

Mita's Four Ideal Types of Time Revisited : Axiomatization of Sociological Concepts of Time (1)

TAKAHASHI Akinariⁱ

Abstract : This paper examines from the viewpoint of axiomatic formalization the sociological typology of time that Mita Munetsuke, one of the most prominent and influential Japanese sociologists in the second half of the 20th century, proposed in the 1980s. The typology, which consists of four ideal types of time such as reiterate, circular, terminable, and rectilinear, aims to compare the modern system of time with others in order to elucidate the problem of time as the origins of boundness and nihility of life. This paper adopts axiomatization in the form of set theory in two steps. First, axiomatic formalization which this paper demonstrates extracts an axiomatic system called the General Axiomatic system of Social Time (GAST) from the concept of social time that P. A. Sorokin and R. K. Merton formulated. Second, the formalization extracts three more axioms which are distinctive of ideal types in Mita's typology: 1) mapping of symbol, 2) axiom of irreversibility and 3) axiom of endpoint. Therefore, this paper shows that 1) axiomatization of sociological concepts of time is possible, 2) each ideal type in Mita's Four Ideal types of Time (MFIT) can be reconstituted as an axiomatic system in which axioms proper to it are added to GAST and 3) the method of axiomatization, which has an advantage to ignore ontological questions such as what time is, what social facts are, or whether they really exist, is useful to rearrange and compare sociological concepts or theories of time.

Keywords : the sociology of time, social time, axiomatization, set theory, MITA Munetsuke

1. Aim and Background

This paper has two aims. First, it is to verify possibilities which axiomatic method has in comparative and historical investigation of sociological theories, in which, although plenty of studies have focused on various theories and theorists individually, few attempts to compare, classify and integrate them have been accomplished after great ambitious works toward theoretical synthesis in this half a century, represented by Giddens (1984), Habermas (1981) and Luhmann (1984). This study shall show that axiomatization is one of the most useful common methodologies to further the synthesis. Second, this paper is to be paradigmatic investigation which axiomatizes sociological theories pertaining to social time. Time is one of the most adequate concepts for axiomatic method because it is shared throughout almost all theories or approaches and necessary to conduct an empirical research whereas it is often adopted as self-evident without reflecting its theoretical connotations and axiomatic structures. This study to axiomatize sociological concepts of time is, therefore, of epistemological interest not only for sociological theories but for all empirical researches concerned with social time.

i Associate Professor, Faculty of Social Sciences, Ritsumeikan University

2. Axiomatic Method in Sociology

T. J. Fararo, one of the most prominent sociologists who adopt axiomatics, summarizes it as follows (Fararo 2002: 168). An axiomatic system consists of 1) some *primitive terms*, which are not defined but merely presupposed, 2) *mathematical-logical terms* such as “and,” “three”, and 3) *primitive statements* called *axioms*, which are not demonstrated because they include only primitive and mathematical-logical terms. There are two procedures applicable to axiomatic systems. The procedure of *definition* is to define terms by primitive terms and the procedure of *deduction* is to demonstrate statements with axioms and defined terms. The method of axiomatization, therefore, has two steps: 1) description of an object (concept or theory) as axiomatic system and 2) application of the axiomatic procedures to the system in order to elucidate logical structures within it. Fararo (2002: 168) calls this usage of the method as *syntactical* whereas he also refers to two other kinds of usage: one is *the semantic* that elucidates semantic references to which the system makes its terms correspond and the other is *the pragmatic* that explicates problems the system aims to solve.

