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INDETERMINATE-ORIENTED TO RATIONAL-ORIENTED: JOHN CAGE, PAPER IMPERFECTIONS, AND GRAPHIC NOTATIONS

Abstract: Around 1904, the sociologist Max Weber observed the lifestyle of Protestants and proposed a theory of rationality focusing on the relationship between individuals' actions and their choices, value standards, and purposes. He then extended this theory to music, positing that the rational features of music are structural, systematic, intentional, functional, and interactive. However, these reasonable features appeared unreasonable when music entered its avant-garde phase—when music became unpredictable, chaotic, and open. Does this mean that avant-garde music was no longer rational? To unpack this question, this paper applies the theory of rationality to John Cage's *Solo for Piano* (1957–58) and delves into the compositional process to present rational features within indeterminacy. In the compositional process, Cage employed the graphic compositional system, including a drawing process and a means of translation. With this system, we may discover the process of rationalization, meaning that when chance-oriented material gradually transforms into the value-/purposive-oriented material—from paper imperfections to points, from points to notes—it presents a rationalization of the compositional material. In short, this paper applies the theory of rationality to *Solo for Piano* to discover its rational features and dissects the transformation of the compositional material to present rationalization.

Keywords: John Cage, indeterminacy, *Solo for Piano*, rational features, rationalization

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Introduction

In 1910, Max Weber developed the idea of rationality in music. He explored rationality through various aspects of music, including musical theories, notational systems, listening effects, and social needs. He recorded his observations in an unfinished draft, named *Die rationalen und soziologischen Grundlagen der Musik* (1921 [Eng.] *The Rational and Social Foundations of Music*, 1958), which was published by his wife, Marianne Weber, and a musicologist, Theodor Kroyer (1873–1945).[1] Weber was the first to identify rationalization in the development of music,[2] listing various factors to illustrate his statements. For instance, he used Pythagoras's studies to prove how mathematics constructs music, explained the functions of ancient music, illustrated religious relationships with musical instruments, and showed the development of musical instruments connected to weather and social class. Among these examples, we may notice that he attempted to extend the idea of rationality to music. Although Weber's contribution is foundational to the sociology of music, researchers and musicologists now pay more attention to popular music to counteract the overwhelming privileging of art music.[3] However, this shift in focus has resulted in a lack of investigation into his theory, leaving its potential largely untapped. Indeed, it is worth questioning why we have not conducted further investigations into 'other' music.

When speaking of 'other' music, it is the music of the 20th century that comes immediately to mind. One reason for this, of course, is that 20th century music was so fantastically varied, from Arnold Schoenberg's (1874–1951) atonality, to the experimental music of the New York School,[4] to György Ligeti's (1923–2006) electronic music.[5] The common thread linking

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[1] Max Weber, *The Rational and Social Foundations of Music*, Southern Illinois University Press, 1958.

[2] Theodor W. Adorno, Sound Figures, Meridian, Stanford, Calif, Stanford University Press, 1999; Brandon Konoval, "Max Weber and the Sociology of Music", in The Oxford Handbook of Max Weber, Edith Hanke Lawrence Scaff, and Sam Whimster (Eds), Oxford University Press, 2020, 468.

[3] John Shepherd and Kyle Devine, *The Routledge Reader on the Sociology of Music*, Routledge, 2015.

[4] The New York School was orbited around the experimental composers John Cage, Morton Feldman, Earle Brown, Christian Wolff, and the pianist David Tudor in the 1950s.

[5] The 20th century music is certainly not only limited in the selected composers and school. The reason of listing them in the introduction is because they offer a straight and directional understanding of the sense of the 20th century music.

these widely different types of music is that they all question the meaning of music. Does music have to be lyrical and melodic? Does music have to be composed according to the theory of harmony? Having posed these questions, they went on to produce music that was decidedly leftfield. For instance, John Cage (1912–1992) reinterpreted music as surrounding sound and employed silence in his musical works, most notably in *4'33"* (1952), in which silence was transformed into an absence of intended sound.[6] His groundbreaking innovations did not stop at silence. A few years later, in the late 1950s, Cage started to explore chance with *I Ching*, an ancient Chinese oracle text. Based on his exploration of chance, Cage then began his interpretations of indeterminacy. In his creations of indeterminate music, notations were no longer notations, at least not in the typical form of scores that we were familiar with. Cage applied random existences of beings (e.g., paper sheets) to his compositional process, and the result was certainly unpredictable. Now, to return to Weber's theory of rationality, when the compositional result is unpredictable, does that mean the music is no longer rational? Does the theory of rationality still apply to this type of music? With these questions in mind, this paper aims to apply the theory of rationality to indeterminate music to present the rationalization of the compositional materials and contribute a new perspective on it.

