

Jihoon Kang*, Sujung Kim**

A Study on the Analysis of the Interrelationship between the Epic of Gilgamesh and the Bible Using Text Mining: Focusing on the Episode of the Great Flood***

SUMMARY

The development of human civilization is a continuous process of imitation and creation based on exchange. Most historical research is performed qualitatively, so consequently, historical interpretations tend to be biased with personal or subjective viewpoints. In this context, Bible is the most-read book in history and comparative studies are steadily conducted owing to its similarities with the myths of ancient civilizations. This study combines qualitative and quantitative analysis to analyze the interrelationship between a myth and the Bible. Specifically, intertextuality analysis was performed around the great flood episode in Mesopotamia's Epic of Gilgamesh and the Bible's Genesis. Text mining-based association rule analysis and word cloud analysis were combined to verify this. Intertextuality analysis revealed the interrelationship between the Epic of Gilgamesh and the Bible; moreover, text mining helped verify the association in intertextuality analysis. Through this, the study proposes a research method for civilization exchange studies by objectively approaching the flow and directionality of exchanges among civilizations in the ancient Mediterranean regions. Furthermore, along with civilization exchange studies, a practical convergent research method for studies in the areas of humanities, regional studies, and history was suggested.

Keywords: Data science, Epic of Gilgamesh, Great flood, Mesopotamia, Myth, Mesopotamian civilization, Bible, Text mining, Association analysis, Civilization Exchange studies, Research methodology.

* Institute for Mediterranean Studies, Busan University of Foreign Studies, Busan, Republic of Korea.

** Department of Arab Studies, Busan University of Foreign Studies, Busan, Republic of Korea.

Correspondence Address: Jihoon Kang, Institute for Mediterranean Studies, Busan University of Foreign Studies, 46234) 65, Gamsaem-ro 485beon-gil, Geumjeong-gu, Busan, Republic of Korea. E-mail: mooswon@bufs.ac.kr.

*** This paper was conducted in 2018 with support from the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2018S1A6A3A02022221).

1. Introduction

The development of human civilization is a continuous process of imitation and creation based on exchange. The Mediterranean region, defined as the “furnace of human civilization”, is an open space where diverse cultures settled around the Mediterranean Sea and advanced human civilization through mutual exchange. The developmental forms of civilization in Mediterranean history are not sorted by individual civilization, nation, and chronicle. Respective cultures of the Mediterranean are closely connected to each other through exchange and are characterized by the continuity of later civilizations accepting, succeeding, and developing earlier civilizations.

Character system, scientific technology, one’s view of life, cosmology, and theology system of the Oriental region, which served as the fertile ground for human civilization, directly influenced the synchronically and diachronically adjacent times and the progress of the Mediterranean culture. Later civilizations such as Greece and Rome that accepted the Oriental civilization further advanced the scholarly knowledge and culture of their forefathers, simultaneously delivering their cultural and academic achievements to later civilizations such as the Islamic civilization. This is the developmental process of Mediterranean culture and is also a continuous process of imitation and creation.

Mesopotamian culture, which grew in Tigris and Euphrates riversides, is humanity’s oldest civilization left in records and concurrently a civilization that has continued on for the longest period. Based on a fertile crescent moon belt, Mesopotamia’s cultural scholarship, belief system, scientific technology, and character system expanded to nearby regions. Surrounding countries accepted and imitated these, developing them into their own unique culture. This study focuses on this historical developmental process of the Mediterranean region to examine the interrelationship between the Mesopotamian civilization’s Epic of Gilgamesh and Judaism’s scriptures Old Testament (Tanakh, Hebrew Bible). Specifically, the study is performed on the 11th clay tablet of the Epic of Gilgamesh and the great flood episode in the Old Testament.

Gilgamesh was the ruler of Uruk (Erekh in the Bible) around 2600 BCE. The Epic of Gilgamesh, depicting many episodes with him as the protagonist, is known to have been recorded in the Babylonian age (Hwang, 2008). The Epic of Gilgamesh is the oldest existing literature recorded in the Akkadian and Sumerian language and comprises 12 clay tablets in total. In particular, the great flood story of the Epic of Gilgamesh is mentioned considering its similarity with Genesis’s flood story of Noah

that starts from the 15th line to the 196th line on the 11th of the 12 clay tablets, comprising 181 lines in total (Kong, 2021).