He also refers to “a particular mode of axiomatization that proved most useful in the social and behavioral sciences” (Fararo 2002: 170). It is called by a logician Suppes (1957) “axiomatization within set theory.” Fararo summarizes the mode as follows:

The procedure has two steps. In the first step, we specify the primitive entities as set-theoretical entities. In other words, primitive terms are given an interpretation in terms of set theory and hence mathematics. This means that one can employ such entities as matrices, functions, and the like, all of which are abstract set-theoretic entities. In the second step, the axioms are regarded as constraints on the interrelations of these entities. The axioms are construed as defining a new “set-theoretical predicate.” ... This procedure or something like it, has been used in a variety of theoretical contexts in the social and behavioral sciences, including formal language theory in linguistics, general equilibrium theory in economics, learning theory in psychology and balance theory in social psychology. (Fararo 2002: 170)

This paper endeavors to apply the set-theoretical mode of axiomatization to a sociological concept of time not only because of its strong usefulness Fararo indicates but for comparison with physical concept of time which has already been formulated as axiomatic system in set-theoretical terms.

3. Newtonian Concept of Physical Time

It is meaningful to ascertain how concept of time is set-theoretically and hence axiomatically formulated in physics before we apply the method of axiomatization to sociological concept of time. It would be sufficient here to adopt Newtonian concept of physical time so as to compare it with sociological one because of their applicabilities for human scale events.

According to Asai (2003: 145), a mathematical physicist, the axiomatic system that constitutes Newtonian concept of time is equivalent to that of the set of real number (\mathbf{R}). If physical phenomena vary continuously, points of time must be distributed continuously as well. Set-theoretically speaking, a bounded real interval is appropriate formulation for the concept of physical, that is, finite and continuous time. Therefore, to physical time formulated as real number are four arithmetic operations, differential and integral calculus able to be applied. Similarly, the concept of physical space can be formulated as a set of real number in set-theoretical axiomatization in terms of continuous distribution of homogeneous elements.¹

4. An Application of Axiomatics to the Concept of Social Time

This paper adopts the sociological concept of time formulated in Sorokin and Merton (1937) as a paradigmatic example of social time. They argue as follows:

[S]ocial time expresses the change or movement of social phenomena in terms of other social phenomena taken as points of reference. In the course of our daily activities we often make use of this means of indicating points of time. (Sorokin & Merton 1937: 618)

From this argument we can extract an axiomatic system to be called the *General Axiomatic system of Social Time (GAST)*. It consists of the following two sets and two mappings:

The General Axiomatic System of Social Time

1. Set of time T

$$\exists T \forall t (t \in T)$$

There is a set T such that any point of time t is an element of it.²

2. Mapping of successor $\text{suc}(t) \in T$

Any t has its successor $\text{suc}(t)$ and $\text{suc}(t)$ is included in T .

The mapping of successor is surjective and hence any t has at least one element in the domain, that is, predecessor.

$$2.1 \ t \neq \text{suc}(t)$$

Any t is not identical with $\text{suc}(t)$.³

3. Set of social fact F

$$\exists F \forall f (f \in F)$$

There is a set F such that any social fact f is an element of it.⁴

$$3.1 \ F = \{f_1, f_2, \dots, f_n | n \in \mathbf{N}\}$$

F is a finite set. (\mathbf{N} means the set of all natural numbers.)⁵

4. Mapping of event $e: F \rightarrow T \Leftrightarrow t = e(f)$

There is a mapping from F to T which shall be called event.⁶

All terms and statements mentioned above are primitive, that is, presupposed as undefined or unproved. This kind of axiomatic approach has an advantage to ignore ontological questions such as what time is, what social facts are, or whether they really exist.

We have axiomatically formalized the concept of social time as above before we answer a semantic question as to what kinds of sociological conceptions of time are appropriate for application of GAST. Sorokin and Merton give a clue to answer the question too. They insist as follows:

All time systems may be reduced to the need of providing means for synchronizing and co-ordinating the activities and observations of the constituents of groups. (Sorokin & Merton 1937: 627)

The thesis this sentence directly advocates is that all systems of social time have causal relationship with, and therefore can be reduced to, properties of the societies that adopt them. And furthermore, it can be said that this thesis supposes a more general proposition that any systems of time in a society necessarily has some interrelations with the social. The former thesis shall be called *strong functionalist* view of social time and the latter proposition *weak functionalist* one. The sociological conception of time to which GAST should be applied cannot merely be strong functionalist in particular but also weak functionalist in general. The mapping of event means that if there is a social fact, then there must be the point of time that corresponds to it. In other words, the axiom of mapping of event expresses that any social fact has a relationship with a point of the social time. Sociologically interpreting, the axiom, which GAST includes, is equivalent to the weak functionalist conception of time because the social in the form of events in a society has necessarily some relationships with the systems of time that the society adopts.