Methodology and research method

First, it should be stated that concepts of rationality are complex. However, along with complexity, rationality also offers us the plasticity to adapt concepts to objectives. Accordingly, this paper intends to decrease its complexity by sorting rationality into three categories: being methodical, functionality, and interactivity.[7] Then, based on these three categories, this paper aims to look into Cage's creative inspirations in order to demonstrate the process of rationalizing the compositional materials.

Second, this paper is positioned as qualitative research, using a critical and analytical method to dissect compositional materials. Specifically, this

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[6] James Pritchett, Laura Kuhn, and Charles Hiroshi Garrett, "Cage, John", *Grove Music Online*, 10, Oxford University Press, 2012. Date of access 1 October 2022 from https://www.oxfordmusiconline.com/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-1002223954.

[7] Chia-Ling Peng, "A preliminary investigation of the rational features of indeterminacy, using John Cage's *Solo for Piano* as an example", *Arts Review*, 2022 [Manuscript submitted for publication].

paper focuses on Cage's philosophical practice, compositional approach, and the graphic compositional materials in his indeterminate music work, *Solo for Piano*. This indeterminate music work is Cage's well-known piece that draws on his inspiration and interpretation of Zen Buddhism. For this reason, the theory of rationality will be used to reflect his philosophical pursuit (i.e., intentions, value standards, and purposes), along with the result (i.e., graphic notations), which will be used to investigate individual systems and the inner structure. From the perspective of Zen Buddhism, it would seem that there is no connection between compositional materials, as it attempts to grasp the pure facts of being rather than offer meanings by any constituent parts. However, Cage interpreted Zen Buddhism after his own fashion in *Solo for Piano*. As Cage comprehended, presenting the existence of the world is the central concept of Zen Buddhism; he regarded the 'existence' as the 'uneven surface of paper sheets', and offered musical meanings by various musical and non-musical symbols. The presenting process consists of two steps: a drawing process and a means of translation.[8] He marked uneven surfaces of paper sheets with dots, he then used either shapes, lines, or musical symbols to connect the dots, with these connections forming a series of links between the compositional materials. Connecting this idea with the central concept of Zen Buddhism, we may notice the uneven surfaces of paper sheets were the beings of the world, and Cage interpreted them through dots and drawings.[9] Through Cage's interpretation, therefore, the connections were established. As connection is one of the objects used to show the rationalization of compositional materials, I applied the concepts of network theory to present the results of the rationalization process. The key concepts in the network theory are actor, tie, dyad, triad, subgroup, relation, and network.[10] For the purposes of this paper, five concepts were selected to explain how to discover networks in a chaotic and unorganized work. First is the actor, which is a fundamental element that conducts actions, and can be an individual, corporation, or col-

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[8] James Pritchett, *The Music of John Cage*, Cambridge [England]; New York: Cambridge University Press, 1993.

[9] In this paper, I intend to use 'drawing' to generally include musical symbols that Cage used in *Solo for Piano*. This is because graphic notations not only consider conventional musical symbols (e.g., staff, clefs, accidentals, etc.) as symbols, but also put lines, shapes, numbers, etc., into considerations. Accordingly, this paper intends to use drawing to include compositional materials when applicable.