The Old Testament and Hebrew scriptures record the stories passed down in east Mediterranean regions including Mesopotamia, Levant, and Egypt around 1500–400 BCE. Moreover, the Old Testament was recorded in the age of Abraham, referred to as the ancestor of faith. At the time, cities that were flourishing the most in the Mesopotamian region were Uruk and Ur—the latter being Abraham’s hometown.¹¹

According to the aforementioned, to assume that the Mesopotamian culture, which created an advanced culture in the ancient Mediterranean region, and the various episodes of the Epic of Gilgamesh, which contain this, directly or indirectly influenced not only the Bible but also the religion or thought of the Mediterranean civilization is reasonable.

This study analyzes this interrelationship by comparing the content conveyed in the Epic of Gilgamesh and the Bible not from a religious perspective but from a scholarly perspective. As most historical research is conducted by a qualitative study, there is a tendency to be biased with personal or subjective viewpoints in historical interpretation. Therefore, this study analyzes the similarity between the Mesopotamian Epic of Gilgamesh and the Bible through intertextuality and combines a quantitative analysis study using data to verify this. The study evaluates civilization exchange studies, which contemplate the process of a culture spreading and transforming through the exchange, providing research methodology for guaranteeing the efficiency of academic studies such as humanities and regional studies.

2. Related studies

2.1 Studies on the association between the Epic of Gilgamesh and the Bible

Studies on the Epic of Gilgamesh have been steadily conducted both in Korea and overseas, and its area of research is expanding as well. Representatively, George (2003; 2020) has consistently deciphered and surveyed the cuneiform script on the clay tablets where the Epic of Gilgamesh was recorded under the topics of *The Babylonian Gilgamesh Epic: Introduction, Critical Edition and Cuneiform Texts*, *Epic of Gilgamesh: The Babylonian Epic Poem and Other Texts in Akkadian and Sumerian* and more.

Research on the interrelationship between the Epic of Gilgamesh and the Bible tends to be conducted in bulk by overseas scholars. Concerning this, these are the major

¹¹ Terah took his son Abram, his grandson Lot son of Haran, and his daughter-in-law Sarai, the wife of his son Abram, and together they set out from Ur of the Chaldeans to go to Canaan. But when they came to Harran, they settled there (Genesis 11:31).

overseas research outcomes regarding the interrelationship between the great flood story of the Epic of Gilgamesh and the story of Noah in the Old Testament.

Pryke (2019a) addressed thematic research on how the Epic of Gilgamesh influenced the Bible in *The Influence of Gilgamesh on the Bible, Gilgamesh: God and Heroes of the Ancient World*, and Chen (2013) examined the association between the Epic of Gilgamesh and the Bible under the topic of the flood story in *The Primeval Flood Catastrophe: Origins and Early Developments in Sumerian and Babylonian Traditions*. Moreover, Fisher (1970) compared and analyzed the contexts of the great flood story in the Epic of Gilgamesh and Genesis and studied their association in *Gilgamesh and Genesis: The Flood Story in Context*. Additionally, Njozi (1990) described the flood story mentioned in the Quran, and Islamic scriptures, from the perspective of kinship and history, along with the content of the Epic of Gilgamesh and the Bible under the topic of *The Flood Narrative in The Gilgamesh Epic, The Bible and The Quran: The Problem of Kinship and Historicity*.

In Korea, studies on the Epic of Gilgamesh have been conducted by researchers in the science of religion, but most of them are not equipped with specialized knowledge in cuneiform script and instead rely on references to conduct research. Regarding this, Bae (2002) has covered Noah's flood story under the big topic of the Bible versus mythic stories, while Hwang (2008) conducted a comparative study of the episode contained in Gilgamesh and the Bible under the topic of the Epic of Gilgamesh and the Bible. Furthermore, Park (2011) conducted a comparative study on the Epic of Gilgamesh, as well as Enuma Elish and various other *Mesopotamian myths and the Bible* text under the topic of Mesopotamian myths and the Bible. Accordingly, while the interrelationship between the Epic of Gilgamesh and the Bible has been continually researched in Korea and overseas, most comprise subjective text analysis based on an intertextuality research methodology.

