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Total Interpretive Structural Modeling (TISM) of the Determinants of Non-performing Assets in India Banking Sector

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Abstract

India, with one of the largest banking networks is currently facing a major problem of mounting non-performing assets (bad loans/stressed assets). In view of the role the banking sector plays in economic growth of the country, it is important to unearth the causal factors and mitigate the risks involved. The study fills a major gap in the literature by identifying the drivers and determinants of NPAs by building a hierarchical model.

The study first identifies the determinants from the existing literature then uses a thematic analysis to identify the major factors. These factors are then used to build a hierarchical structure using Total Interpretive Structural Modeling (TISM).The socio-cultural factors and the internal factors affecting the borrowers are found to be the dependent factors, whereas the economic conditions and the political factors are the major drivers. The study also finds the interlinkages between the environmental conditions, legal framework, internal factors related to respective banks, ownership pattern, adherence to regulatory framework and technological factors.

The study aims to identify the drivers and dependents of the determinants of NPAs which would act as a scaffolding for policy makers as well as bankers. Based on these findings, better instruments and mechanisms for recovery/management of stressed assets can be put in place.

Keywords: Total interpretive structural modelling (TISM), Non-performing assets (NPAs), India, Banking.

Introduction

"Banking is a very treacherous business because you don't realize it is risky until it is too late. It is like calm waters that deliver huge storms" - Nassim Nicholas Taleb(2008)

India's banking system, one of the largest banking networks in the world, has witnessed a dynamic period of growth and reforms over the last two decades. The present banking structure has evolved continuously after liberalization with deregulation of interest rates, dilution of government stake in public sector banks and a monumental increase in the market share of private sector banks.

Banking sector is often referred to as the stimulus for a country's economic growth; it is considered as the backbone of an economy as it enables the process of channelizing funds from the surplusunits sectors to the deficit sectors in the economy. It provides resources to

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capital intensive sectors and acts as a lubricant to the wheels of economic development. Due to this dependence, the overall growth of the economy is highly correlated with the health of the banking industry (ASSOCHAM, 2014).In emerging economies like India, the banksnot only act as agents of financial intermediation but alsoassist in the governments' social programs.

Although the Indian banking industry has expanded considerably in the past, the present status indicates that the problem of credit risk has engulfed the sector. This problem,if not managed and mitigated, may transform into a vicious cycle which will erode the banks net worth. The literature has empirical evidences that the banks have succumbed to mounting NPA pressure that has affected the long-term sustainability and growth. Indianbanks reported 9.20 per cent of its assets as stressed or bad in 2016 (World Bank database). The major reason for this as observed by Rajan (2017)is the way in which these stressed assets are dealt with.The worst way to handle distress assets (NPAs) is to 'extend and pretend', anticipating a 'miracle' to recover such loans or hoping for 'an act of God'.According to Rajan, the public perception about this problem relates to mainly the widespread corruption,irrational exuberance, tolerance for high promoter leverage, slowdown in government permissions, mindset of bankers and lack of instruments for recovery.

Though, there is a plethora of research on the determinants of NPAs both in India and worldwide, the problem still exists. Most of the earlier studies focus on the determinants in isolation ignoring the impact that they may have on each other. This study aims to analyze this problem from a fresh perspective by identifying the interlinkages and dependence among these determinants. The study employs a widely recognized tool, TISM to build a hierarchical structure of the determinants of NPAs,which according to the authors is a pioneering work in this area. The study aims to identify the drivers and dependents that would act as a scaffolding for policy makers as well as bankers. The socio-cultural factors and the internal factors affecting the borrowers are found to be the dependent factors, whereas the economic conditions and the political factors are the major drivers. The study also found the interlinkages between the environmental conditions (natural calamities, floods, famines and earthquakes etc which are important in the Indian context) and the factors influencing banks and borrowers.

The main objectives of the study are

- to identify the determinantsofnon-performing loans; and
- to develop a total interpretive structural model of determinants of non-performing loans in the Indian banking sector.

The structure of the paper is as follows: Section 2 describes the concept of non-performing loans followed by the findings of recentliterature related to the factors influencing non-performing themin the banking sector,nationally as well as globally. Section 3 presents the methodology; identification of factors related to determinants of non-performing loans in the Indian context and describes the research methodology used for development of the model. Section 4 explains the model, Section 5contains the results. Section 6synthesizes the learning and sets out some recommendations for practitioners as well as academics and section 7 concludes.

Literature Review

The decades of 60s and 70s were marked by nationalization of most banks in India and the balance of payments crisis is considered as its major fallout. These events eventually triggered India towards liberalization and a need for remodeling the country's financial system was felt. Narasimham Committee (1991) identified NPAs as one of the possible causes for the malfunctioning of the public sector banks (PSBs). Thus, in order to put a check on the NPA problem, the committee recommended banks to publish the magnitude of NPAs on an annual basis.

What are NPAs?

According to the latest definition by Reserve Bank of India (RBI)(2015), an asset, including a leased asset, becomes non-performing when it ceases to generate income for the bank.

“A non-performing asset (NPA) is a loan or an advance where;

i. interest and/or instalment of principal remain overdue for a ‘specified’ period of more than 90 days in respect of a term loan,

ii. the account remains ‘out of order’, in respect of an Overdraft/Cash Credit (OD/CC),

iii. the bill remains overdue for a period of more than 90 days in the case of bills purchased and discounted,

iv. a loan granted for short duration crops will be treated as NPA if the instalment of principal or interest thereon remains overdue for two crop seasons.

v. a loan granted for long duration crops will be treated as NPA if the instalment of principal or interest thereon remains overdue for one crop season.”

