

An ISM-MICMAC Based Approach to Analyze Cloud Computing Adoption in Organizations

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Abstract: Cloud computing adoption in any business organization, represents a complex system which can be characterized as having a large number of subsystems like legacy information technology infrastructure, the new information technology architecture being created owing to cloud adoption, the techno-managerial complexity of managing infrastructure of disparate information architectures, integration of legacy architecture with new cloud architecture, managing the emergent distributed and software system, database management and manpower planning in terms of skill orientation in view of cloud adoption. In addition to the complexities of cloud adoption, the trade-offs like security vs. scalability, control vs. agility, standardizations vs. lock-ins, puts cloud computing adoption in “pluralist” category in relationship continuum, where stakeholder have contradictory view point about a problem situation. Therefore, cloud adoption in any organization represents an unclear and complex situation with poorly articulated interactions amongst associated elements, which needs to be well-defined to understand the process of cloud adoption and its impact on adopting organization.

Keywords: Cloud computing, Cloud adoption, ISM, MICMAC analysis.

I. INTRODUCTION

Cloud Computing conceptualizes delivering traditional information technology facilities as

commoditized services, similar to deliverance model of utilities such as water, electricity, gas etc.; where the users of cloud computing utilizes the information technology facilities as end user and are being billed for the usage of that service. This concept of cloud computing as commoditized service, is an extension of utility computing vision, which represents new scenario of how information technology (IT) services are developed, deployed, scaled, updated, maintained and procured (Buyya *et al.*, 2008) [1].

Cloud computing adoption enables ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell and Grance, 2011) [2]. This feature of cloud computing represents a convergence of two major trends; firstly the ability of contemporary computers being employed efficiently through highly scalable hardware and software resources, and, secondly business agility where information technology act as a competitive tool through fast preparation, parallel execution, use of compute-intensive business analytics that respond in real time to user necessities (Marston *et al.*, 2011) [3].

A firm’s migration towards cloud computing begins with the consolidation of server, storage, and network resources, that works to control redundancy, decrease wasted space, and increase equipment usage [4]. Hardware such as servers, storage

devices, and other components are treated as a pool of resources rather than a discrete system, thereby allowing the allocation of resources on demand [5]. Virtualization forms a solid foundation for all cloud architectures. It enables the abstraction and aggregation of all data resources, thereby creating a unified resource that can be shared by all the information technology application. Automation optimizes a firm's virtualized resources, through a transformative procedure and critical information technology processes become more dynamic and flexible management is achieved by trustworthy policies. In addition to automation, utility which include both self-service and metering, and provide feedback about the cost of the resources allocated, is necessary requirements in creating a cloud service.

A cloud infrastructure consists of hardware and software that are necessary to support the cloud services being provided [4], [5]. The hardware resources are typically server, storage and network components and also referred as physical layer. The abstraction layer consists of the software deployed across the physical layer to manifests the essential cloud characteristics and sits above the physical layer (Meel and Grance, 2011). Through cloud internetworking, disparate cloud systems can be linked in such a way, so as to accommodate both the unique nature of cloud computing and the running of legacy information technology workloads.

Cloud computing adoption in any organization, represents a complex system which can be characterized as having a large number of subsystems like legacy information technology infrastructure, the new information technology architecture being created owing to cloud adoption, the techno-managerial complexity of managing infrastructure of disparate information architectures, integration of legacy architecture with new cloud architecture, managing the emergent distributed and software system, database management and manpower planning in terms of skill orientation in view of cloud adoption. As organization looks to adopt cloud computing, the adoption process will stimulate many loosely structured interactions amongst these subsystems, the outcome of which is not predetermined.

Along with the above discussed complexities of cloud adoption, the trade-offs like security vs. scalability, control vs. agility, and standardizations vs. lock-ins [6], [7]; gives rise to a situation where basic interests of cloud service provider and adopting organization are compatible i.e. to adopt cloud offerings; but they do not share the same values and beliefs. Therefore, cloud adoption in any organization represents an unclear and complex situation with poorly articulated interactions amongst associated elements, which needs to be well-defined to understand the process of cloud adoption and its impact on adopting organization.

Interpretive structural modelling, which is defined as the process that transforms unclear and poorly articulated mental models into visible well defined models useful for many purposes (Satsangi, 1985); and enables intervention in ill-structured problem situations by providing a hierarchical model of the associated elements with reduced complexities under the given contextual relationship, to allow holistic understanding of the problem situation, becomes an ideal technique to analyse cloud adoption in business organization.