5. Mita's Four Ideal Types of Time

Mita Munetake, one of the most prominent and influential Japanese sociologists in the second half of the 20th century, proposes a typology of social time (**Fig. 1**). This paper tackles *Mita's Four Ideal types of Time (MFIT)*⁷ as a test case in axiomatization of sociological concept of time because of its semi-formalized character which he has already given to it by himself. His intention which made himself construct the typology must be ascertained before its substance shall be scrutinized in detail. Mita describes the intention from the point of view of the problem of time:

Time as serious question for our lives is time as the origin of *boundness* of life on one side and that as the origin of *nihilicity* of life on the other side.

'Time' as the origin of *boundness* of life, as we have seen, is nothing but the consequence of the mechanism in which collectivities where the subjects struggle with each other in a certain form of society make the parameter of time an entity with its own binding force. When we are 'pressed for time' or 'bound by time', we are bound by the other named time. Why this type of boundness emerges in the form of 'time' as abstract objectiveness is in itself, as already seen, a question of the form of the society.

Time as the origin of *nihilicity* of life, as we have explored, is nothing but the expression of the contradiction between particular *time representation* and particular *consciousness of the subject*. In other words, it is nothing but the shadow of the contradiction between the time representation as 'abstractly infinite irreversible rectilinear propagation', and the absolutization of *individual ego* against *Gemeinschaft* and that of *human being* against the rest of the universe. It is needless to say that the latter moment (a certain type of consciousness of the subject) relates to a particular form of society. On the basis of facts in comparative sociology, we have explicated that the former moment (a certain type of time representation) also corresponds firstly to a particular type of relationship among the subjects within a society and secondly to a type of orientation of the whole society toward nature. (Mita 1981=2003: 321-322: emphasis in original)

This description clarifies that Mita supposes an essential relationship between systems of time and the social as the weak functionalist conception does. He formulates MFIT that can compare the modern system

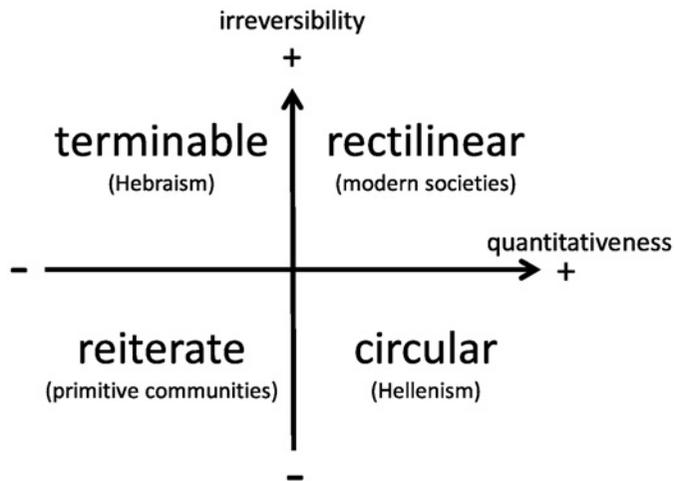


Figure 1 Socio-evolutionary arrangement of MFIT (Mita 1981=2003: 195)

of time with others in order to solve the question of time cited above. Furthermore, he summarizes the substance of MFIT as follows:

We can conclude that one axis [that constitutes Mita's typology: TA] is the dimension pertaining to immanence and transcendence of '*human being*' within/from '*nature*' and the other is the dimension pertaining to immanence and transcendence of '*individuality*' within/from '*communality*'.