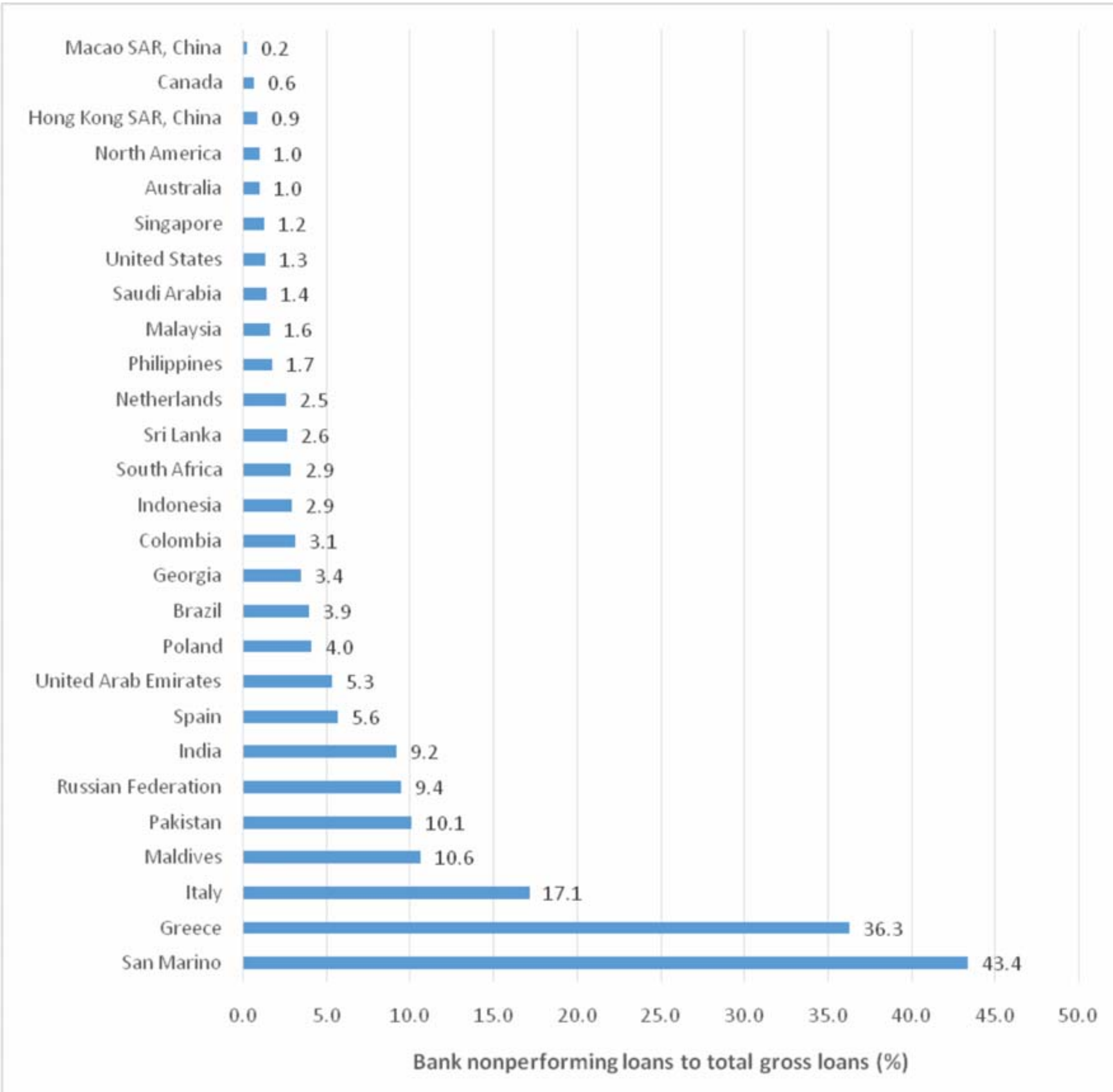
However, this definition has been subject to several amendments in the past;for the year ending 31 March 1993 the ‘specified’ period was four quarters instead of the present 90 days period. Subsequently, this ‘specified’ period was reduced to three quarters in 1994 and two quarters in 1995 in a phased manner. In order to be consistent with the international best practices and to ensure greater transparency, this ‘specified’ period was reduced to 90 days from the year ending March 31, 2004(RBI, 2001).

Categories of NPAs

The Narasimhan Committee (1991) suggested that based on the time period and realisability of the dues on the assets, the banks and financial institutions should classify their assets by compressing the health codes into four broad groups namely Standard assets, sub-standard assets, doubtful assets and loss assets.

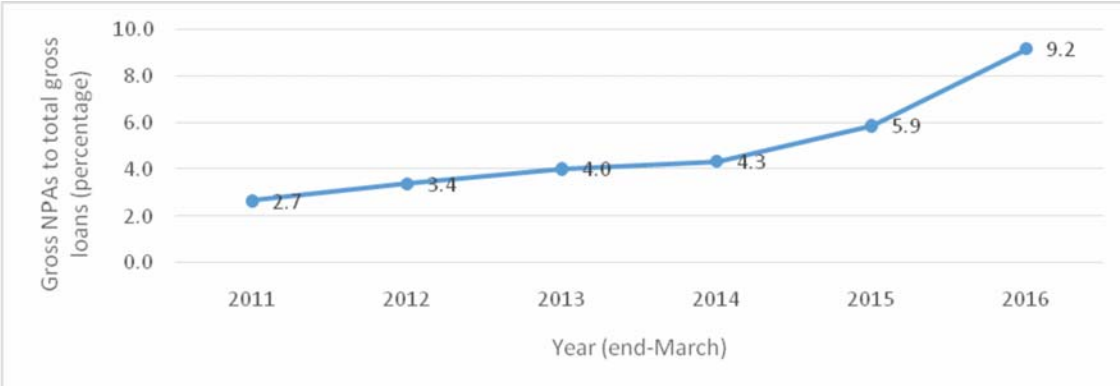
In order to understand the gravity of the problem of NPAs in the Indian banking industry, it is important to understand the global scenario. Since, NPAs gained substantial attention only in the post reform era, it would be useful to look at recent figures rather than adhere to a historical account. According to the recent data by World Bank, San Marino (43.40 per cent) and Greece (36.30 per cent) are most affected by the problem of NPAs. This problem is one of the main reasons behind the low aggregate profitability of European banks. Asset quality issues have been brought to the fore by the global financial crisis (GFC). In the euro area, NPA ratios stood at low or manageable levels prior to the crisis. At the same time, the root cause of NPA is related to structural issues that were further amplified with the start of the financial and economic crisis. In fact, the surge in NPAs further revealed the limited ability of large parts of the euro area banking system to deal with distressed debt (Constâncio, 2017). On the other hand, Canada being the least affected by the problem of NPAs, is rated the best banking system in the world byMoody’s Investors Services for itsfinancial strength and safety. Apart for this, the World Economic Forum has also declared Canada’s banking system the best in the world for seven years running as none of the Canadian bank failed or required a bailout during the GFC (India ranks at 75th position) (Schwab, 2016). India has a net NPA ratio of 9.20 per cent which is moderately high. Figure2 indicates the trend of NPA in the Indian banking industry post the GFC.