II. LITERATURE REVIEW

The review discourse on cloud computing can primarily be divided into two broad category technological and business issue [8]. Technological review discourse contemplates cloud computing in performance subcategory, which includes studies such as performance comparisons across different clouds (Iosup *et al.*, 2011), to improve dynamic resource allocation (Streitberger and Eymann, 2009; Warneke and Kao, 2011), to estimate performance of cloud network with nodes failure (Lin and Chang, 2011), and to improve interoperability across different clouds [9]. Data Management which includes data consistency (Vogels, 2009), data redundancy (Pamies-Juarez *et al.*, 2011), data mining algorithms and methods (Grossman *et al.*, 2010), integration of distributed data (Chen *et al.*, 2011), data encryption (Anthes, 2010), data colouring. Service Management focusing on service lifecycle in the cloud (Breiter and Behrendt, 2009) and publishing, discovering, and selecting

cloud-based services (Goscinski *et al.*, 2011) [10]. Security, which includes articles that look at general security mechanisms such as restrictions and audits (Spring, 2011a; Wang *et al.*, 2011), multi-tenancy authorization (Calero *et al.*, 2010), third-party assurance (Zissis and Lekkas, 2010), and cloud-based security services (Li *et al.*, 2011) [11]. Business Issues which includes cost comparison between the cost of leasing cloud services and that of purchasing and using a local server cluster (Walker, 2009), techniques to estimate and monitor costs for cloud services (Truong and Dustdar, 2010), algorithms for finding minimum cost storage strategy (Yuan *et al.*, 2011) [12]; Pricing, articles in this subcategory mainly focus on the pricing strategies of cloud providers. A common approach for studying this topic is to compare different pricing strategies and analyze the pros and cons in terms of acceptance of customers. Legal Issues, which examines legal issues associated with cloud computing including policy, governance, and law (Kaufman, 2009), general legal risks of adopting cloud computing (Joint *et al.*, 2009), as well as addressing specific topics such as digital forensic investigation in cloud computing systems (Taylor *et al.*, 2010) [13]. Adoption, this subcategory explores topics related to cloud-computing adoption in businesses including general businesses by providing ROI (Return on Investment) models for firms to decide on the suitability of adopting cloud computing (Misra and Mondal, 2011).

The review of published journal articles indicates that most studies empirically evaluate the general concept of cloud computing adoption like performance, cost, security, cloud providers, and, are the most frequently used to explain cloud computing adoption factors and processes. Although empirically tested theories/frameworks/models are dominant in existing literature on cloud adoption, but majority of articles have adopted some form of theoretical perspectives to gain insights about cloud computing adoption factors and processes, and, then adopted empirical methods to establish some facts and figure about cloud adoption. The emphasis on theoretical aspects to understand cloud adoption implies that cloud computing adoption phenomenon is multifaceted and requires further exploration to understand the relationship and influence amongst

factor which influence cloud adoption.

III. RESEARCH OBJECTIVE

Objective 1: To identify integrated elements for implementation of Cloud Computing.

Objective 2: To develop a hierarchical structural model under relevant contextual relations of the identified elements.

IV. RESEARCH METHODOLOGY

In the present research, interactive management (IM) technique of system sciences have been deployed. IM process has three phases, the Planning Phase, the Workshop Phase, and the Follow-up Phase. Planning Phase consists of two steps; namely the information gathering phase and expert identification phase. Information gathering phase was executed by researcher in the through extensive review of Literature to find established factors impacting cloud computing adoption in business organization. In the expert identifications phase, experts from academia and industry were identified and contacted to get their insights about the problem statement. The workshop phase was performed through a series of workshop, brainstorming sessions and focused group discussions.

A. Research Design

Phase 1 - Identifying Integrated Elements for Cloud Computing Implementation

In this phase, the researcher has identified the relevant factors affecting cloud computing adoption in business organization through:

- Review of literature.
- NGT workshop to enlist the factors and using RII to generate factors having highest impact on cloud computing adoption in business organizations.