Cultures which contrast 'human being' as the independently transcending against 'nature' as being as such make seriously the idea of time as *irreversibility* real. In the same way, the world where *Gesellschaft*-like associations among independent 'individuals', or systems of objectified interdependence develop in the outside of synchronicity lived within '*Gemeinschaft*' substantiates the idea of time as *quantitativeness*.

... Two types of time consciousness, those of 'Hellenism' and 'Hebraism', as ideal types, that is, as methodically purified models are located [in MFIT: TA] as contrast paths bridging time consciousness in primitive communities toward that of the modern world. (Mita 1981=2003: 194-195: emphasis in original)

Both dimensions that constitute MFIT and their sociological interpretations should be ascertained here for axiomatization. The first dimension consists of distinction between qualitiveness and quantitativeness, or concreteness and abstractness whereas the second dimension consists of distinction between reversibility and irreversibility. According to Mita's sociological interpretation, the former corresponds to distinction between time representations based on and outside of communal symbolism whereas the latter to distinction between time representations analogous to circulation in the natural world and mortality of human life.

It is noteworthy that Mita has semi-formalized MFIT by means of both abstract dimensions or distinctions. This paper, therefore, do not focus on the sociological interpretation or the semantic substance of MFIT but on the formal or syntactic structure in order to reformulate it further in terms of set theory.

6. Axiomatic Formalization of MFIT

Each type in MFIT can be reconstituted as an axiomatic system in which axioms proper to it are added to GAST (Table 1).

The axiomatic system equivalent to *qualitative* types in MFIT which fill the left side of Figure 1 includes mapping of symbol.

5. Mapping of symbol $s: T \rightarrow F \Leftrightarrow f = s(t)$

There is a mapping from T to F which shall be called symbol.⁸

The mapping of symbol is injective.⁹ Any point of time is symbolized by the social fact that corresponds to it.

And the mapping of symbol is absent in axiomatic systems equivalent to *quantitative* types in MFIT which fill the right side of Figure 1. Because the mapping of successor, which means a mapping from T to T itself, is included within GAST and therefore within the quantitative types of social time, it can be said sociologically that quantification of time representation means emergence of autonomous systems of time which are not symbolized by social facts.

The axiomatic system equivalent to *irreversible* types of MFIT which fill the upper side of Figure 1 includes axiom of irreversibility.

6. Axiom of irreversibility $\text{suc}(t_{n-1}) \in S_n \subseteq T \wedge t_{n-1} \notin S_n$

S_n is the image of the mapping of successor.

Any successor is included within S_n , but the predecessors are not.

The axiomatic system equivalent to the *terminable* type of social time includes both the mapping of symbol and the axiom of irreversibility. Therefore, it must include the following axiom as well.

7. Axiom of endpoint

$$\exists t_0 \forall t \neg (\text{suc}(t) = t_0) \wedge t_0 \in T$$

$$\exists t_n \forall t \neg (\text{suc}(t_n) = t) \wedge t_n \in T$$

There are two endpoints in T .

One is t_0 that has no predecessor and the other is t_n that has no successor.

Table 1 The Axiomatic System of MFIT

Axioms Types in MFIT	GAST 1. T 2. $\text{suc}(t)$ 3. F 4. $e: F \rightarrow T$	5. Mapping of symbol $s: T \rightarrow F$	6. Axiom of irreversibility $\text{suc}(t_{n-1}) \in S_n$ $\wedge t_{n-1} \notin S_n$	7. Axiom of endpoint $\exists t_0 \forall t \neg (\text{suc}(t) = t_0)$ $\exists t_n \forall t \neg (\text{suc}(t_n) = t)$
reiterate	+	+	-	-
circular	+	-	-	-
terminable	+	+	+	+
rectilinear	+	-	+	-