Discussion on the trend of NPAs in the Indian banking industry



Source: World Bank database

Figure 1: Trend of NPAs in banking systems globally



Source: World Bank database

Figure 2: Trend of NPAs in the Indian banking industry

The systematic data on NPAs became available for analyzing only in 1998 after the second recommendations of the Narasimhan Committee(Rajeev and Mahesh, 2010). The trend of NPAs in the Indian banking industry is rather alarming and regulatory changes and interventions are thus needed urgently. The NPA levels in 2011 were recorded at 2.70 per cent which have significantly increased to 5.9 per cent in 2015 and subsequently 9.20 per cent in 2016. As on December 2016, these non-performing loans (approx. Rs. 10 lakh crore in value) were almost equivalent to 7 per cent of India's Gross Domestic Product (Ray , 2017). The then, Reserve Bank of India governor, Raghuram Rajan stated that the 'overall economic downturn' was the major cause for the rising NPAs(The Hindu, 2016). Poor project evaluation, extensive project delays, poor monitoring, cost overruns, and the effects of global overcapacity on prices and imports are also some setbacks for asset quality(Rajan, 2016). The growing NPAs are a fallout of the policies to uncover the problem (asset quality review). The banking industry earlier was constrained by collective reluctance to recognize the problem(Rajan, 2017). Now after the constant interference by RBI and implementation of stricter regulatory norms of Basel, the problem has been uncovered and eventually will be mitigated by due diligence and proper mechanisms/ instruments to deal with distress.

The fifteenth edition of RBI's biannual Financial Stability Report (RBI, 2017)has cautioned that the gross bad loan ratio of Indian banks which was 9.60 per cent in March 2017 will rise to 10.20 per cent of the total loan book in March 2018. In the disclosures in March 2017, banks reported very high ratios of gross NPLs to its total lending. Indian Overseas Bank being the worst at 22.39 per cent followed by IDBI Bank at 21.25 per cent, Central Bank at 17.81 per cent, Bank of India at 13.22 per cent, Punjab National Bank with 12.53 per cent, Oriental Bank with 13.73 per cent, Dena Bank with 16.27 per cent and so on (Economic Times, 2017).

Drivers of NPAs: A historical perspective

The commonly used PESTLE framework (political, economic, social, technological, legal and environmental) to evaluate the NPA problem has undergone structural changes due to the dynamic nature of the banking system and the environment it functions in. After the reforms of 1991, the rapid pace of globalization and the advances in the information technology industry has induced economic integration and interdependence amongst nations and their banking sectors.

In the literature, there are plethora of studies about the problem of NPAs (also referred as bad loans/ stressed loans and NPLs). This section represents a synthesized view of some of the significant researches to develop insights about the drivers/determinants of NPLs across the world. Reddy (2004) examined the issues related to the terms of credit in the Indian banking industry and considered banks' lending policy as an important driver of NPAs at banks. He also pointed out that default cannot be clearly classified as a rational decision. In fact, a probabilistic assessment of costs and benefits is done by the defaulter. Mohan (2003) conceived the term 'lazy banking' while reflecting critically on banks' investment portfolio and its lending policy, further in Mohan (2004) emphasis was placed on terms of credit such as maturity and interest. These two studies provided the factor (banks' lending policy) that is well accepted in the literature globally (McGoven (1993); Meacci (1996); Bloem and Goerter(2001)).

The seminal study byReddy (2004) observed a number of critical issues related to the credit delivery mechanism in the banking system of India. The work focused on terms of credit (interest), risk management approaches and management of portfolio. In the past the credit system of India was based on three pillars namely, fixing the interest rates as well as quantum of credit, emphasizing on collateral, and specifying the end-use of credit. In the recent period, it is observed that fixing the rates of interest and quantum of credit has been done away with. The study also emphasized the issue of collateral lending specifically in the service sector.

Furthermore, in the context of NPAs with regards to the lending to the priority sector, there may be a marginal difference between the loan given to the two categories of borrowers (priority and private). The study also suggested that lending should be based on sound financial and economic decisions rather than any conventional system. Meacci (1996) in a study of Italian banks observed that the riskiness of an asset is strongly rooted in the bank's lending policy which can be further adduced to the inadequate scrutiny of sectoral prospects.

The study by Mohan (2004) stressed that public sector banks had a relatively higher interest rate spread along with lower rate of returns, reflecting higher costs of operations. The study also mentioned that asset quality was poor coupled with higher loan loss provisions. Thus, operating costs and inefficiency at the bank is recognized as a one of the determinants of NPAs at bank. In the context of Indian banking, Rajaraman and Vasistha (2002) provided empirical evidence of a significant bivariate relationship between the problem of bad loans in the public sector banks and operating inefficiencies.

Another important aspect covered by the literature is that of tenure of funds provided by the bank in terms of loans or investments. The deposit liabilities of a bank often have a relatively shorter maturity than its assets (i.e., loans and other lending); which in-turn induces the problem of asset liability mismatch (Ranjan and Dhal, 2003).