Phase 2 - Development of Hierarchical Structural Model

In this Phase 2, the researcher has developed the interaction matrix amongst identified factors and developed hierarchical structural model under

relevant contextual relations of cloud computing adoption in business organization though:

- Creating SSIM matrix and deploying VAXO framework for identifying the relationship amongst factors affecting cloud computing adoption in business organizations through workshop using brainstorming.
- ISM technique being deployed to develop hierarchical model of identified factor affecting cloud computing adoption in business organizations.

B. Sampling

The number of experts required for any interactive management session should be between 10 and 15; for proper cross fertilization of ideas which encourages contributions from everyone and facilitates quick agreement on the relative importance of issues, problems, or solutions. Both participants and the facilitator are required to be subject matter experts of the topic under discussion.

The experts were identified under three categories namely policy maker, academic experts and industry practitioner. Following is the profile mix of experts who were contacted for data collection:

- Policy Maker from Government-01
- Academia-16
- Industry-12

In order to justify the minimum requirement of experts, the number of respondents in all the workshops was between 10 and 15. The sampling technique adopted was non-probability Judgment Sampling.

V. FINDING AND ANALYSIS

To identify integrated elements for implementation of Cloud Computing, researcher has adopted the concept of open coding which was propounded by Wolfswinkel *et al.*, in 2011. Open Coding is the mechanism of generating categorical labels named codes, to capture the basic themes that appear in a review article [1-19]. Researcher has adopted this methodology, because it is in complete

synchronization with the fundamental principle of interpretive structural modelling, which looks to identify variables and establish hierarchical model based on the contextual relationship.

The concept of opening coding resulted in 40 codes, whose frequency of occurrence in selected reviewed article is as follows:

TABLE I: LIST OF CODES GENERATED THROUGH OPEN CODING MECHANISM WITH OCCURRENCES IN SELECTED REVIEW ARTICLE

Keywords	Matching Occurrences in Selected Article for Review
Strategic Importance of IT	20
Top Management Support	25
Geographical Diversification	10
Impact of Structure	4
Innovativeness	10
Number of Employees	4
Conformity with Work Culture	10
Resistance to Change	5
Personality Traits	10
Net Worth	10
Integration with In-House and Existing System	20
Institutional Influence	10
Adequate User and Technical Support by Vendor	15
Vendor Choice	15
Market Scope	10
Nature of Industry	10
Trialability of Cloud Services	30
Compatibility with Existing System	30
Improved Collaboration with Channel Partners	10
Reduction in Time and Resource on IT Management	15
Access to Technical Expertise	15
Scalability	30
Faster Deployment	30
Total Cost of Ownership	20
Capex to Opex	20

Keywords	Matching Occurrences in Selected Article for Review
Ecological Benefit	15
Business Process Improvement	15
Agility	20
Reduced Time to Market	15
Service Level Agreement	20
Expertise of Employee	20
Internet Penetration	10
Technology Diffusion	30
Type of IS Function	10
Standardization	10
Interoperability	10
Lock In	10
Switching Cost	10
Data Security	25
Data Privacy	25

Researcher then conducted the Nominal Group Technique workshop, where the initial responses of experts were captured; with the triggering question “mention one factor affecting cloud adoption in business organization”. The forum was then opened for data filtration based on the captured responses and gross list of identified factors of cloud adoption obtained through open coding mechanism as listed in Table I. A more generic statement to capture the intent of factors in adoption of cloud computing were framed, which are presented in Table II.

TABLE II: LIST OF GENERIC STATEMENTS TO CAPTURE FACTORS AFFECTING CLOUD ADOPTION

Sr. No.	Factors Affecting Cloud Adoption
1	Impact of level of technical knowledge of adopting organization seeking cloud services.
2	Impact of service level agreement on adoption for adopting organization.
3	Impact of quality of technical support being offered by vendor of cloud services.
4	Impact on agility (responsiveness) on adoption for adopting organization.

