SANCTION ENFORCEMEMT MECHANISMS IN ARTIFICIAL AGENT SOCIETIES- A GLANCE

[1]Aastha Sharma, [2]Harjot Kaur

[1]Student(M.Tech(CSE)), [2]Assistant Professor

[1,2]Department of Computer Science and Engineering, GNDU Regional Campus,

Gurdaspur, Punjab, (India)

ABSTRACT

Organizations work smoothly because of presence of norms in them. Norms enforce standards which must be followed by each user of the organization. The norms, if violated cause sanctions to come into picture. The proposed work conducts a review of various techniques used within organizations to enforce norms and establishing sanctions if norms are violated. Literature survey of existing literature is conducted to discover the work already done towards this aspect. This work also presents research gaps which elaborate the limitations of existing literature to suggest future scope in norm violation and sanction enforcement. The Comprehensive literature study present in this work highlights the limitations that exist in exiting literature.

Keywords- Norms, Organization, standards, agents, sanctions

I. INTRODUCTION

Norms are established for the well being of organization. It is studied that deviations occur when norms are violated [1]. Norm's violations determination could be difficult. Norm's behaviour provides tools for analysing violation of them. To progress forward a case study is conducted of particular organization. Many distinct types of norms are defined along with sanctions, if norms are seriously violated [2]. Organization generally utilizes this structure of norms in order to ensure discipline and more profitability. It has been studied that sole norms cannot be used to ensure rules and regulations [3]. In order to achieve regulations, penalty in terms of sanctions must be enforced. Simulative environment in terms of multi agent systems is created to show impact of violation of norms.
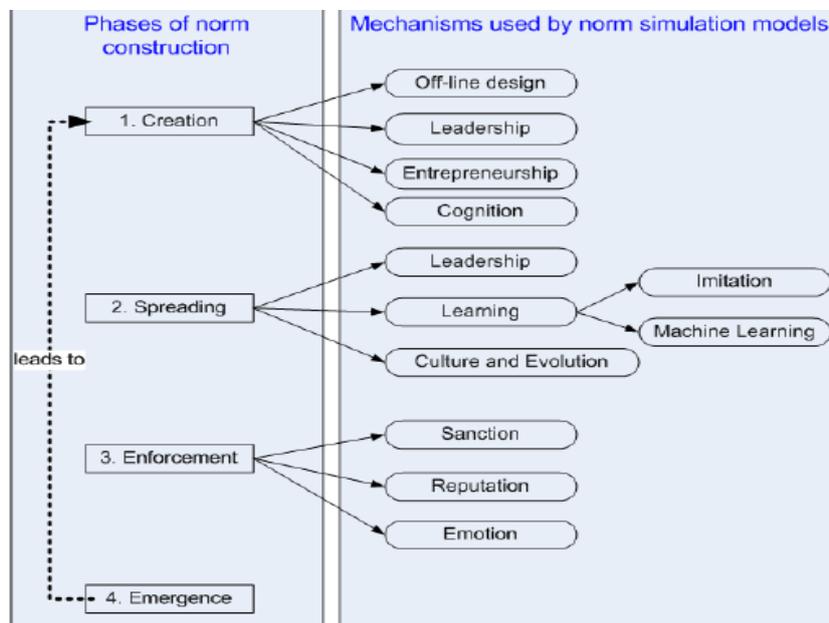
1.1 Norms in artificial agent societies

"Norms are expectations of an agent about the behavior of other agents in the society"[19]. These are established in order to ensure rules and regulations. Without their usage, it is difficult to establish discipline.

1.1.2 Norm lifecycle

Norms go through the phases or life cycle. A study has been done on the life cycle of norms. It has been discovered that norms' life cycle consist of four phases [4]. These phases are as listed below:

- Norm Creation: First of all norms are created in order to ensure order.
- Norm Spreading: Norms once created needed to be conveyed to each member of the organization so that they can be followed. This phase ensures spreading of information regarding norms.