Muniappan (2002) observed various internal and external factors related to the borrowers.The internal factors confronting the borrowers such as diversification of the loan amount for expansion or modernization, taking up new opportunities or projects, time overruns, cost overruns during any stage of the project, business failures (product failures), inefficiency in management, weak or stressed labour relations, inappropriate technology or obsolescence etc.

The external factors are similar to systematic risks such as economic slowdown, recession, non-payment by other countries, power shortage, price escalation, natural calamities etc. On the other hand, Das and Ghosh (2003) stated the facts from the lenders' perspective. Their study empirically examined NPAs of public sector banks in India with regards to the asset size, credit growth, operating efficiency and various other macroeconomic conditions.

In a study of US banks, McGoven (1993)argued that a behavioral aspect, 'character' was a major determinant in lending decisions. The study suggested that the banker must consider the following aspects through personal interactions and establish an accurate personality-morale profile of the prospective borrowers and guarantors. The aspects such as staff morale, loyalty, historic credit reports from current and previous bankers, trade-credit reference check through market interaction, stress management etc. However, in the current time period, the banks are much more technological advanced and use sophisticated tools such as CIBIL scores, for assessing the borrowers' credit capacity. It is important to note that the use of CIBIL score is still in a nascent stage.

Bloem and Goerter (2001) reported that it is likely that NPAs are caused by a number of 'wrong economic decisions' by individuals and sometimes even by 'badluck' (uncertainweather conditions, unexpected price change*etc.*). The study suggested that the businesses can mitigate or hedge the risk by making provisions and taking insurance; the cost of which is borne by the customers. Similarly, the financial institutions include risk premium of uncertainty in the interest rate while lending.

In a study of Chilean credit market, Fuentes and Maquieira (1998) examined different factors that affect the loan repayment. The empirical analysis suggested limitations in accessing credit, macroeconomic stability, information sharing, techniques of collection, bankruptcy code, judicialsystem, prescreening mechanism and major changes in the financial market regulations as the important determinants. In another study, the same authors(Fuentes and Maquieira, 2003)analysed time series data (1960-97) of Chilean banks and concluded that information sharing, deep financial market liberalization and other legal reforms were important aspects of the credit market developments.

De Lis, Pagés and Saurina (2001) emphasized the role of GDP growth rate, debt-equity ratio of the borrowing firms, market regulation structure, loan growth, growth rate of bank branches, bank size, collateral loans, net interest margins, market power and capital-asset ratio as indicators of bank loan losses (NPAs).

After the GFC new variables for explaining the problem of NPAs have emerged in the literature. For instance, Misra and Dhal (2010) focused on business cycles for investigating the NPA problem. De Bock and Demyanets (2012) opined that 'herd behaviour' of bank managers;leniency during the economic booms phase can deteriorate the credit standards. Another study byAggarwal and Mittal (2012), ascribed improper selection of borrowers' activities, weak appraisal system of credit, industrial problems, management inefficiencies, inadequate credit management, monitoring and follow up, natural calamities and other uncertainties. Lokare (2014)investigated the macro-financial linkages of the asset quality phenomenon. The main factors used in the study were credit growth, GDP growth and interest rate cycles, inflation, asset prices and world GDP growth.

From the literature reviewed above, it can be synthesized that there is a plethora of literature regarding the factors or variables that are likely the determinants of NPAs. However, studies lack focus on the possible links between these variables. Thus, in this study, the authors attempt to overcome this serious limitation by structuring the existing knowledge from the literature; by classifying the factors as drivers and dependent. The study enables to understand the interaction between the leading and lagging indicators and further builds a model using a structural technique to identify linkages; direct as well as transitive between these variables by taking opinions from the experts in this domain.

Methodology

TISM Concept

The philosophical basis for the development of the Interpretive Structural Modeling (ISM) approach(Warfield, 1973c) and the conceptual and analytical details of the ISM process (Warfield

(1974a); Warfield (1976); Warfield (1994) and Warfield (1999)) are applied widely by many authors. The Total Interpretive Structural Modeling (TISM) technique (Sushil, 2012) is an innovative extension to the widely accepted ISM technique. In this technique, weakly articulated mental models are transformed into systematic forms. Importantly, the technique does not add any new information to the existing pool of knowledge, but enables in developing a hierarchical structure of the variables. The TISM technique uses systematic iterative application of graph theory to interpret embedded objects; resulting in a directed graph for the complex system amongst the set of variables. Due to the value addition and its simplicity this technique has been widely used in different fields of research including Nasim (2011); Prasad and Suri (2011);Wasuja et al. (2012), Srivastava and Sushil (2013); Sahdev et al. (2014);Yadav and Sushil (2014); Jena et al. (2016). In fact another extension of TISM, 'fuzzy TISM' has also been used in the literature by Khatwani et al. (2015) andMohanty and Shankar(2017).

In the literature, three main techniques, namely Interpretive Structural Modeling (ISM), Analytic Network Process (ANP) and Analytic Hierarchy Process (AHP) are used for modeling and multi criteria decision making (MCDM) in different areas. Structural models can be developed to identify the relationship between the variables of interest which help in understanding the structure of the system better. Keeping this in mind, the TISM methodology has been adopted here as it not only allows for developing hierarchy and links, but also provides the interpretation of these links.

Identification of factors causing non-performing assets

Despite identifying the factors related to non-performing loans from the literature, semi-structured interview with the senior level bank officials are conducted to understand the factors from the practitioners' viewpoint. For this study, thematic content analysis is used which is a qualitative data analysis method. It is a method for "identifying, analysing and reporting themes within data" (Braun and Clarke, 2006). The themes generated from the analysis are treated as factors influencing the non-performing loans. The thematic analysis led to the identification of the following factors:

TISM development

An ISM enables in interpreting the links in terms of the contextual relationship between each pair of factor, and also the direction of their relationship. However, there is a need to further interpret the reason behind these links. TISM makes this possible for the researchers by answering "why" a certain link exists.