Sr. No.	Factors Affecting Cloud Adoption
5	Impact on business process improvement on adoption for adopting organization.
6	Impact of level of compatibility with existing information system of adopting organization considering adoption.
7	Impact of degree of complexity of integration with in-house and existing information system on adoption for adopting organization.
8	Impact of ease of information system management (reduction in time and resource) on adoption for adopting organization.
9	Impact of ecological benefit (less carbon footprint) on adoption for adopting organization.
10	Impact of level of innovativeness in adopting organization.
11	Impact of rate of technology diffusion on adoption.
12	Impact of conformity with work culture on adoption for adopting organization.
13	Impact of level of expertise of employee in organization seeking cloud adoption.
14	Impact of geographical spread of organization seeking cloud adoption.
15	Impact of structure (team based, project based, departmental etc) of organization seeking cloud adoption.
16	Impact of government regulations on adoption for adopting organization.
17	Impact on collaboration with channel partners on adoption for adopting organization.
18	Impact of improvement in market scope on adoption for adopting organization.
19	Impact of data privacy concern on adoption for adopting organization.
20	Impact of data security concern on adopting for adopting organization.
21	Impact of fast deployment of cloud services as compared to traditional method on adoption.
22	Impact of concern regarding interoperability of cloud services.
23	Impact of concern regarding lock in (only one service provider) of cloud services.
24	Impact of scalability of cloud services as compared to traditional method on adoption.

Sr. No.	Factors Affecting Cloud Adoption
25	Impact of standardization (standard adopting architecture) of cloud services on adoption.
26	Impact of concern regarding switching cost of cloud services on adoption.
27	Impact of type of industry (Manufacturing, I.T., Banking etc) on adoption.
28	Impact of network ecosystem (internet speed, performance etc) on adoption for adopting organization.
29	Impact of employee’s strength (number of employees) on adoption for adopting organization.
30	Impact of personality traits (decision maker) on adoption for adopting organization.
31	Impact of reach to market (time to market) on adoption for adopting organization.
32	Impact of resistance to change (employee) on adoption for adopting organization.
33	Impact of strategic importance of information technology services in adopting organization.
34	Impact of top management support on adoption for adopting organization.
35	Impact of total cost of ownership (capital expenditure versus operational expenditure) on adoption.
36	Impact of trialability of cloud services.
37	Impact of type of information system function (strategic function or support function) being adopted on cloud services.
38	Impact of ubiquitous access (organization accessibility to resources) on adoption.
39	Impact of vendor (selection) offering cloud services on adoption.
40	Impact of status of company (start-up, MSME, multinational) on adoption of cloud services.

Researcher floated the table obtained above in form of a questionnaire to a select set of experts from industry, to rank them on a scale of 1 to 5, where 1 represented least impact on adoption of cloud computing in business organization and 5 indicated maximum impact on adoption. Relative Importance Index (RII) were the indices of the variables are ranked according to their relevance was then deployed to rank the factors. In Relative Importance Index (RII), the indices ranging from 0.71 - 1.00 are

classified as high, 0.41 - 0.60 as medium, and, Less than 0.40 as being low. The top ranked items rated 0.71 or above, indicating a high importance, were deemed to be of importance and therefore included in the research.

TABLE III: LIST OF SHORTLISTED FACTORS AFFECTING CLOUD ADOPTION HAVING COMPOSITE INDEX SCORE OF MORE THAN 0.71 AS PER RII CALCULATION

Sr. No.	Factors Affecting Cloud Adoption	C.I.
1	Impact of level of compatibility with existing information system of adopting organization considering adoption.	0.96
2	Impact of data privacy concern on adoption for adopting organization.	0.96
3	Impact of data security concern on adopting for adopting organization.	0.96
4	Impact of top management support on adoption for adopting organization.	0.96
5	Impact of ubiquitous access (organization accessibility to resources) on adoption.	0.96
6	Impact of fast deployment of cloud services as compared to traditional method on adoption.	0.93
7	Impact of total cost of ownership (capital expenditure versus operational expenditure) on adoption.	0.93
8	Impact of concern regarding interoperability of cloud services.	0.92
9	Impact of scalability of cloud services as compared to traditional method on adoption.	0.92
10	Impact of trialability of cloud services.	0.92
11	Impact of standardization (standard adopting architecture) of cloud services on adoption.	0.90
12	Impact of type of information system function (strategic function or support function) being adopted on cloud services.	0.90
13	Impact of service level agreement on adoption for adopting organization.	0.89
14	Impact of degree of complexity of integration with in-house and existing information system on adoption for adopting organization.	0.89