2.2 Association analysis and word cloud

Association analysis extracts interrelationships between a large collection of keywords or words with a text mining-based unsupervised machine learning technique. In particular, the frequency of concurrence among the words is analyzed to derive associative relationships. These are then utilized to identify the topic pertaining to a specific text or flow of the text content.

In other words, Association analysis allows inferring the subject or content of a document. The Apriori algorithm is a representative algorithm for discovering association rules. Association rules between data are created based on the frequency of the occurrence of data, and in this study, association rules between words are

created based on the frequency of the occurrence of words. Kim, Kim, and Lee (2018) suggested a process of dynamically classifying the associated text by using topic modeling and association rules in the study of *Dynamic Text Categorizing Method using Text Mining and Association Rule*. In the study *Group-wise Keyword Extraction of the External Audit using Text Mining and Association Rules*, Seong, Lee and Jung (2022) examined a methodology based on text mining and association rules analysis for automatically categorizing the associated text and extracting group-wise key vocabulary that determines the differences among groups. In this way, association analysis is used as an analysis method for the identification of research trends, automatic categorization of texts, keyword categorization, term analysis, and so on.

Word cloud is a visualization technology that visually shows the frequency of word occurrence in a document. Core keywords frequently appearing in a specific document can be intuitively grasped through word cloud, and the content and subject of the document can be inferred through this. Word cloud, especially, is a representative text mining technology for analyzing unstructured text, and it is commonly used to infer the subject of a document because it extracts key themes or keywords from a large amount of text and expresses them in an easy-to-understand manner.

2.3 Intertextuality research

Intertextuality refers to the property of association between texts². This is a phenomenon in which a text, when it was recorded or interpreted, is directly or indirectly influenced by a previous text. Intertextuality became the subject of research in the era of post-structuralism and postmodernism. Julia Kristeva (1941-), a French philosopher and semiotician, first used the term ‘intertextuality’ in 1966. According to this perspective, all texts are built as a mosaic of quotations, and all texts represent the acceptance and transformation of another text in contemporary times, intertextuality includes notions such as pastiche, mimesis, and modulation through a broader extension of its meaning. Since the 2000s, all cultural products including music, films, paintings, and literary works all fall under intertextuality and are intertextual (An, 2007). Intertextuality has been used as a traditional analysis method for a comparative study among entities.³ In relation to this, Cheung-O An investigated whether a text is plagiarized from the perspective of intertextuality, a subcategory of text linguistics, to sort the scope and regulations of plagiarism to some

2 The property of association means that all texts always have the potential to be combined with other texts. All texts continue non-linearly through combination with other texts and free association (Yoo, 2017:43).

3 It means texts such as novels, comic books, and films or media such as films, radio, and drama as well as all entities that are subject to comparison.

degree in his study (2007). As such, intertextuality makes a quantitative comparative analysis of two texts to allow an inference of similarities or associations between the compared subjects.

This study analyzes the interrelationship between a myth and the Bible through a text-mining-based association analysis technique. Studies on the association between myths and the Bible have been conducted continuously. Previous research on the association between myths and the Bible was performed using a qualitative research methodology based on intertextuality. However, as a trait of qualitative research, the researcher's subjective views could reflect in their research content without having some grounds, which could hurt the credibility of the study. To avoid this issue, we performed intertextuality analysis combining data-based quantitative analysis. As the technologies of analyzing big data such as data mining are based on statistical techniques, the occurrence frequency of a specific word, especially quantitative data with high figures, greatly influences analysis. Yet, we cannot rule out the possibility that a key term determines the context and flow of the text regardless of occurrence frequency in interpreting a specific text. Hence, we combine intertextuality analysis to complement this. This study has tremendous scholarly significance in making an attempt to advance the field of Korea's civilization exchange studies, reassessing the history of civilization with respect to the Mediterranean civilization.

