliance}\ ) \& (\text{и} = \text{belief}))\ \rightarrow \delta/\delta')\ ))$ (37)

CASE IVe: Mistaken Action Plan , Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait II)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = mistaken\ action\ plan) \Lambda\ communicate\_task(i, \Xi = logical/virtual\ channel, j, \gamma, \chi = \text{compliance}) \Lambda\ believe\_task(j, \text{жç} = trait\ II, i, \gamma, \text{и} = \text{non} - \text{belief}) \Lambda\ O(counter\_task(j, (\ (\chi = \text{compliance}\ ) \& (\text{и} = \text{non} - \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (38)

CASE IVf: Mistaken Action Plan , Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait III)

$O(primary\_task(i, \gamma)) \Lambda\ actual\_task(i, j, \gamma, \Psi = mistaken\ action\ plan) \Lambda communicate\_task(i, \Xi = logical/virtual\ channel, j, \gamma, \chi) \Lambda\ believe\_task\ (j, \text{жç} = trait\ III, i, \gamma, \text{и} = \text{non} - \text{belief}) \Lambda\ O(\ (counter\_task(j, (\ (\chi = \text{compliance}\ ) \& (\text{и} = \text{non} - \text{belief}))\ \rightarrow \delta`/\delta)\ ))$ (39)

CASE V:Incapacity Plan

This case is similar to case III. Due to incapacity the performing agent is unable to accomplish the task.

SUB SECTION VA:NON-FRAUD CASE (AGENT WITH INCAPACITY PLAN SENDS NON-COMPLIANCE REPORT)

CASEVa: Incapacity Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait I)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = incapacity\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel, j,\gamma,\chi = non-\text{compliance})\Lambda\ believe\_task(j,ж_{\text{ç}} = trait\ I,i,\gamma,\text{и} = \text{belief})\Lambda\ O(counter\_task(j,(\ (\chi = \text{non}-\text{compliance}\ )\&(\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (40)

CASEVb: Incapacity Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait II)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = incapacity\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel, j,\gamma,\chi = non-\text{compliance})\Lambda\ believe\_task(j,ж_{\text{ç}} = trait\ II,i,\gamma,\text{и} = \text{belief})\Lambda\ O(counter\_task(j,(\ (\chi = \text{non}-\text{compliance}\ )\&(\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (41)

CASEVc: Incapacity Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Physical and Receiving agent is of Trait III)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = incapacity\ plan)\Lambda\ communicate\_task(i,\Xi = physical\ channel, j,\gamma,\chi = non-\text{compliance})\Lambda\ believe\_task(j,ж_{\text{ç}} = trait\ III,i,\gamma,\text{и} = \text{belief})\Lambda\ O(counter\_task(j,(\ (\chi = \text{non}-\text{compliance}\ )\&(\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (42)

CASEVd: Incapacity Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait I)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = incapacity\ plan)\Lambda\ communicate\_task(i,\Xi = logical/virtual\ channel, j,\gamma,\chi = non-\text{compliance})\Lambda\ believe\_task(j,ж_{\text{ç}} = trait\ I,i,\gamma,\text{и} = \text{belief})\Lambda\ O(counter\_task(j,(\ (\chi = \text{non}-\text{compliance}\ )\&(\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (43)

CASEVe: Incapacity Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait II)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = incapacity\ plan)\Lambda\ communicate\_task(i,\Xi = logical/virtual\ channel, j,\gamma,\chi = non-\text{compliance})\Lambda\ believe\_task(j,ж_{\text{ç}} = trait\ II,i,\gamma,\text{и} = \text{belief})\Lambda\ O(counter\_task(j,(\ (\chi = \text{non}-\text{compliance}\ )\&(\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (44)

CASEVf: Incapacity Plan , Non-Compliance Communication and Perfect Interpretation (Communication Channel is Logical/Virtual and Receiving agent is of Trait III)

$O(primary\_task(i,\gamma))\Lambda\ actual\_task(i,j,\gamma,\Psi = incapacity\ plan)\Lambda\ communicate\_task(i,\Xi = logical/virtual\ channel, j,\gamma,\chi = non-\text{compliance})\Lambda\ believe\_task(j,ж_{\text{ç}} = trait\ III,i,\gamma,\text{и} = \text{belief})\Lambda\ O(counter\_task(j,(\ (\chi = \text{non}-\text{compliance}\ )\&(\text{и} = \text{belief}))\ \rightarrow \delta'/\delta)\ ))$ (45)

CASEVI: ReceivingAgent j doesnot Trust Performing Agent i nor can Monitor Performing Agent's Activities. Hence Receiving Agent requires an Independent Agent's testimonial regarding Performing Agent's activities

¬trust(i, j, γ, χ=compliance/non-compliance) Λ¬witness(i, j, γ, χ=compliance/non-compliance)ΛO(testify(k, j, i, γ, χ=compliance/non-compliance))Λtrust(j, k, testify(k, j, i, γ, χ=compliance/non-compliance))Λ testify(k, j, i, γ, χ=compliance/non-compliance)→O(counter_task(j, χ&и)) → δ'/δ)) (52)

References

[1]Mayer, R., Davis, J., & Schoorman, F. 1995. An Intergrative Model of Organizational Trust. Academy of Management Review, 20(3): 709-734. .

[2] Gefen, D. 2002. Reflections on the Dimensions of Trust and Trustworthiness among Online Consumers. ACM

[3].Deutsch, M. 1958. Trust and Suspicion. Journal of Conflict Resolution, 2: 265-279

[4]. Rousseau, D., Sitkin, S., Burt, R., & Camerer, C. 1998. Not so different after all: A Cross-discipline view of Trust. Academy of Management Review, 23(3): 393

[5] Costa, P., McCrae, R., & Dye, D. 1991. Facet scales for Agreeableness and Conscientiousness: A revision of the NEO Personality Inventory. Personality and Individual Differences, 12: 887-898.

[6] Goldberg, L. 1990. An Alternative "Description of Personality": The Big-Five Factor Structure. Journal of Personality and Social Psychology, 59(6): 1216-1229.

[7]Indian Banking Fraud Survey 2012: Navigating the Challenging Environment. Deloitte February 2012

[8] Working Group on Information Security, Electronic Banking, Technology Risk Management, Cyber Frauds

[9] Bologna, G. J. & Lindquist, R. J. (1995). Fraud auditing and forensic accounting: new tools and techniques. Wiley Publishers, New York, II edition

[10] Simmons, M. R. Recognizing Elements of Fraud

[11]Wright, G.H.V Deontic Logic Mind, New Series, Vol 60, No 237, (January, 1951), pp 1-15

[12] Meyer, J.J.CH A Different Approach to Deontic Logic:Deontic Logic as a Variant Dynamic Logic

[13] McKnight, D., & Chervany, N. 2002. What Trust Means in E-Commerce Customer Relationships: An Interdisciplinary Conceptual Typology. International Journal of Electronic Commerce, 6(2): 35-59.

[14] Hofstede, G. 1980. Culture's Consequences. Newbury Park, CA: Sage.