Sr. No.	Factors Affecting Cloud Adoption	C.I.
15	Impact of concern regarding switching cost of cloud services on adoption.	0.89
16	Impact of concern regarding lock in (only one service provider) of cloud services.	0.88
17	Impact on agility (responsiveness) on adoption for adopting organization.	0.85
18	Impact of quality of technical support being offered by vendor of cloud services.	0.84
19	Impact of vendor (selection) offering cloud services on adoption.	0.84
20	Impact of ease of information system management (reduction in time and resource) on adoption for adopting organization.	0.82
21	Impact of network ecosystem (internet speed, performance etc) on adoption for adopting organization.	0.82
22	Impact of reach to market (time to market) on adoption for adopting organization.	0.80
23	Impact of rate of technology diffusion on adoption.	0.78
24	Impact of government regulations on adoption for adopting organization.	0.77
25	Impact of geographical spread of organization seeking cloud adoption.	0.76
26	Impact of strategic importance of information technology services in adopting organization.	0.76

Sr. No.	Factors Affecting Cloud Adoption	C.I.
27	Impact of type of industry (Manufacturing, I.T., Banking, etc.) on adoption.	0.73
28	Impact of ecological benefit (less carbon footprint) on adoption for adopting organization.	0.72
29	Impact of level of innovativeness in adopting organization.	0.72
30	Impact of structure (team based, project based, departmental etc) of organization seeking cloud adoption.	0.72
31	Impact of status of company (start-up, Msme, multinational) on adoption of cloud services.	0.72

Researcher than conducted a Follow up workshop, to discuss the findings of Data Collection. A consensus emerged in the workshop , that to have a comprehensive understanding of cloud adoption the numbers of elements needs to further reduce by summing up relevant terms in more generic terms. Inspirit, the essence of the terms which are merged must be adopted in the combined term, and, the combined term should satisfy the intended concept the present, which is to identify list of integrated elements impacting cloud computing adoption in business organization. The following terms were acronym and there conceptual definitions were formulated as presented in Table IV.

TABLE IV: LIST OF ACRONYM AND CONCEPTUAL DEFINITION OF CONCEIVED ACRONYMS AFFECTING CLOUD ADOPTION

Sr. No.	Acronym	Definition	Elements Combined From (Table C)
1.	AGI	Agility which relates to organization responsiveness to business opportunities, due to faster and on demand deployment of resources.	6,17
2.	CAB	Cloud Associated Benefit relates to the concept of ubiquitous access to resources post cloud adoption and the ecological impact of cloud adoption models.	5,28
3.	COM	Compatibility which relates to integration of cloud services with current I.T. products, interoperability and heterogeneity of cloud offerings.	1,8,14
4.	DM	Data Management which relates to data privacy, data security once data resides on cloud service provider.	2,3
5.	INDI	Industry Index relates to the kind of industry the cloud adopting organization belongs and type of cloud adopting organization.	27,31

Sr. No.	Acronym	Definition	Elements Combined From (Table C)
6.	INNOI	Innovation Index relates to rate and level of innovation and disruptive technology percolation.	23,29
7.	OS	Organization Status which relates to geographical spread of organization, structure and I.T. strategy.	25,26,30
8.	SCA	Scalability relates to elasticity of I.T. resource management and ease of I.T. management for adopting organization.	9,20
9.	SR	Statutory Regulation which relates to government regulations regarding operational side of cloud offerings which include security, standardization and lock-in concerns of cloud offerings.	11,16,24
10.	STM	Superior Time to Market relates to rate at which the offerings of cloud adopting organization will reach target market as compared to traditional organization.	22
11.	TCO	Total Cost of Ownership relates to the cost aspect of cloud offerings which converts capital expenditure to operational expenditure due to metered services and also includes the switching cost of changing cloud service provider.	7,15
12.	TE	Technological Ecosystem relates to internet network speed, performance and penetration and also the stage of cloud adopting organization on cloud computing maturity model.	12,21
13.	TMS	Top Management Support.	4
14.	TRI	Trialability of cloud offering for cloud adopting organization.	10
15.	VQ	Vendor Quality which relates to service quality which includes service level agreement, customization capability of product offerings as per need and the lead time to accomplish the same.	13,18,19

The hierarchical structural model was established using Interpretive Structural Modelling. Following are the steps that are typically followed to create an interpretive structural model [19].

- Problem Identification
- Identification of elements
- Determine Contextual Relationship
- Develop Structural Self-Interaction Matrix (SSIM)
- Develop Initial Reachability Matrix
- Develop Final Reachability Matrix
- Level Partitioning
- Conical Matrix

- Digraphs
- Interpretive structural Model

Researcher has completed the problem identification step in introduction section and identification of elements in objective 1. Contextual relationship of “intent”, in which the relationship between two variables A & B, can be stated as “A should help achieve B”; is clearly suitable for this topic, as the objective of this research is to ascertain the relationship amongst identified elements which helps to achieve cloud computing adoption in business organizations.