TISM (modified) methodology

The TISM technique adopts almost all central steps of ISM, i.e. reachability matrix and its partitions. The modified TISM addresses the challenge of a large number of pair comparisons and cumbersome transitivity checks on the reachability matrix. The nine-step process of TISM is briefly presented below.

Step I: Identify and define elements

The elements for modelling in the study are the factors related to the non-performing assets and are identified through literature review and classified into themes using a semi-structured interview with experts.

Step II: Define contextual relationship

To develop the structure, it is important to define the contextual relationship between the variables/ factors of interest. Here, the relationship identified between the factors is attribute enhancement, i.e, "Factor A will influence or enhance Factor B"

Factor Code	Factor Description	Evidence from literature
C1	Political factors such as political instability, trade restrictions, priority sector lending, frequent transfers of officials, corruption etc.	Rajanand Dhal (2003), Bhide et al. (2003), Das and Ghosh (2002), Breuer (2006)
C2	Environmental conditions such as natural calamities; floods, earthquake, droughts, etc.	Rajanand Dhal (2003), Bhide et al. (2003), Das and Ghosh (2002), Muniappan (2002).
C3	Ownership pattern that is, whether the bank is publicly owned, privately owned, a subsidiary of a foreign bank etc.	Hu et al. (2004), Micco et al. (2007), Salas and Saurina (2002)
C4	Economic factors such as inflation, GDP, exchange rates; which influence the spending habits of individuals/corporates. Other globalization induced factors such as liberalization and deregulations.	Rajanand Dhal (2003), Bhide et al. (2003), Das and Ghosh (2002), Muniappan (2002), Ghosh (2015), Bercoff et al. (2002), Altman et al. (2001), Thiagarajan et al. (2011), Louzis et al.(2012), Cifteret al. (2009), Nkusu (2011), Hofmann et al. (2006), Beck et al. (201 3), Breuer (2006) and Laryea et al. (2016)
C5	Socio-cultural factors mainly the underlying behavior and attitude of customers such as diversion of funds, helping/promoting other concerns, incalcitrant attitudes, willful defaults and unethical means of obtaining loans	Rajanand Dhal (2003), Bhide, et al. (2003), Das and Ghosh (2002), Reddy (2004), Gibson and Tsakalotos (1992), Breuer (2006)
C6	Internal factors related to respective banks such as inefficiency in management, insufficient monitoring and follow up, unethical practices in sanction of loans, lack of infrastructural facilities at the banks such as power supply and computerization, lending terms of credits, maturity, interest ra tes, collateralized lending, allowance of moratorium periods.	RajaramanandVasishtha (2002), Ghosh (2003), McGoven (1998), Thiagarajan et al. (2011), Louzis et al. (2012), Podpi era and Weill (2008), Larye et al. (2016), Reddy (2004), Mohan (2003, 2004), Meacci (1996), BloemandGorters (2001), Misraand Dhal (2010), Louzis et al. (2012), Bofondi and Ropele (2011), Beck et al. (2013)
C7	Technological factors which enable rapid exchange of information, creation of new products and reduction in transaction costs thus contributing to enhanced operational efficiency.	Rajanand Dhal (2003),Bhide et al. (2003), Das and Ghosh (2002)
C8	Internal factors confronting borrowers such as time and cost over runs of projects, business/ product failure, inefficient management, strained labor relations	Muniappan (2002), BloemandGorter (2001)
C9	Legal aspects such as bankruptcy norms, legal recourse, measures in the area of debt recovery, securitization, asset reconstruction, resolution of default, amendments in archaic laws, legislative laws.	Rajanand Dhal (2003), Bhide et al. (2003), Das and Ghosh (2002), Fuentes andMaquieira (2003), Breuer (2006)
C10	Lack of institutional framework adopting to international best practices pertaining to prudential regulation and supervision.	Misraand Dhal (2010), Klomp and de Haan (2014), Agoraki et al. (2011), Boudriga et al. (2009), Avijit (2015)

An example may be “Political factors will influence or enhance legal factors”.

Step III: Interpretation of relationship

This step gives TISM an edge over traditional ISM, as the former seeks an interpretation of the relationships. In this study, the contextual interpretation is “In what way will factor A influence or enhance factor B?”. This will help to achieve an in-depth knowledge explicitly.

Step IV: Interpretive logic of pair-wise comparison

An “Interpretive Logic-Knowledge Base” is generated for pair-wise comparison of the elements; each comparison may be answered by a Yes (Y) or No (N). If the answer is Y, further interpretation is necessary. The total number of pair-wise comparisons is (10* 9)/2 = 45, and the total number of rows is 10*9 = 90 for the factors.

Step V: Reachability matrix and transitivity check

The reachability matrix for the elements is prepared by writing 1 for the statements answered in Y and 0 if answered in N from the interpretive logic-knowledge base of the previous step.

This matrix is further checked for the transitivity rule (if A->B and B->C, then A->C). The knowledge base is updated as Y, in case a transitive link is obtained and “transitive” is mentioned against it in the interpretation column along with the meaningful reason (if any).

The final reachability matrix is obtained when no further transitive links are possible, shown in Annexure 2.

Step VI: Level partition on reachability matrix

Level partitioning is carried out similar to the ISM methodology. This provides levels to all the elements, shown in Annexure 5.

Step VII: Developing digraph

The elements are portrayed in the form of a directed graph, where the elements are arranged according to the levels, and relationships are portrayed from the reachability matrix. Those transitive links whose interpretation is crucial, are retained.