3. Research method

In this study, association analysis, and word cloud analysis are conducted for the Bible and the Epic of Gilgamesh, respectively. Through this, the keywords that are represented in the Bible and in the Epic of Gilgamesh as well as the relationship between words are identified. Afterward, the relationship between the two documents is verified by comparing and analyzing the keywords that make up the Bible and the Epic of Gilgamesh as well as the relevance and connection between words. In addition, intertextuality analysis is performed in parallel for more accurate verification. Finally, the relevance between the two documents is verified again by comparing and analyzing the contents of the intertextuality analysis, association analysis, and word cloud analysis. The R software package was used for data preprocessing, analysis, and visualization in this study.

3.1 Research Procedure

The research procedure for analyzing the interrelationship between the Epic of Gilgamesh and the Bible is shown below in Figure 1. After collecting data on the Korean Bible and the Epic of Gilgamesh online, data preprocessing for association

rules analysis and word cloud analysis were performed respectively. Detailed procedure and content on the preprocessing are addressed specifically in the following section. Afterward, association rules analysis and word cloud analysis were both conducted on the subject of the preprocessed data. To guarantee the efficiency of analysis in the process, intertextuality analysis was also conducted.

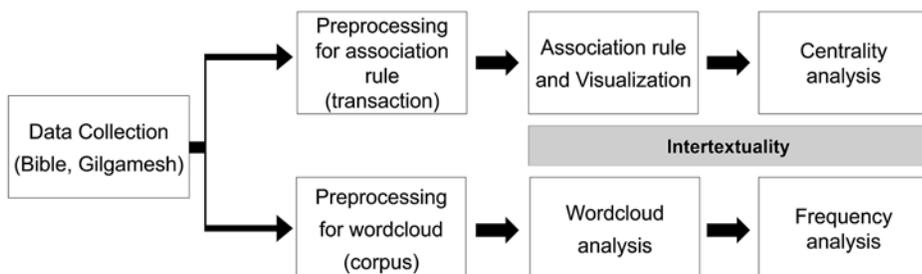


Figure 1. Research Process.

3.2 Subject of data collection

The data for analysis were collected from the Epic of Gilgamesh’s 11th clay tablet⁴ and the great flood episode of Genesis (Chapters 6-9) in the Bible (Korean Bible Society, 2022). As regards language, the Korean versions were collected. The Epic of Gilgamesh is written in Sumerian, and the Bible is in Hebrew and Aramaic. Since the languages of the Epic of Gilgamesh and the original text of the Bible are not the same, there is no choice but to use a translation of the texts. Therefore, the use of Korean texts for digital examination is valid, considering that there is no such data-based analysis of the interrelationship between the Epic of Gilgamesh and the version of the Bible in Korean and overseas studies. The reason for limiting the analysis scope to Genesis and the Epic of Gilgamesh’s 11th clay tablet is as follows. Analysis was conducted on the subjects of the entire Bible and the entire Epic of Gilgamesh according to the research procedure in Figure 1. As a result of analysis, while some similarities could be extracted from a large frame such as creation myth and Noah’s ark, detailed association could not be extracted. The reason can be found in existing studies that compared and analyzed myths and the Bible. Existing studies on the association between myths and the Bible found that the Bible showed partial similarities with various ancient myths rather than showing similarity with the

⁴ The clay tablet text is a translation of George’s *Epic of Gilgamesh: The Babylonian Epic Poem and Other Texts in Akkadian and Sumerian* (2020) into Korean, Kyunghye Gong’s *Epic of Gilgamesh* (2021) was used. The reason is that it is the best extant text of the Epic of Gilgamesh, which introduces the relevant research in its most complete form.

entirety of a specific myth (Kim, 2021). In other words, an experiment confirmed this that making a comparative analysis of a single myth with the entire Bible was not suitable for the hypothesis verification method of this study. Consequently, an episode that has been researched to demonstrate similarity was selected as the scope of analysis.

3.3 Preprocessing

Data preprocessing was conducted separately on both the Epic of Gilgamesh and the Bible. The preprocessing process is shown below in Figure 2. The Apriori algorithm is the representative algorithm for association analysis. After collecting data, transaction objects were generated to apply the Apriori algorithm for removing stopwords and creating association rules. Moreover, a corpus was generated for word cloud analysis to remove stopwords; subsequently, a matrix was generated to apply frequency analysis and word cloud.