- Norm Enforcement: After norms are established and conveyed to agents of the organization, they are needed to be enforced so that they can be followed effectively.

- Norm Emergence: This phase leads to the emergence of new norm if current norms are not meeting the requirements of an organization.

Norm lifecycle can be best described through figure 1.

Fig 1: Lifecycle of norms

The norms life cycle describes effectively the process of initialisation and its progress until last stage. Violation of norms gives rise to sanctions.

1.2 Sanctions in Artificial Agent Societies

A sanction in general terms is "an official permission for an action to be done. It is a kind of punishment for disobeying a norm". The establishment of sanctions is necessary so that sufficient punishment can be enforced in case of norms violation. In other words, we can say norms give rise to sanctions but vice-versa is not true. It is enforcement of norms in an organization that gives rise to sanctions [5,6]. Sanctions also possess a life cycle. We have proposed a sanctions life cycle, which is deduced from norms life cycle. It is presented in fig 2. It comprises of the following phases:

- Sanction Enforcement: Sanctions are enforced so that they can be carefully followed by the agents. Violation of norms results in sanction to come into picture.

- Sanction Obedience: This phase specify the guidelines to be followed to ensure sanctions are followed successfully.

- Sanction Need: This phase specifies the requirement of sanction as a result of norm violation.

- Sanction Reinforcement: After new norms come into existence, new sanctions are also created and enforced. This phase is termed as sanction reinforcement.
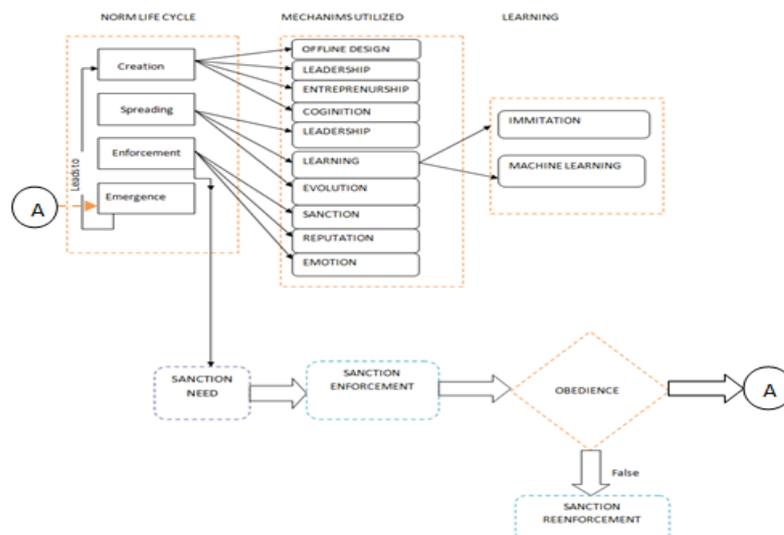
Fig 2: Lifecycle model of sanctions

1.3 Types of Norms

Distinct type of norms and sanctions are present in any organization. This subsection gives a brief description of them. Hernández et al. [7] has studied that the norms which can be enforced within a society can be little more about social norms, private norms, local norms, legal norms.

- **Social norms**

Social norms are those norms in which banners, pamphlets are used by companies to make people aware about the disadvantages of smoking. So that people come to know that smoking is really injurious to health. If they were still trapped in smoking and harm their families due to their malicious intension then under social norm some sanctions will be enforced on them which are written in law.

- **Private norms**

Private norms are those norms which are implemented by small organizations for their personal benefits. For instance, in most of the places like internet cafes, shops, etc use this trick to maintain their standard and status and also convey message to people about the dangerous situation which they can face due to smoking.

- **Local norms**

Local norms are those norms which are used within small towns. For example in most of the organizations when vehicle is parked at parking lot then a slip is given to driver then slipped is valid within the parking lot this is considered as local norm.

- **Legal Norms**

Legal norms aim at developing certain social relations in the interest of ruling class.