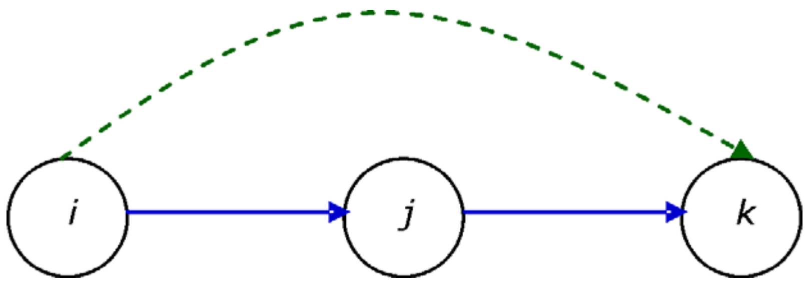
Step VIII: Interaction matrix

A binary matrix is developed by translating the final digraph using 1 to indicate direct and significant transitive links. It is further developed as an interpretive matrix by providing the relevant interpretation from the knowledge base, shown in Annexure 3 and 4.

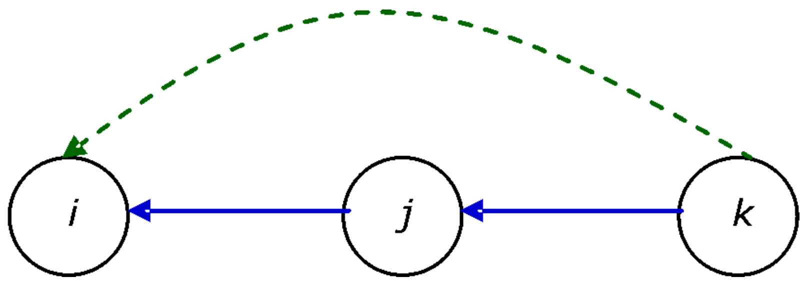
Step IX: Total interpretive structural model

The connective information from the digraph and interpretations from the interaction matrix are used to develop the TISM. The nodes in the digraph are replaced by interpretations provided in the interaction matrix. The TISM model for factors related to non-performing loans is shown in Figure 4.

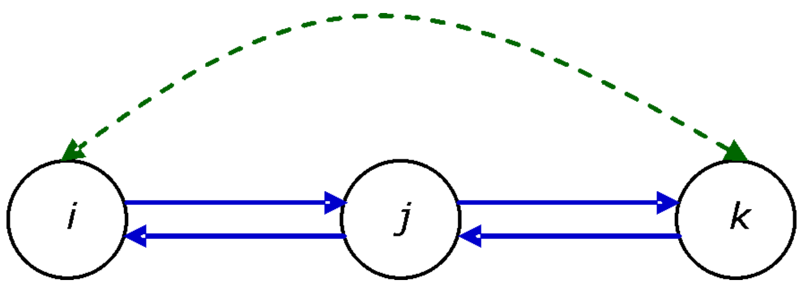
However, in the modified TISM approach (Sushil, 2017), the fourth and fifth steps are performed simultaneously; others steps remaining the same. The TISM approach has n(n-1)/2 i.e, (10*9)/2 paired comparisons. The modified approach reduces these paired comparisons significantly as transitivity checks are done in a sequential manner simultaneously; reducing duplication and redundancies. For instance,



a. Forward transitive relation *i-k*



b Backward transitive relation *k-i*



c Both way transitive relationship *i=k*

Figures (a), (b) and (c) are examples of transitive relationships that are forward, backward and both ways, respectively. In (a), had there been no link (that is, expert answered with a 'N') between *i to j,* the expert need not comment on the link between *i to k.* In (b), if there is no link between *k to j,* the expert does not have to respond to redundant link of *k to i.* In (c), if there is a both way relation between *i to j* and *j to k,* then it shows that there will exist a transitive link between *i to k* and *k to i.*

The correctness of the model is rechecked by applying the measures suggested by Sushil (2016).