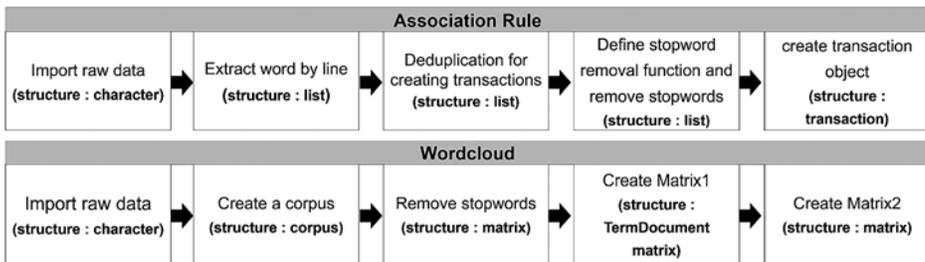


Figure 2. Process of Preprocessing.

4. Analysis of interrelationship between the epic of Gilgamesh and the Bible

4.1 Intertextuality analysis

Myths of geographically close regions comprise many similar episodes. The flood story is universally exhibited in myths that emerged in the regions of the ancient Orient and Mediterranean areas. The Egyptian myth of the ancient Egypt civilization records a flood story in the funeral text “Book of the Dead” (Kim, 2020:345); the Mesopotamian civilization mentions a flood in the Epic of Gilgamesh; while Greek myths record an episode of infuriated Zeus causing a flood (Lee, 2022). It is reasonable to speculate that the episodes of the Orient civilization, which precedes the others, must have affected the later civilizations — a general phenomenon that occurred through exchange between civilizations.

1) Epic of Gilgamesh

Mesopotamian civilization's Epic of Gilgamesh was recorded in 12 clay tablets inscribed with cuneiform script. Of them, the content of the 11th clay tablet comprises the flood story. The narrative of the clay tablet develops into a story wherein Gilgamesh hears an epic tale from Utnapishtim who has obtained eternal life by surviving the flood. The content mentioning the flood story is as follows.

*Shuruppak, a city that you surely know,
situated on the banks of the Euphrates,
the city was very old and had gods inside it. The hearts of the Great Gods moved them to
inflict the Flood. Their Father Anu uttered the oath (of secrecy),*

Hero Enlil was their Adviser,

God Ninurta was their Chamberlain,

God Ennugi was their guardian. [Tablet XI.11–20] (Kong, 2001:133–134)

These verses confirm that there was a flood at the time and that this event was planned by several gods including Anu and Enli. Meanwhile, another god Ea instructs one person (Utnapishtim) to make an ark (a vessel with a roof) as a way to survive the flood and directs him to board all life on the ark. After receiving Ea's instruction, Utnapishtim makes the ark and paints it with bitumen according to the direction. The relevant content is as follows.

the carpenter carried his hatchet ... the weak brought whatever else was needed ...

[Tablet XI.23–42] (Kong, 2001:133–134)

O man of Shuruppak, son of Ubartutu

*Tear down the house and build a boat! Abandon wealth and seek living beings! Spurn
possessions and keep alive living beings! Make all living beings go up into the boat. The
boat which you are to build ... roof it over like an ark ... I understood and spoke to
my lord, Ea ... I cannot reside in your city ... I will go down to the ark to live with my
lord, Ea." [Tablet XI.50–54] (Kong, 2001:133–134)*

*All the living beings that I had I loaded on it, I had all my kith and kin go up into the
boat. All the beasts and animals of the field and the craftsmen I had go up.*

[Tablet XI.81–85] (Kong, 2001:136)

As it can be seen from the text, Utnapishtim loaded the ark with all living things following Ea's instructions. It is confirmed that not only his relatives but also the craftsmen boarded the ark. Meanwhile, the flood went on for seven days, and the

recorded details confirm that the subject to be punished by the flood was all human beings.

How could I ... order a catastrophe to destroy my people! No sooner have I given birth to my dear people than they fill the sea like so many fish!" [Tablet XI.120–123]
(Kong, 2001:137–138)

*During six days and seven nights
came the wind and flood, the gale, the great flood flattening the land."*
[Tablet XI.127–129] (Kong, 2001:138)

After the violent rain and wind ceased at the end of the flood, people who had boarded the ark resort to ways of finding land to disembark, which is well portrayed in the following verse.