All of the above said norms are required to be followed. In case of violation of norms, sanctions are enforced. Júnior and Cortés[8] have described that sanctions are majorly legal in nature. Legal sanctions can cause persons to put in jail in case of violations. Sanctions are categorized as under:

- **Economic sanctions**

Economic sanctions cause ban on trade as a result of violation of economic norms established within the organization.

- **International Sanctions**

International sanctions cause the ban against the person or organization causing a violation against behaviour.

- **Pragmatic Sanctions**

These sanctions are caused due to violation against law. This is a serious offense which may result in prison also.

- **Legal Sanctions**

Legal Sanctions are consequence of Legal Norms Violation[21]. International sanctions fall within this category. Legal sanctions are considerable expensive in nature. Alternative sanctions are thus imposed. Alternative sanctions include shaming hence is a part of legal sanction which is much cheaper as compared to existing legal norms.
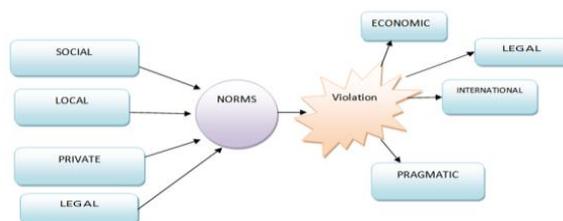

Fig 3: Norms and Sanction Model

- **Paper Organization**

The section I gives introduction about the norms including norm's definition and types. The section II covers literature survey. The section III includes the research gaps. Various conclusions extracted from this work are presented in section 1V.

II. LITERATURE SURVEY

This section provides the detailed description of background work which is already done regarding norms and sanctions.

Hamid et al. [9] have studied the norms mechanism in multi-agent systems. Open multi- agent systems are considered in this work. This paper studies the impact of establishing norms on behaviour of agents. The norms are no longer built-in during design phase. Rather norms are enforced during interaction phase. Hence, run time allocation of norms is studied in this work. The authors have not discussed sanction enforcement in their work. Hence, norms enforcement is not considered in this approach.

Mahmoud et. al. [10] have studied that norms mining approach is followed in order to determine whether agent is following the protocols or not. Community norms are considered in this paper. The components of norms which are going to strengthen the norms are also identified through this approach. The identification process may vary with the environment. This approach is suitable only if static environment is considered. Dynamic environment is not suitable in this work because of its continuous change in situation and supra-system .Hence the concept of sanctions has not been considered in this approach by authors.

Centeno et. al. [11] have studied that adaptive sanctioning mechanism in their presented work. Adaptive sanctioning mechanism provides continuously alteration of norms or protocols depending upon the interaction of agent in a workable environment. The authors have not considered static environment. But it is also observed that dynamic environment may cause the problems

Balke et. al. [12] have studied normative run- time reasoning agents in multi-agent systems. Run-time interaction agents with the actual system are considered in this work. No case study is conducted to prove the worthiness of this work. The existing environment has legion of problems. Hence, modification to the existing literature is required to prove its worth. Dynamic behaviour alteration along with norm modification is considered in this study. However, Sanction enforcement is not considered. The authors have not discussed how sanctions result because of disobedience of norms.

Jin et. al. [13]have studied that adaptive iteration learning control for non linear multi- agent systems. Dynamic approach is utilized by authors rather than static approach. Multi- agent system provides the details and descriptive analysis of norms and sanctions establishment. Cost associated with the analysis process is sufficiently reduced. The simulative environment is used for performing various operations in the system. Static environment of operation is considered. Sanction enforcement is not considered. Hence norms may not be properly enforced to enhance discipline.

Dybalova et. al. [14] have proposed a framework for norm aware multi agent systems. The authors have considered 2OPL(Organizational Programming Language) to design a framework in which norms are dynamically identified in the presented work. This framework is used to determine whether agents follow the norms established by normative organization. A case study is also presented in this approach to ensure worth of the presented work.

Alechina et. al. [15] have suggested the approach used in order to verify, establish and monitor the norms established in the normative organization. Architecture and implementation languages are also considered in this approach. This work provides generalized environment for considering normative organizations. In realistic environment the work proposed may be difficult to conduct. Neither static nor dynamic environment is considered. Hence practical consideration is limited in this work.