Model

TISM framework of the determinants of NPAs in the Indian banking industry

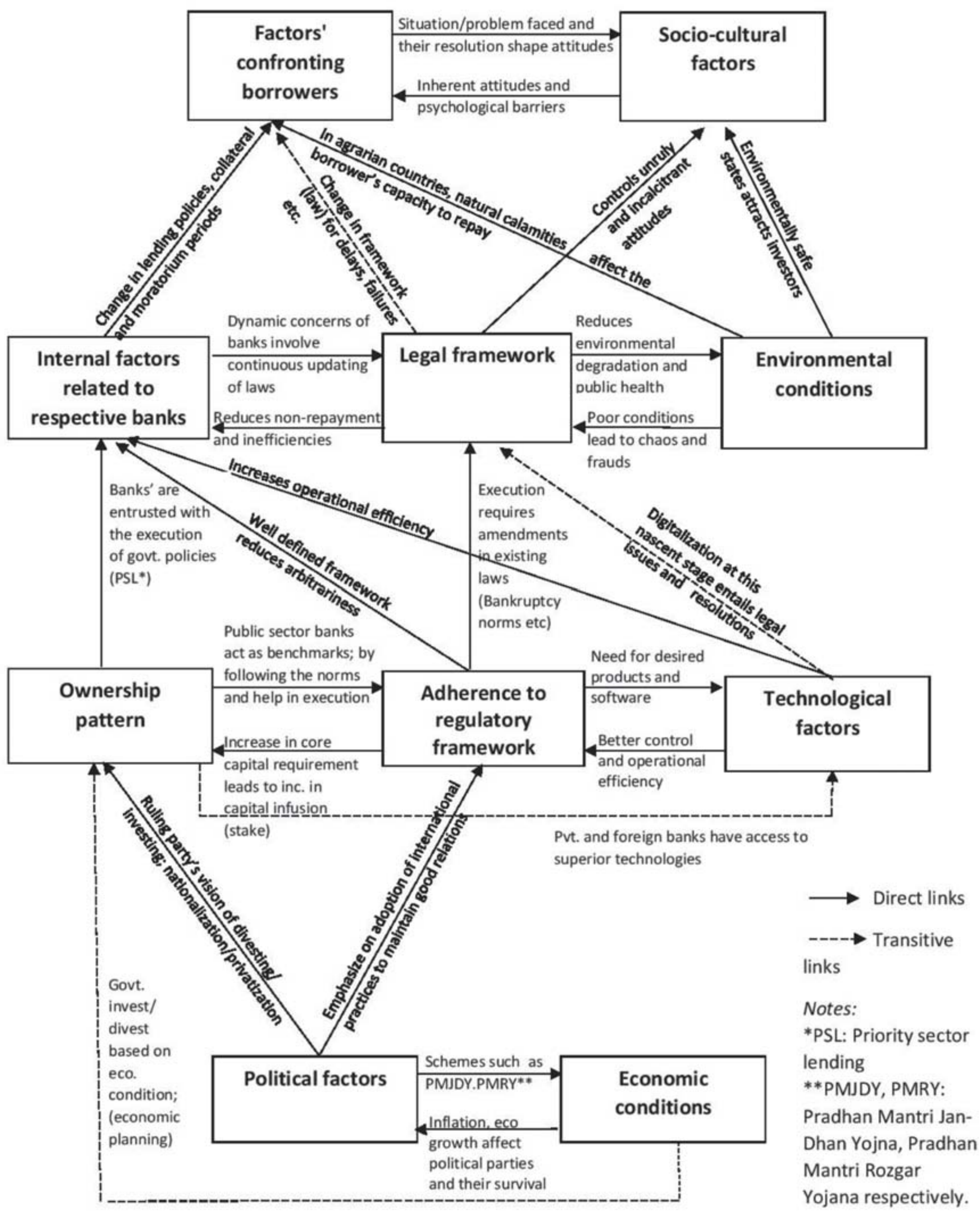


Figure 4: TISM framework of determinants of NPAs in the Indian banking industry

Results

Political factors (political instability, trade restrictions, priority sector lending, frequent transfers of officials) and economic conditions (inflation, exchange rates, unemployment, which influence the spending habits of individuals/corporates and other globalisation induced factors such as liberalisation and deregulations) are the main drivers of NPAs in the Indian banking industry.The two factors are related to each other; conditions of higher inflation rates among others affect the growth and survival of political parties. For instance, the current government's party manifesto before the elections stated that the party would set up Price Stabilisation Fund to keep inflation in control and pursue banking sector reforms to deal with the concerns of NPAs (Times of India, 2014). Relatedly, political factors viz schemes introduced by the parties such as PMJDY (Pradhan Mantri Jan DhanYojna) and PMRY(Pradhan MantriRozgarYojana) enhance job opportunities, financial inclusion, prosperity and economic growth (Govt. of India website, 2016).

The ruling party's vision and roadmap for development with regards to nationalization or privatization plays a key role in changing the ownership patterns of banks(Sen, 2016).The ownership pattern enhances the adherence to the regulatory framework. As adherence to Basel framework increases, the banks have to increase their tier 1 equity capital. However, most PSBs have to rely on external infusion as they cannot generate capital internally, largely due to their deteriorating asset quality. The government will thus infuse seventy thousand crores in PSBs over 2016-19, thus increasing its stake (Philip, 2016) .The ownership pattern also impacts the internal factors related to respective banks, as generally PSBs are entrusted with the execution of the public policies(Singh, 2016). These are passed on to the borrowers through subsidized interest rates, tenure, collaterals and moratorium periods.

Adherence to regulatory framework acts on twin fronts by enhancing the existing legal framework (through amendments and inclusion of new laws) and upgradation of technology (continuous need for new products and software). A well-defined framework reduces chances of arbitrariness. On the other hand, technological innovation increases digitalization and online maintenance of records, enhancing adherence to regulatory framework and increasing the operational efficiency at banks. Albeit, it is at a nascent stage and requires resolution of various entailed legal issues.

The factors confronting borrowers such as cost/time over run, obsolete technology/products, diversion of funds,etc, change and reshape the attitudes and psychologyof the people which enhances their socio-cultural attitudes. On the other hand, the socio-cultural factors define the inherent attitudes and psychological barriers determine their business choices and risk taking behavior. Environmental conditions also play an important role in shaping the attitudes of people; a condition of drought, flood or earthquake and the steps taken by the government has an important role in changing the behavioral dynamics(Cameron and Shah, 2015). These environmental conditions are also responsible for inability of farmers (especially) to repay their debts. The agricultural households of south India are the most indebted, exacerbated by additional loans taken to meet health issues. This diversion of funds diminishes their ability to invest in farming(Saha, 2017). In this regard, the RBI has allowed state and district level banks to take a tolerant view on rescheduling of loans if crop loss is 33 per cent or more apart from the government which has increased the target of agricultural credit from Rs 9 lakh crore to Rs10 lakh crore in budget 2017-18 (Rajagopal, 2017).

Managerial implications

The study has identified the interlinkages between the factors. Based on these relations and interlinkages, better instruments and mechanisms for distress recovery can be put in place. It would enable the regulators to introduce corrective actions at the weak links which will enable a smooth execution of regulatory reforms and policies to check stressed assets timely.

Conclusion

This study highlights the interactions and interplay among the determinants of non-performing assets in the Indian banking sector. The hierarchical structures presented in the TISM portray the leading and lagging relationships among different factors. The study contributes to the knowledge of management by determining various factors, their interplay and inter-relationships, which will determine how the Indian banking industry will shape itself in coming times. From a methodological perspective, the study showcases the application of multiple methods combining qualitative and quantitative research tools and thus, it illustrates a mechanism that may be used to conduct exploratory study in the researcher's area of interest. The study can be further replicated in different contexts to examine the driver-dependent relationships among the variables of interest. Thus, the study can be viewed as a significant step in research related to Indian banking industry's most important problem in the current time period.