When the seventh day arrived, I sent forth a dove and released it. The dove went off; but came back to me; no perch was visible so it circled back to me. I sent forth a swallow and released it. The swallow went off; but came back to me; no perch was visible so it circled back to me. I sent forth a raven and released it. The raven went off, and saw the waters slither back.

It eats, it scratches, it bobs, but does not circle back to me. [Tablet XI.145–154]
(Kong, 2001:139)

What is evident from these details is that a dove, a swallow, and a raven are used to check if there is a shore the birds can land on; in other words, Utnapishtim is trying to check if people who boarded the ark can get off it wondering if the water that submerged the ground owing to the flood has been drained. Meanwhile, the below verses show Utnapishtim giving a burned offering and receiving the gods' blessing once the flood had ended.

I put in place the offering and perform a sacrificial ritual to the four winds.
[Tablet XI.155] (Kong, 2001:139)

*He touched our forehead and, standing between us, he
blessed us. Previously, Utanapishtim was a human being. But now let Utanapishtim
and his wife become like us, the gods!*
[Tablet XI.192–194] (Kong, 2001:141–142)

In this way, the Epic of Gilgamesh mentions a seven-day-long flood to punish humans, revealing the flood to be the will and plan of the gods. Moreover, it is recorded that the way to survive the flood is by manufacturing an ark and having all living things aboard it. Releasing birds in search of lands after the flood had ended is mentioned, and it can be confirmed that the story records in the order of the

protagonist, who was instructed by the god, gave a burned offering to the god, and thereafter, received blessings.

2) Bible

The Bible records the story of Noah's flood in the Old Testament's Genesis Chapters 6-9. The flood mentioned in Genesis is as follows.

Seven days from now I will send rain on the earth for forty days and forty nights, and I will wipe from the face of the earth every living creature that I have made.
[Genesis 7:4]

And after the seven days the floodwaters came on the earth. [Genesis 7:10]

And rain fell on the earth for forty days and forty nights. [Genesis 7:12]

As can be seen from the above details, the flood story was recorded in Genesis and rain fell for 40 days. In the meantime, the flood is executed according to the one and only God's plan to punish humans as their sins have increased.

The Lord saw how great the wickedness of the human race had become on the earth, and that every inclination of the thoughts of the human heart was only evil at all times.
[Genesis 6:5]

The Lord regretted that he had made human beings on the earth, and his heart was deeply troubled. So, the Lord said, 'I will wipe from the face of the earth the human race that I have created—and with them the livestock, the birds, and the creatures that move along the ground—for I regret that I have made them.
[Genesis 6:6–7]

Nevertheless, God instructed Noah, who He favored the most among all human beings, to make an ark and directed him to load it with a male and female pair of all living creatures along with his family. God's instructions to Noah were as follows.

So, God said to Noah, I am going to put an end to all people, for the earth is filled with violence because of them. I am surely going to destroy both them and the earth. So, make yourself an ark of cypress wood; make rooms in it and coat it with pitch inside and out.

This is how you are to build it: The ark is to be three hundred cubits long, fifty cubits wide, and thirty cubits high. Make a roof for it, leaving below the roof an opening one cubit high all around. Put a door in the side of the ark and make lower, middle, and upper decks. I am going to bring floodwaters on the earth to destroy all life under the heavens, every creature that has the breath of life in it. Everything on earth will perish.

But I will establish my covenant with you, and you will enter the ark—you and your sons and your wife and your sons' wives with you. You are to bring into the ark two of all living creatures, male and female, to keep them alive with you. Two of every kind of

bird, of every kind of animal, and of every kind of creature that moves along the ground will come to you to be kept alive. You are to take every kind of food that is to be eaten and store it away as food for you and for them. [Genesis: 13–22]

The following verses detail how Noah finds land to disembark after the flood of 40 days and nights ends.