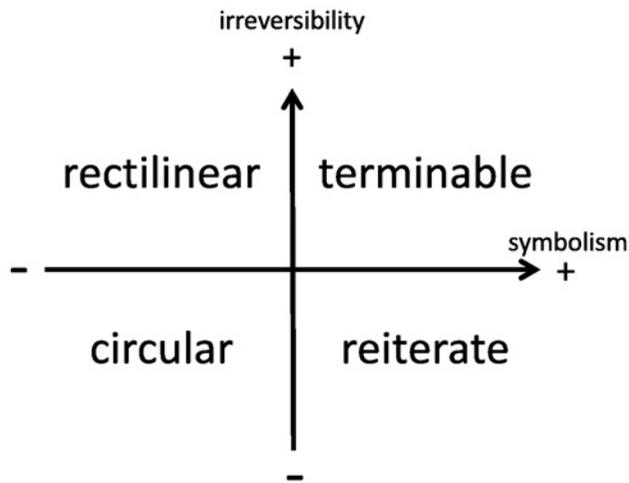


Figure 2 Axiomatic arrangement of MFIT

In short, the *circular* type in MFIT is equivalent to GAST. In addition to GAST, the *reiterate* type contains the mapping of symbol whereas the *rectilinear* type includes the axiom of irreversibility. Further, the *terminable* type consists of GAST, the mapping of symbol, the axiom of irreversibility, and the axiom of endpoint. **Figure 2** rearranges the original arrangement of MFIT (Fig. 1) in the view point of introduction of the specific axioms into GAST. It is not surprising that the axiomatic arrangement of MFIT (Fig. 2) differs from the socio-evolutionary one (Fig. 1) because mathematics also often sees that what are equivalent to more complex (or, more specific, more concrete) axiomatic systems such as natural number or Euclidean geometry precede historically.

The axiomatic elucidation so far makes it clear that geometrical metaphor such as circle (corresponding to the circular), line (corresponding to the rectilinear), line-segment (corresponding to the terminable), which Mita uses in descriptions about MFIT, is misleading because all four types in MFIT lacks an axiom which defines *continuity* necessary for axiomatic formulation of geometric lines. Although Mita equates the rectilinear type with the physical concept of time, the former differs from the latter that is formulated as an axiomatic system including that of real number. Mita (1981=2003) criticizes the rectilinear type, which he characterizes as peculiar to modern societies, partly for its infiniteness that can bring about both boundness and nihility of life. Strangely he does not indicate problems pertaining to infinitesimal partition of modern systems of time whereas he emphasizes questions emerged from infinite extension of it. It can be said that he does not exactly understand difference between the physical concept of time as real number and the rectilinear type of social time he criticizes because of his neglect of rigorous examination in the form of axiomatic formalization¹⁰.

7. Conclusion

The investigation executed above shows that axiomatization of sociological concepts of time is possible at least. How social time differs from the astronomical time (Sorokin & Merton 1937) or the physical concept of time can be strictly determined by virtue of the method. The axiomatization of MFIT makes it clear that even MFIT, one of the most abstract and general social theories of time in Japanese, lacks

exactness from the view point of axiomatic formalization. MFIT may be more strictly generalized by axiomatization so as to be applied to more extensive and various forms of time which Mita does not assume. This is an advantage of axiomatic formalization to abstract semantic and pragmatic constituents in theories in order to investigate possibility of application to objects or fields which are not assumed originally. This paper obtains a provisional outcome which leads to comparative sociology with other sociological conceptions of time and inquiry into implications for empirical studies of social time.

Notes

- 1 This point makes it possible to understand Bergson's critique of concept of time more strictly. "Now, if space is to be defined as the homogeneous, it seems that inversely every homogeneous and unbounded medium will be space. For, homogeneity here consisting in the absence of every quality, it is hard to see how two forms of the homogeneous [that is, space and time: TA] could be distinguished from one another. Nevertheless it is generally agreed to regard time as an unbounded medium, different from space but homogeneous like the latter: the homogeneous is thus supposed to take two forms, according as its contents co-exist or follow one another" (Bergson, 1889=1910: 98).
- 2 In other words, this axiom means only that it is possible to determine univocally whether an element is included in T or not. It has no substantial or semantic implication.
- 3 In other words, any t has order relationships with the others. And it is not excluded that a predecessor can be the successor of its successor, that is, $t = \text{suc}(\text{suc}(t))$.
- 4 cf. note 2.
- 5 In other words, there are a finite number of social facts.
- 6 It can be said that a f is called event when it corresponds to a certain t .
- 7 Although MFIT is proposed under the name of Maki Yūsuke, a pseudonym of Mita, this paper uses "Mita" as proponent of MFIT.
- 8 It can be said that a t is symbolized by a f when they correspond with themselves.
- 9 In other words, any point of time has a unique social fact that corresponds to it and different points of time correspond to the different social facts respectively.
- 10 However, it goes without saying that his geometric metaphor is useful to describe time *representations* which people conceive in certain systems of social time.