[10] Stanley Wasserman and Katherine Faust, *Social Network Analysis Methods and Applications*, Cambridge University Press, 2012, 17.

lective social unit.[11] When this concept is applied to *Solo for Piano*, the actors are the compositional materials. Second is a tie, which means a linkage between actors;[12] in this research, it indicates connections between materials. Third is a dyad, meaning a pair of actors and the tie between actors. This means a dyad is like a group that consists of two actors and a connection.[13] Here, it is expressed in the same way: the two materials and the link form part of an individual system. Fourth is a relation, which shows a link between one type of collection.[14] In graphic notations, I regard it as an individual system. The last is a network, which indicates a larger group of collections, including actors, ties, dyads, and relations.[15] When I apply this concept to compositional materials, it shows the inner structure. Put simply, this paper regards a compositional material as an object (actors), then attempts to build links between materials (tie), and then puts links together to show a part of the system (dyad). When putting different parts of the system together, it reveals the systems (relation); in bringing these systems together, the inner structure (network) will be revealed.

The final step of this paper is to visualize the results through Gephi, a visualization software that can demonstrate visual network analysis.[16] Gephi was firstly applied for investigating Jazz networks with individual, bands, subgenres and records as main factors,[17] the finding effectively demonstrates the distribution of Jazz networks, and therefore, this research attempts to visualize the network through this software. Gephi uses its own terms: source, target, and weight. In this paper, the term of source represents the subject, the term of target represents the object, and the term of weight means the amount of source and target. This means that source and target show corresponding direction of visualization. For example, numbers are one kind of

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[11] Ibid.

[12] Ibid.

[13] Ibid.

[14] Ibid.

[15] These terms (actors, ties, dyads, and relations) represent essential components of the network. From actors to relations, they show a gradual process of building networks, and therefore, the actor here does not refer to conventional impression of actor (a person who conducts actions); instead, it represents the smallest element of the network theory.

[16] Tommaso Venturini, Mathieu Jacomy, and Pablo Jensen, "What do we see when we look at networks: Visual network analysis, relational ambiguity, and force-directed layouts", *Big Data & Society*, 8/1, 2021, 1.

[17] Ibid, 7.

material with two types of functions; in this case, the number is a node of source, which takes a position of subject having two types of nodes as targets; the targets take a position of object and represent two functions of the number; while weight means the amount of the material in the notation. To put it in another way, the material-based links focus on how materials and their functions construct the network. As such, source and target mean notations themselves, compositional materials, and functions of materials simultaneously, whereas weight means the number of notations and compositional materials. Another type of link is notationally based, which focuses on the link between notations. This means that when notations build links, they construct an individual system consisting of compositional materials, functions of materials, notations, and the amounts of these elements. After visualizing these links, the results will present a part of the inner structure of *Solo for Piano*. With several links like this, they construct an overall network of this musical work.

Three categories of Weber's rationality: being methodical, functionality, and interactivity

To reduce the complexity of rationality, this section begins with Weber's observations on Protestantism, connecting this to his applications on conventional Western music. In investigating concepts of rationality, Weber first investigated a rational element of religion, doctrine,[18] delving into the predestination of Calvinists. According to this doctrine, Calvinists believe in God and secure their salvation by adhering to an assiduous way of life. From here, the first feature of rationality, being methodical, is apparent. This feature was transferred to the methodical formation of music when Weber applied this to Western music in his *Rational and Social Foundations of Music*. In this work, Weber asked the question of how music is built. He arrived at his answer by dissecting the arithmetical structure of intervals, where he researched Pythagoras's studies to present the structural feature of music. For example, Weber listed a formula $\frac{n}{(n + 1)}$ resting upon a vibration ratio to present a subdivision of intervals to demonstrate the arithmetical existence of

music. He demonstrated this with an octave $\left(\frac{1}{2}\right)$, which harmonically divides

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[18] Max Weber, Hans Heinrich Gerth, and C. Wright Mills, *From Max Weber: Essays in Sociology*, Routledge classics in sociology, Milton Park, Abingdon, Oxon, New York, Routledge, 2009, 286.

into a fourth $\left(\frac{3}{4}\right)$ and a fifth $\left(\frac{2}{3}\right)$; the fourth can be subdivided into a major third $\left(\frac{4}{5}\right)$ and a major halftone $\left(\frac{15}{16}\right)$, and the fifth comprises a major third $\left(\frac{4}{5}\right)$ and a minor third $\left(\frac{5}{6}\right)$. Those constructions of intervals present in arithmetical formation are the fourth $\frac{4}{5} \times \frac{15}{16} = \left(\frac{3}{4}\right)$, the fifth $\frac{4}{5}\left(\frac{5}{6}\right) = \left(\frac{2}{3}\right)$, and the octave $\left(\frac{3}{4}\right) \times \left(\frac{2}{3}\right) = \left(\frac{1}{2}\right)$.[19]