Hexmoor et. al. [16] have considered social norms which originate naturally within human societies. This paper reviews the applications of norms in society through multi-agent systems. Urban societies are considered as a work of fiction in this case which is described in terms of MAS. The work describes that norms establishment in smaller organization is relatively easy as compared to complex environment where norm establishment process is critically found to be difficult.

Neruda et. al. [17]have described automated approach to handle social norms in a normative organization. Normative organization ensures norms establishment and its sufficient enforcement. The concept of sanctions is again not considered in this work. The authors have established automated reasoning in their work for computationally large organizations which can be presented as multi-agent systems. This work also includes controlling agents, who ensure that no agent can violate norms and get away easily. Dynamic environment and sanction consideration is let back of this approach. The sanction non-consideration for dynamic environments is let back of this approach.

Balke et. al. [18] have suggested the clarity of definition of norms in normative environment. Normative environments are those in which norms are required to be established to describe them. The normative environment cannot be used at a place where norms are not required to be set. This paper also describes about nature of norms. The essential features of norms are interaction and this aspect is highlighted in this work. Sanctions enforcement for norm disobedience is again found absent in this approach. The type of enforcement

(whether static or dynamic) in which operations can be performed is not considered in this work.

III. RESEARCH GAPS

This paper studies the impact of norms and sanctions with respect to the organization. Sanctions are result of norm enforcement in an organization. If an agent does not follow the norms then sanctions will be charged against it. Norm enforcement can be static or dynamic in nature. Static enforcement ensure sanction establishment during design time and dynamic norms ensure norms establishment during run time. Behavioural changes greatly influence norms establishment. The static and dynamic environments are not considered in most of the literature which is surveyed. Most of the works also do not consider sanction enforcement. There is a big need of considering sanction enforcement in normative organizations. Hence, enhancements in existing research can be performed.

Centeno et al. have studied that the multi-agent System (MAS) plays critical part in analysing the behaviour of person in organization where dissimilar environment is presented to user [11,19]. The obligations are needed to be satisfied in order for the agent to be successful in an organization. The agents can be bounded by certain rules and regulations. Agents who do not satisfy the rules are sanctioned. The punishment to be given to them will depend upon the severity of problem caused by them. Hence sanctions are critical in stabilising the behaviour of the agent within the organization. The sanctions will be applied with respect to the disobeyed norms. The certain situations in which the norms can be disobeyed are as follows:

a) When an agent A has more goals to achieve as compared to an agent B

b) Agents cannot do anything for specified norm

c) The beliefs are not successfully established

d) The bearer menaces an agent.

All of above conditions have not been discussed in all the above mentioned existing works. So there is a big need to resolve this issue. Henceforth, these enhancements can be pursued as one of the future research directions.

IV. CONCLUSIONS

The analysis of norms and sanctions within the organization gives us details about relationship that exist between employees and organization. The positive relationship result in achieving the goals associated with the organization. The failure in achieving the goal or in other words norms violation gives rise to sanctions to be enforced. Future work tends to formulate a model to deeply inspect the norms and sanctions and hence providing framework that allows the user to understand the concept of norms comfortably. Interactive interface can also be designed for achieving the same.

V. REFERENCES

[1] xing, W.E.I.G, "Team Cooperation Incorporating Inequity Aversion and Social Norms," no. 2003, pp. 1174–1181, 2009.

[2] Acm, I.W.I.C, "Rewriting Agent Societies Strategically," 2009.

[3] Lazar, M., "On infinity norms as Lyapunov functions: Alternative necessary and sufficient conditions," in

49th IEEE Conference on Decision and Control (CDC), 2010, pp. 5936–5942.

[4] "dblp: record journals/tpds/WuLXYLW15." [Online]. Available: http://dblp2.uni-trier.de/rec/html/journals/tpds/WuLXYLW15#. [Accessed: 08-May-2016].