Structural Self-Interaction Matrix (SSIM) of the identified elements is shown in Table V.

TABLE V: VAXO FRAMEWORK USED TO CREATE SSIM

Variables	TMS	VQ	TRI	AGI	TE	CAB	OS	STM	COM	SR	DM	TCO	INOI	SCA	INDI
TMS	X	V	V	V	V	V	V	V	V	V	V	V	V	V	V
VQ		X	V	V	V	V	V	V	V	X	V	X	V	V	V
TRI			X	V	V	V	V	V	X	A	X	A	V	X	V
AGI				X	V	V	V	X	A	A	A	A	V	A	V
TE					X	V	X	A	A	A	A	A	X	A	X
CAB						X	A	A	A	A	A	A	A	A	A
OS							X	A	A	A	A	A	X	A	X
STM								X	A	A	A	A	V	A	V
COM									X	A	X	A	V	X	V
SR										X	V	X	V	V	V
DM											X	A	V	X	V
TCO												X	V	V	V
INOI													X	A	X
SCA														X	V
INDI															X

Researcher then uses “SMART ISM” software to create the interpretive structural model, which is shown in Fig. 1.

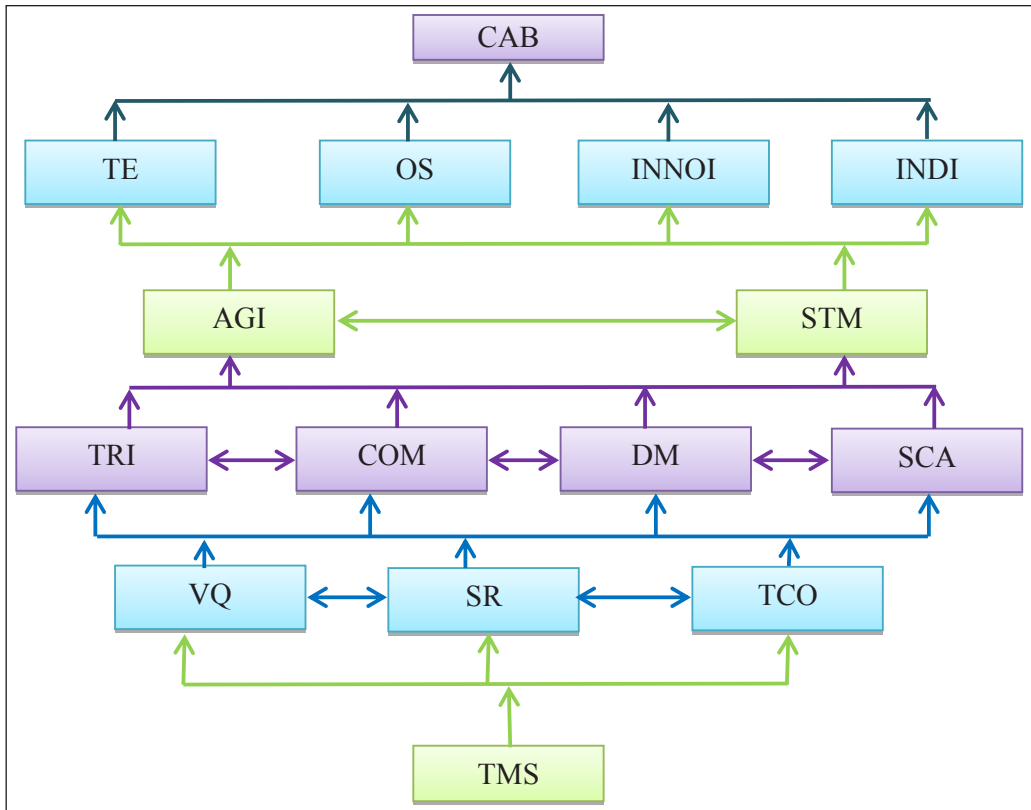


Fig. 1: ISM of Factors Affecting Cloud Adoption

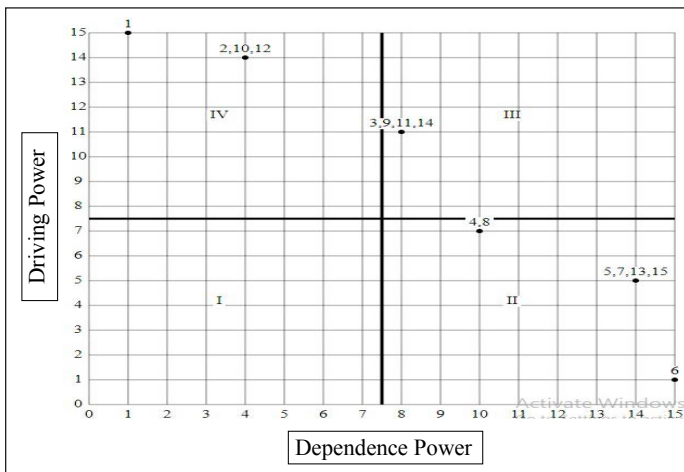
MICMAC (Cross-Impact Matrix Multiplication Applied to Classification) analysis, helps in asserting, the degree to which each variable influences and gets influenced by the other variables in the problem under study. Driving Power which defines that how many elements are being achieved by the element under consideration, and, dependence power which defines

that how many elements helps achieve the element under consideration is calculated by summing up the 0s and 1s in the columns and rows corresponding to each variable in the Conical Matrix. The combination of the driving power and dependence power give rise to four categories of variables as following:

TABLE VI: MICMAC ANALYSIS CATEGORIES

Driving Power	Dependence Power	Variable Category	Characteristic
Low	Low	Autonomous	These variables due to their low driving and dependence power do not affect the system to a great extent. They more or less remain extraneous variables.
Low	High	Dependent	Strongly influenced by the system but does not influence the system. These variables are sensitive to the action taken on the influent variables.
High	Low	Independent or Influent	Strongly influences the system but is not influenced by the system. Any action on these variables will affect other variables which are dependent on these variables.
High	High	Linkage	These variables cause instability of the system as their power of affecting and getting affected by the other variables is high. Any action on these variables will cause volatility in the system.

The above combinations of MICMAC analysis is understood more clearly using the graphical visualization and are depicted below to better analyse the categories of variables and their implication on cloud computing adoption.



- I – Autonomous Variables
- II – Dependent Variables
- III – Linkage Variables
- IV – Influent Variables