The second feature from his observations of Calvinism is functionality. The functionality of religion uncovers a wide-ranging discussion, which focuses on the following questions: what is the position of religion? How did religion actively influence believers? How did people take action under the influence of religion? Based on the development of Western societies, it is apparent that most people adopted a relatively passive position. They swore obedience to their religion and built their civilization, whether as a base or superstructure. Naturally, this viewpoint does not imply that individuals obeyed orders blindly without thought or motivation. Rather, it suggests that at that period in time, people's ethical standards were largely based on or reinforced by their religious beliefs. In other words, the force of religion inculcated its teachings in people, who embraced them and behaved accordingly. This ongoing process led to the establishment of aesthetic and moral standards as well as to their reinforcement. Religion thus actively participated in human progress. This illustrates how religion has an impact on people's thoughts and actions, affecting how they react, behave, and measure things. From this discussion, I generated the feature of functionality to reflect how Weber validly applied rationality to music. In Weber's brief description, we may notice religious influences at the mental level. It created loneliness, anxiety, uncertainty, and fear, but it also provided solutions to this mental state. Accordingly, these emotions (derived from predestination) became motivation stimulating believers to achieve success, which accidentally formed the spirit of capitalism. From this point, religion acted as a catalyst that spurred believers to methodically live worldly lives and convinced them that success in a calling was a sign of being a chosen one. Although the underlying feature of lifestyle and religion is being methodical, the same description reveals another feature, namely functionality. Again, Weber did not invariably apply the whole theory to music. Rather, he dissected the develop-

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[19] Max Weber, *The Rational and Social Foundations of Music*, Southern Illinois University Press, 1958, 3.

ment of organs (a musical instrument) and presented the importance of churches and monasteries to illustrate their functions.

He emphasized that "only ecclesiastical use offered a solid basis for the development of this instrument, while the monastery organization was the only possible base on which it (organs) could prosper".[20] Because of the unique status of monastic organizations and the dual identities of monks, they might be seen as the setting for the development of organs. In other words, it was common practice for organists and organ builders to be employed by monasteries as either technicians or monks, and as such they had an advantage in controlling the temperament of organs and innovating organs.

The last feature is interactivity, which I extracted from Weber's discussions on general interactions at the societal level. By listing the benefits of the piano, such as amplifying the tone, maintaining the tone, and creating beautiful chords with precise pitch, he made it clear that the popularity of the piano was closely related to market demands, the rise of the middle class, and regional weather. With these benefits, the piano was the only musical instrument that satisfied music aesthetics at that time. Along with the benefits, the 'coincident' appearance of Mozart, Liszt, and other performers also sparked public acclaim, which then raised demand for music publishers and concert managers, ultimately resulting in the commercial success of pianos. In short, interactivity is a trait that can be unintentional or purposeful. The fundamental concept of incidental interaction alludes to the unintentional creation of capitalism, which was the result of Calvinists' assiduous, profit-seeking, and meticulous way of life. The emergence of capitalism was an unforeseen phenomenon, just as the presence of musicians, including but not limited to Mozart and Liszt, can be unpredictable as well. This unpredictability then stimulated intentional interactions, such as preferences in musical instruments and compositional methods. The parallel example is the intentions that motivated Calvinists to pursue salvation through a conscientious lifestyle. In brief, the interactions are variable and may include personal choices, considerations, preferences, aesthetics, and perceptions. Regardless of how the description changes, however, the central idea hinges on the shaping of objects – how societies were formed and how musical instruments were developed.

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[20] Ibid., 114.