References

- Asai, T., 2003, *Butsurigenshō no Sūgakuteki Syogenri: Gendai Sūributsurigaku Nyūmon (Mathematical Principles of Physical Phenomena: An Introduction to Modern Mathematical Physics)*. Tokyo: Kyoritsu Shuppan.
- Bergson, H., 1889, *Essai sur les données immédiates de la conscience*. (Pogson, F. L. (trans.), 1910, *Time and Free Will: An Essay on the Immediate Data of Consciousness*, Kessinger Publishing Company.)
- Fararo, T. J., 2002, Axiomatics and Generativity in Theoretical Sociology, in Szmatka, J., Lovaglia, M. & Wysienska, K. (eds.), *The Growth of Social Knowledge: Theory, Simulation, and Empirical Research in Group Processes*, Praeger Publishers. pp.167-181.
- Giddens, A., 1984, *The Constitution of Society*, Polity Press.
- Habermas, J., 1981, *Theorie der kommunikativen Handelns*, Suhrkamp.
- Luhmann, N., 1984, *Soziale Systeme*, Suhrkamp.
- Mita, M. [= Maki, Y.], 1981=2003, *Jikan no Hikaku Shakaigaku (Comparative Sociology of Time)*. Tokyo: Iwanami Shoten.
- Sorokin, P. A. & Merton, R. K., 1937, Social time: A methodological and functional analysis, *The American Journal*

of Sociology, **42**(5), 615-629.

Suppes, P., 1957, *Introduction to Logic*, Van Nostrand.

This work was supported by JSPS KAKENHI Grant Number JP19K02145.

見田「時間の4類型」・再考 —社会学的時間概念の公理論化 (1)—

高橋 顕也ⁱ

本稿は、公理論的形式化という観点から、20世紀後半の日本を代表する社会学者である見田宗介（真木悠介）の社会学的な時間類型論を考察する。反復的、円環的、線分的、および直線の時間という4つの類型からなるこの類型論が目指しているのは、近代的な時間システムをその他のシステムと比較することによって、生の拘束および虚無の淵源としての時間という問題を解明することである。本稿の公理論化は2つの段階からなり、いずれでも集合論の方法を採用する。第一に、本稿で論証される公理論化によって、P. A. ソローキンとR. K. マートンが定式化した社会的時間（social time）の概念から、「社会的時間の一般公理系」（GAST）と呼ぶべき公理系が抽出される。第二に、形式化によって見田の類型論に特徴的なさらに3つの公理が抽出される。すなわち、1) 象徴写像（mapping of symbol）、2) 不可逆性の公理（axiom of irreversibility）、および3) 終点の公理（axiom of endpoint）である。以上より本稿が示しているのは、第一に、社会学的な時間概念の公理論化は可能であるということ、第二に、見田による時間の4類型論（MFIT）の各類型は、「社会的時間の一般公理系」に対しておのおのに固有の公理を加えた公理系として再構成できるということ、そして第三に、公理論化という方法は、時間とは何か、社会的事実とは何か、あるいはそれらが実在しているのか否かといった存在論的な問いを不問に付すという利点があるのだが、時間の社会学的な諸概念や諸理論を再編成し比較するのにあたって有用であるということである。

キーワード：時間の社会学、社会的時間、公理論化、集合論、見田宗介

i 立命館大学産業社会学部准教授