Fig. 2: MICMAC Graph

VI. CONCLUSION/DISCUSSION

A closer analysis of cloud adoption model which has emerged using ISM and thereon the MICMAC analysis reveals that, the role of Influencer, which have high driving power, is being enacted by TMS, VQ, SR, and TCO in the developed structural model. TMS is having the highest power of influence, which impacts cloud adoption in business organization. The highest power of influence understandably emerges from the decision making authority of top management and will be crucial for implementation of any business initiative to percolate in the echelon of business organization.

If any organization is seeking to deploy cloud offerings, the critical factors which will influence its decision will be cost consideration, types of cloud product offerings, lead time of cloud adoption, service quality of cloud offering and the regulatory framework requirement to be followed. Vendor Quality (VQ) incorporates lead time, service quality and portfolio of cloud offerings; Statutory Regulation (SR) incorporates regulatory framework requirement,

and, Total Cost of Ownership (TCO) incorporates the cost consideration of capital expenditure to operational expenditure and cost of switching cloud service provider if needs arises. Therefore, from the hierarchical model and MICMAC graph we can see that the next level of influencer are VQ, TCO, SR; if the organization wants to adoption cloud computing based on the decision of top management.

The interaction of VQ, SR, TCO comes out to be counter reinforcing, where each variable is effecting and getting effected by each other. This situation can be easily understood by the example of Digital India, given the impetus of government regulation, the types of cloud offering by vendors, there service quality and there time of deliverance will improve in order to penetrate the given market condition. As organization will come across offering which reduces their capital expenditure based on the inherit property of cloud offerings of consumption based billing of IT resources, they will look to offload there IT resource requirement to cloud based solutions, which will only increase the quality of vendor offering and at prices which may more or less be comparable. The impact of these will also be seen in the context of government regulations which will further look to address issues such as data security, interoperability and lock-ins of cloud offerings, and will bring a more comprehensive statutory framework. Again the statutory requirements will affect the vendor offerings which in turn will impact the cost of cloud adoption and the cycle will keep on dynamically repeating.