Transformation and visualization of paper imperfections

In applying three rational features to Cage's *Solo for Piano,* we find that being methodical is shown in his compositional technique, that functionality is shown in functions of compositional materials, and that interactivity can be found in interactions between the composer and performers. Cage designed the basic framework and allowed performers to interpret this work. In the chosen process, Cage and his performers construct invisible interactions. This is similar to an audience's emotional resonance when it appreciates a performer's music.[21] This section explains the transformation of paper imperfections and visualizes the systems and inner structure constructed by these imperfections.

In 1952, Cage attempted to present surrounding sound for the first time with Bob Rauschenberg, Merce Cunningham, Charles Olson, M. C. Richards, and David Tudor at Black Mountain College.[22] Following the success of the attempt, Cage altered his focus from silence to chance-oriented materials. The materials here do not refer to surrounding sound but to random occurrences in the world, such as paper imperfections. One distinct example is *Concert for Piano and Orchestra*, which consists of 63 pages covering 84 types of notations.[23] During the process of creation, Cage invented a graphic compositional system that includes two steps: a drawing process and a means of translation.[24] This graphic compositional system is the key to presenting the transformation of paper imperfections. In the drawing process, Cage dotted the uneven surface of papers, drew shapes or lines by connecting them, and then offered musical meaning through drawings, such as numbers, staff, clefs, accidentals, and grouping as the means of translation.[25] In these pro-

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[21] Zachary Loeffler, "'The only real magic': Enchantment and disenchantment in music's modernist ordinary", *Popular Music*, 38, 2019, 13.

[22] John Cage, *Silence: Lectures and Writings*, Middletown, Conn, Wesleyan University Press, 2011.

[23] James Pritchett, Laura Kuhn, and Charles Hiroshi Garrett, "Cage, John", *Grove Music Online*, 10, Oxford University Press, 2012. Date of access 1 October 2022 from https://www.oxfordmusiconline.com/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-1002223954.

[24] James Pritchett, *The Music of John Cage*, Cambridge [England], New York, Cambridge University Press, 1993.

[25] Chia-Ling Peng, "Investigating Variable Compositional Materials – Taking Cage's *Solo for Piano* (1957–58) as an Example", *International Journal of Music Science, Technology and Art*, 4, 2022, 4.

cesses, Cage did not just 'freely' apply chance-oriented materials but also gave creative freedom to performers. Put another way, Cage's focus was not to duplicate the results of performances but rather to vary the realizing processes.[26] With this in mind, we are now ready to look into the different stages of paper imperfections.

As mentioned above, Cage took randomly generated paper imperfections as the compositional material. Here, the material is chance oriented. When the materials were marked and offered meanings by Cage, these materials underwent a process of being determinate; they were transformed into performable materials, rather than being meaningless paper imperfections. Nevertheless, this does not mean that they are determinate; instead, their status is still uncertain, requiring performers to determine them, and as such are indeterminate-oriented materials. When performers undertake their realization, indeterminate-oriented materials go through the process of being determinate, after which they become rational-oriented materials. From this serial process (chance-oriented, indeterminate-oriented, and rational-oriented), one becomes aware of the importance of a performer's choices, decisions, and actions. This importance reflects Weber's rationality. Habermas explained rationality as value-rational actions, meaning that actions represent the individual's expression of preferences and value standards,[27] while purposive-rational actions relate to the planning, acting, and creating of behaviors that assist individuals in achieving their goals. Applying value-rational and purposive-rational actions to a performer's realization, we may ask why performers choose these notations and how performers conduct these notations.

To return to the theory of rationality, we can also conclude from Weber's discovery that the main characteristics of rationality are systematic and structural.[28] To investigate systems and structure, compositional materials are fairly important. As such, I chose to put compositional materials in order first, before determining which compositional materials were repeated. By offering meanings to compositional materials in a repetitive way, Cage facilitated the formation of rationality (systematic and structural) in *Solo for*

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[26] James Pritchett, Laura Kuhn, and Charles Hiroshi Garrett, "Cage, Jon", op. cit.

[27] Jürgen Habermas, The Theory of Communicative Action, Boston, Beacon Press, 1984.

[28] Max Weber, *Protestant Ethic and the Spirit of Capitalism*, Hoboken, Taylor and Francis, 2013.

Piano. Accordingly, this paper applies the network theory, along with its key concepts, to present the systems and the inner structure.