[5] Gharakheili,H.H., Vishwanath,A. and Sivaraman,V., "Pricing user-sanctioned dynamic fast-lanes driven by content providers," in *2015 IEEE Conference on Computer Communications Workshops (INFOCOM WKSHPS)*, 2015, pp. 528–533.

[6] Robert,M.R., Cortes,M.I., Campos, G.A.L. and Freire,E.S.S., "A sanction-application mechanism considering commitment levels in hierarchical organizations," in *2015 Latin American Computing Conference (CLEI)*, 2015, pp. 1–11.

[7] Hernández,P., Cubillo,S. and Blanc,C.T., "On T-norms for Type-2 Fuzzy Sets," vol. XX, no. XX, pp. 1–9, 2014.

[8] Júnior,R.M.R. and Cortés,M.I., "Commitment Levels in Hierarchical Organizations," 2015.

[9] Hamid,N.H.A., Ahmad,M.S., Ahmad,A., Mahmoud,M.A., Yusoff,M.Z.M. and Mustapha,A., "Trusting norms in normative multi-agent systems," in *Proceedings of the 6th International Conference on Information Technology and Multimedia*, 2014, pp. 217–222.

[10] Mahmoud,M.A., Ahmad,M.S., Ahmad,A., Yusoff,M.Z.M. and Mustapha,A., "A norms mining approach to norms detection in multi-agent systems," in *2012 International Conference on Computer & Information Science (ICCIS)*, 2012, pp. 458–463.

[11] Centeno,R., Billhardt,H. and Hermoso,R., "An Adaptive Sanctioning Mechanism for Open Multi-agent Systems Regulated by Norms," in *2011 IEEE 23rd International Conference on Tools with Artificial Intelligence*, 2011, pp. 523–530.

[12] Balke,T., Vos,M.D., Padget,J. and Traskas,D., "Normative Run-Time Reasoning for Institutionally-Situated BDI Agents," in *2011 IEEE/WIC/ACM International Conferences on Web Intelligence and Intelligent Agent Technology*, 2011, pp. 1–4.

[13] Jin,X., "Adaptive iterative learning control for nonlinear multi-agent systems consensus output tracking with actuator faults," in *2016 American Control Conference (ACC)*, 2016, pp. 1253–1258.

[14] Dybalova,D., Testerink,B., Dastani,M. and Logan,B., "A framework for programming norm-aware multi-agent systems," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 8386 LNAI, pp. 364–380, 2014.

[15] Alechina,N., Bassiliades,N., Dastani,M., Vos,M.D., Logan,B., Mera,S., Martin,A.M. and Schapa,F., "Computational models for normative multi-agent systems," *Dagstuhl Follow.*, vol. 4, pp. 71–92, 2013.

[16] Hexmoor,H., Venkata,S.G. and Hayes,D., "Modeling Social Norms In Multiagent Systems," *J. Exp. Theor. Artif. Intell.*, vol. 18, no. 1, pp. 49– 71, 2006.

[17] Neruda,R. and Kazík,O., "Formal social norms and their enforcement in computational MAS by automated reasoning," *IAENG Int. J. Comput. Sci.*, vol. 39, no. 1, pp. 80–87, 2012.

[18] Balke,T. and Pereira,C.D.C.," Norms in MAS: Definitions and Related Concepts*"*, vol. 4. 2013.

[19] Kobti,Z., Reynolds,R.G. and Kohler,T., "The effect of kinship cooperation learning strategy and culture on the resilience of social systems in the village multi-agent simulation," in *Proceedings of the 2004 Congress on Evolutionary Computation (IEEE Cat. No.04TH8753)*, 2004, vol. 2, pp. 1743–1750.

[20] Bicchieri, C., "The Grammar of Society: The Nature and Dynamics of Social Norms", Cambridge University Press, New York, USA, 2006.

[21] Gopalan,S., "Alternative Sanctions and Social Norms in International Law: The Case of Abu Ghraib," *Michigan State Law Rev.*, vol. 2007, pp. 785–839, 2007.