The interaction amongst variables of level five of the structural model is posing adoption issues which are present in the next level of developed structural model and are called linkages factor; owing to their power of affecting and getting affected by the other variables. The impact of influencer variables in cloud adoption will depend upon the next layer of variables which are TRI, COM, DM, and SCA; as the adoption of cloud offerings will be impacted by the performance of this layer as they have high driving power which influences the next layer of dependent variables.

As evident that the interaction between level five variables results in scenario which requires further

deliberations in terms of standardization of cloud offering and data security. The variable of level four perform are precisely performing the same function. Trialability (TRI), talks about cloud offering being devised in such a manner which permits easy early adoption, will require the features of compatibility (COM) like integration with existing systems, interoperability and heterogeneity of cloud offerings, to achieve its intended purpose of early adoption. Scalability (SCA) which talks of elasticity or the ease of opting in or out of cloud services will further require cloud offering to be developed in such a manner, which is easy to implement. As more and more cloud offerings will be adopted by business organization data management (DM), which talks about data security and privacy will be a major concern.

On the other hand in today's age of digitalization, the ocean of data being generated and the IT resource being required will require cloud offering to be adopted in organization. The moment organization seeks cloud offering trialability, compatibility and scalability of cloud offering, will become the deciding factor for adopting cloud computing. These interactions amongst TRI, COM, SCA, DM clearly indicates a reinforcing relationship amongst these variables and cloud adoption benefits will only manifest if they are successfully integrated in cloud offerings. Influencer as discussed represents level six and level five of interpretive structural model, and, can broadly be called as representing cloud computing ecology; whereas, linkages are the level four of structural model, researcher and linkages which can broadly be called as strategic success factors of cloud offering must work in cohesion for successful cloud adoption by business organization.

Level three of structural model models represent the benefits of cloud adoption which the organizations can realize in terms of responsiveness to market situations and time to market of product and services. Agility (AGI) relates to organization responsiveness to business opportunities, due to faster and on demand deployment of information and technology resources. If any organization requires an excess of storage capacity due to its open day sale, will benefit the most from this aspect of cloud offering

of excess storage capacity as per the demand of the organization, which requires no prior set up and can be released post consumption. This represents a typical example of agility where the organization can respond to sudden customer demand and satisfy them. As the responsiveness of organization to prevalent market condition improves, the time taken by organization to offer its products or services to the market will also be reduced. Superior Time to Market (STM) relates to enhanced rate at which the offerings of cloud adopting organization will reach target market as compared to traditional organization. But the dependence on cloud computing ecology and strategic success factors of cloud offering maps these factors as dependent factors as per MICMAC analysis.

To realize the full potential of cloud adoption like ubiquitous access to resources on heterogeneous devices; along with the ecological impact of having less carbon footprint and on demand information technology resource availability, which in this research has been coined as cloud associated benefits (CAB), leading to sustained competitive advantage. The organizations must work on their technological ecosystem (TE) which includes their stage in cloud computing maturity model as discussed in chapter of introduction; the network ecosystem which include speed and penetration of intranet and also the excess to internet. As organization will work towards achieving cloud adoption, the speed of adoption will depend upon the openness of organization towards innovation and rate at which the upgrade themselves with respect to any disruptive technology, which in this research has been coined as innovation index (INNOI). The state of technological ecosystem and rate of innovation index will be driven by the kind of industry the cloud adopting organization belongs and type of cloud adopting organization for example MSME, start-up etc. coined as industry index (INDI). The three terms TE, INNOI, INDI forms reinforcing loop where one will help achieve the other two and vice versa; for example, more competitive the industry indexes, faster will the rate of innovation index and better will the state of technological ecosystem. On the other hand, more advanced technological ecosystem will fasten up innovation

index which in turn will increase the scenario of industry index. Therefore, the terms appear in same level of interpretive structural model and along with organization status (OS) will determine the extent to which cloud adoption benefits are realized in any organization.

Organization Status (OS) which relates to geographical spread of organization, structure and information technology strategy will also have a reinforcing relationship with technological ecology, innovation index and industry index. A multi-location presence, along with project or matrix based structure of organization and the strategic role of information technology will drive the status of technological ecosystem and innovation index of any organization. As more and more organization will adopt cloud computing within a given industry, the landscape of industry will change, which in turn will drive the aspects of organizational status. In the developed hierarchical model, this interaction amongst TE, OS, INNOI and INDI has been captured at level two and as per MICMAC analysis fall under the category of dependent variable.

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