The network theory indicates complex interactions through several links that are connected by several sets of nodes.[29] Turning to the main elements (nodes, links, and networks), these reflect the interplay between randomness and order.[30] Applying this theory to society, we may regard objects in society as nodes: when each node cooperates/interacts with another, a network is established, and when different types of interactions are formulated, these interactions form a multilayer network.[31] The concepts of networks and multilayer networks can be applied to various objects, as long as there are interactions across objects or layers. Drawing on this theory, five key concepts can be adapted to *Solo for Piano*, namely, actor, tie, dyad, relation, and network. An actor represents compositional material; a tie represents a connection between compositional materials; a dyad represents a pair of compositional materials and the connection between them (this is also part of an individual system); a relation represents a collection of dyads (this means that a relation represents an individual system); a network indicates a combination of all the concepts and therefore shows the inner structure. Applying these concepts to Cage's *Solo for Piano*, this paper aims to explore two types of relations: the material-based relation, and the notation-based relation. Accordingly, in the material-based relation, the connections between materials and their functions were discovered, while in the notation-based relation the connections between notations were the primary focus. In this section of the paper, Gephi is used to represent the networks straightforwardly, since merely categorizing or describing their links may not adequately convey the system and structure. Taking notation B (see Example 1), notation D (see Example 2), notation L (see Example 3), and notation BR (see Example 4) as examples, the results are as follows.

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[29] Ginestra Bianconi, "The Structure of Single Networks", in: *Multilayer Networks*, Oxford University Press, 2018, 9.

[30] Ibid.

[31] Ibid., 80.

Example 1: Notation B in Cage's *Solo for Piano*

Example 2: Notation D in Cage's *Solo for Piano*

Example 3: Notation L in Cage's *Solo for Piano*

**Example 4:** Notation BR in Cage's *Solo for Piano*
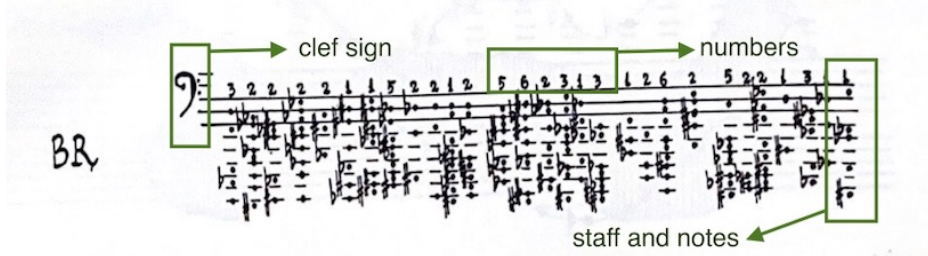
Notations B, D, L, and BR use numbers, clefs, staffs, inked rectangles, accidentals, grouping notes, and arrows as compositional materials. When looking into performing instruction, we notice that Cage specifically pointed out similarity in the instruction. For instance, notation D is like notation B, the clef of notation L is like notation B, the number of tones in notation BR is like notation B. When putting this relation into consideration, this paper considers notation B as the foundation of notations D, L, and BR. In addition, the similarity is shown in their visual side. They use vertical direction more than horizontal and use numerals to represent the number of playing notes. Here, from aspects of the compositional materials and the visual side, these notations form system B.

Nevertheless, the problem is with notation L, which uses grouping (a means of translation) that does not show in notation B or other notations of this system. As mentioned above, systems construct the inner structure, and Cage repeatedly used compositional materials. Thus, in the instruction of notation L, we can find out that Cage wrote "perimeter is like notation A" (see Example 5). In other words, notation L can belong to the system of notation A (see Example 6) and B at the same time. The common notation, which in this case is notation L, strengthens the interrelation between the two systems.