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Annexures

Annexure 1: Development of the TISM framework
Initial reachability matrix with direct links

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	1	0	1	1	0	0	0	0	0	1
C2	0	1	0	0	1	0	0	1	1	0
C3	0	0	1	0	0	1	0	0	0	1
C4	1	0	0	1	0	0	0	0	0	0
C5	0	0	0	0	1	0	0	1	0	0
C6	0	0	0	0	0	1	0	1	1	0
C7	0	0	0	0	0	1	1	0	0	1
C8	0	0	0	0	1	0	0	1	0	0
C9	0	1	0	0	1	1	0	0	1	0
C10	0	0	1	0	0	1	1	0	1	1

Annexure 2: Reachability matrix with direct and transitive links

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	
C1	1	0	1	1	0	1*	1*	0	1*	1
C2	0	1	0	0	1	1*	0	1	1	0
C3	0	0	1	0	0	1	1*	1*	1*	1
C4	1	0	1*	1	0	0	0	0	0	1*
C5	0	0	0	0	1	0	0	1	0	0
C6	0	1*	0	0	1*	1	0	1	1	0
C7	0	0	1*	0	0	1	1	0	1*	1
C8	0	0	0	0	1	0	0	1	0	0
C9	0	1	0	0	1	1	0	1*	1	0
C10	0	1*	1	0	1*	1	1	0	1	1

Annexure 3: Interaction matrix (binary)

	Political factor	Environmental condition	Ownership pattern	Economic factors	Socio-cultural factor	Factors related to respective banks	Technological factors	Factors confronting borrower	Legal aspects	Adherence to regulatory framework
Political factors	X	0	1	1	0	1	1	0	1	1
Environmental conditions	0	X	0	0	1	1	0	1	1	0
Ownership pattern	0	0	X	0	0	1	1	1	1	1
Economic factors	1	0	1	X	0	0	0	0	0	0
Socio-cultural factors	0	0	0	0	X	0	0	1	0	0
Factors related to respective banks	0	1	0	0	1	X	0	1	1	0
Technological factors	0	0	1	0	0	1	X	0	1	1
Factors confronting borrowers	0	0	0	0	1	0	0	X	0	0
Legal aspects	0	1	0	0	1	1	0	1	X	0
Adherence to regulatory framework	0	1	1	0	1	1	1	0	1	X

Annexure 4: Interaction matrix (interpretive matrix)

	Political factors	Environmental condition	Ownership pattern	Economic factors	Socio-cultural factors	Factors related to respective banks	Technological factors	Factors confronting borrowers	Legal aspects	Adherence to regulatory framework
Political factors	X	0	Ruling party's vision	Schemes such PMJDY,PMRY**	0	1	1	0	1	Emphasize to maintain good relations
Environmental conditions	0	x	0	0	Attracts investors	1	0	Natural calamities affect capacity to repay	Poor conditions lead to chaos and frauds	0
Ownership pattern	0	0	X	0	0	Execution of govt. policies (PSL*)	Pvt. and foreign banks have access to superior technology	1	1	PSBs act as benchmarks; by following the norms
Economic factors	Inflation, etc. affect poli tical parties	0	Economic planning	X	0	0	0	0	0	1
Socio-cultural factors	0	0	0	0	X	0	0	Inherent attitudes and psychological barriers	0	0
Factors related to respective banks	0	1	0	0	1	X	0	Lending policies, collateral,moratorium periods	Concerns involve continuous updating of laws	0
Technological factors	0	0	1	0	0	Operational efficiency	X	0	Digitalization entails legal issues and resolutions	Better control and operational efficiency
Factors confronting borrowers	0	0	0	0	Problem faced shape attitudes	0	0	X	0	0
Legal aspects	0	Reduces environmental degradation	0	0	Controls unruly and incalcitrant attitudes	Reduces non-repayment and inefficiencies	0	Change in framework (law) for delays, failures etc.	X	0
Adherence to regulatory framework	0	1	Increase in core capital leads to inc. in capital infusion	0	1	Well defined framework reduces arbitrarines	Need for desired products and software	0	Execution requires amendments in laws (Bankruptcy	X

Annexure 5: Partitioning the reachability matrix into different levels

Iteration 1

Variables	Reachability set	Antecedent set	Intersection set	Level
C1	1,3,4,6,7,9,10	1,4	1,4	
C2	2,5,6,8,9	2,6,9,10	2,6,9	
C3	3,6,7,8,9,10	1,3,4,7,10	3,7,10	
C4	1,3,4,10	1,4	1,4	
C5	5,8	2,5,6,8,9,10	5,8	Level I
C6	2,5,6,8,9	1,2,3,6,7,9,10	2,6,9	
C7	3,6,7,9,10	1,3,7,10	3,7,10	
C8	5,8	2,3,5,6,8,9	5,8	Level I
C9	2,5,6,8,9	1,2,3,6,7,9,10	2,6,9	
C10	2,3,5,6,7,9,10	1,3,4,7,10	3,7,10	

Iteration 2

Variables	Reachability set	Antecedent set	Intersection set	Level
C1	1,3,4,6,7,9,10	1,4	1,4	
C2	2,6,9	2,6,9,10	2,6,9	Level II
C3	3,6,7,9,10	1,3,4,7,10	3,7,10	
C4	1,3,4,10	1,4	1,4	
C6	2,6,9	1,2,3,6,7,9,10	2,6,9	Level II
C7	3,6,7,9,10	1,3,7,10	3,7,10	
C9	2,6,9	1,2,3,6,7,9,10	2,6,9	Level II
C10	2,3,6,7,9,10	1,3,4,7,10	3,7,10	

Iteration 3

Variables	Reachability set	Antecedent set	Intersection set	Level
C1	1,3,4,7,10	1,4	1,4	
C3	3,7,10	1,3,4,7,10	3,7,10	Level III
C4	1,3,4,10	1,4	1,4	
C7	3,7,10	1,3,7,10	3,7,10	Level III
C10	3,7,10	1,3,4,7,10	3,7,10	Level III

Iteration 4

Variables	Reachability set	Antecedent set	Intersection set	Level
C1	1,4	1,4	1,4	Level IV
C4	1,4	1,4	1,4	Level IV