**Example 5:** Instruction of notation L

Example 6: Notation A in Cage's *Solo for Piano*
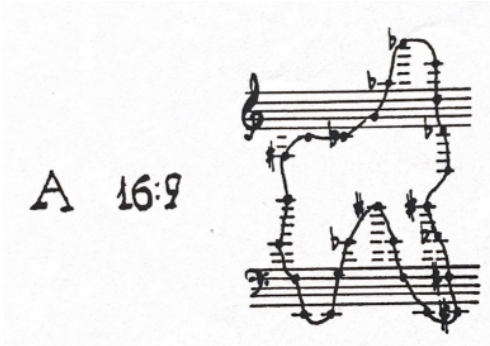
After categorizing the materials, the next stage is to build connections be-tween the compositional materials and notations and between notation and notation. The connections will be presented through Gephi. To visualize the connections of these notations, three sets of data were input ed—composi-tional material to notations at a visual level, compositional materials to nota-tions at a functional level, and notation to notation (this connection shows the relation between notations). As shown in Example 7, thicker ties (lines)

Example 7: Visualization of system A (left-hand side) and system B (right-hand side). In general, the visualization shows that the two systems form part of the inner structure
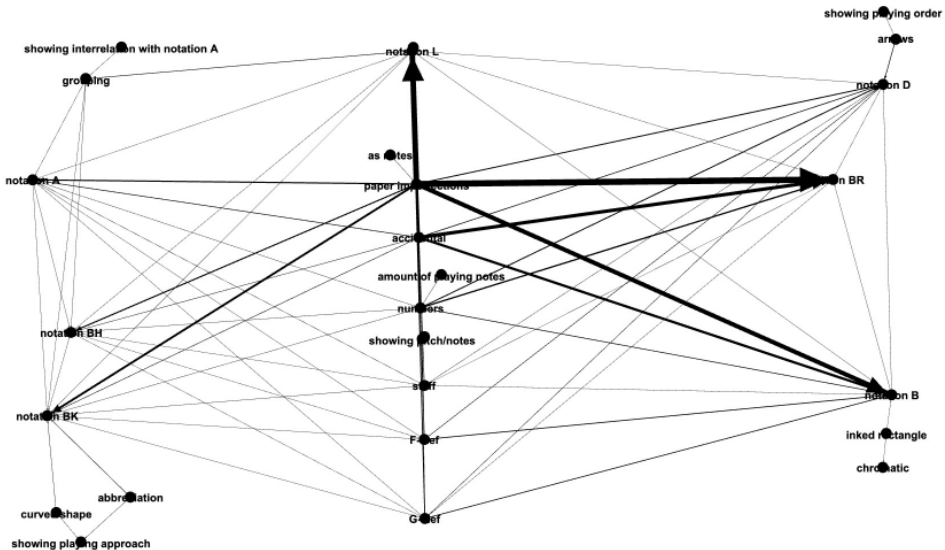
show more weights, meaning there were more identical compositional materials in that notation. The left-hand side shows system A and the right-hand side shows system B; the common compositional materials and the common notation (notation L) has been placed in the middle. From Example 7, therefore, we can easily recognize how the two systems link with one another and how they form part of the inner structure.

Conclusion

From the perspective of rationality, this paper shows three features (being methodical, functionality, and interactivity) that can be found in Cage's compositional technique, material functions, and interactions between him and his performers. Using these features, this paper dissects a serial transformation of compositional materials, from chance-oriented to indeterminate-oriented, then becoming rational-oriented. Along with the transformation, these features bring out the potential of visualizing systems and their inner structures. In addition to the theory of rationality, the application of the network theory strengthens the possibility of building links to reveal individual systems and their inner structures. Using Gephi can effectively visualize the results so readers can easily comprehend invisible systems and their inner structures. After a series of processes, this paper shows the transformation of compositional materials and the rational features in indeterminacy. This paper is located as a preliminary investigation and is still in need of further adjustments. Even so, with Weber's theory of rationality, we may open a new avenue for researching graphic notations.

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Summary

Around 1904, the sociologist Max Weber observed the lifestyle of Protestants and proposed a theory of rationality focusing on the relationship between individuals' actions and their choices, value standards, and purposes. He then extended this theory to music, positing the main rational features of music to be structural, systematic, intentional, functional, and interactive. When applying these features to Cage's *Solo for Piano*, the serial transformation of the status of compositional materials may be revealed. In addition to the transformation, this research also applies Gephi to reinforce the rational features of *Solo for Piano*, in an effort to present the systems and inner structures and uncover a new angle of indeterminacy.