Noah sent out a raven, and it kept flying back and forth until the water had dried up from the earth. Then he sent out a dove to see ... But the dove could find nowhere to perch because there was water over all the surface of the earth; so, it returned to Noah in the ark ... He waited seven more days and again sent out the dove from the ark. When the dove returned to him in the evening, there in its beak was a freshly plucked olive leaf! Then Noah knew that the water had receded from the earth. He waited seven more days and sent the dove out again, but this time it did not return to him.
[Genesis 8:7–12]

What is clear from this text is that Noah used a raven and a dove to search for land to leave the ship. After seeing that the dove he sent out last is not returning, he confirms that there is a shore to land on, that is, the ground has been exposed as the water had drained.

In Genesis Chapters 8 and 9, Noah gives a burned offering to God, and it is recorded thereafter that God blesses Noah and his sons.

Then Noah built an altar to the Lord and, taking some of all the clean animals and clean birds, he sacrificed burned offerings on it. The Lord smelled the pleasing aroma.
[Genesis 8:20–21]

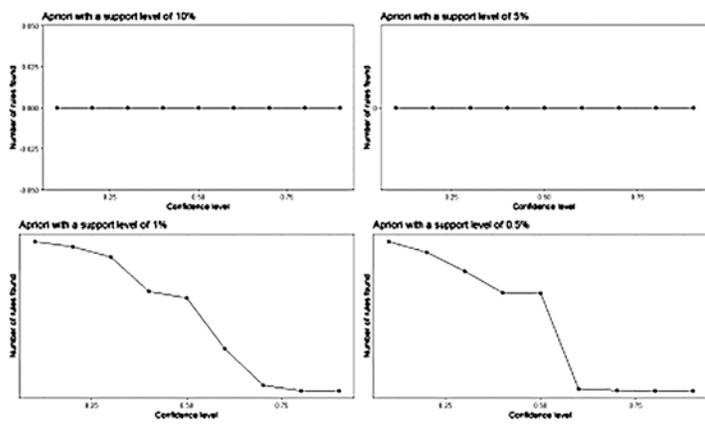
Then God blessed Noah and his sons, saying to them, Be fruitful and increase in number and fill the earth. [Genesis 9:1]

In this way, the flood story shown in Genesis of the Old Testament indicates the plot of how the flood was developed by the absolute authority of one God and that direct instructions were given to one person called Noah. After receiving God's instructions, Noah creates an ark and boards it with his family along with male and female pairs of all living creatures; once 40 days and 40 nights pass, he finds land by releasing birds and eventually gets off the ark. Subsequently, the narrative includes him giving a burned offering to God and God blessing him and his family.

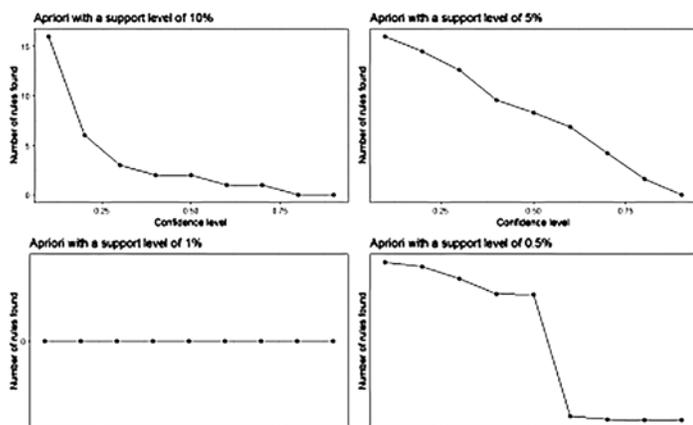
4.2 Association Analysis

As mentioned earlier, the Apriori algorithm was used to analyze association rules. Support, confidence, and lift were used as analysis indexes of association rules analysis. Support is the concurrence probability of the words A and B P (A∩B),

while confidence is the probability of the word B additionally occurring when the word A has occurred $P(B|A)$. Lift is the probability of B occurring when the word A has occurred $P(B|A)/P(B)$. Support and confidence were used as hyperparameters of the Apriori function, and in this case, the resulting value varied depending on the set value of support. It is usually seen that the larger the support and confidence, the higher the association. As for lift, when $LIFT > 1$, association is higher and the lift value is larger; when $LIFT < 1$, association is seen as low. Figure 3 is the reasonable hyperparameter line.



Epic of The Gilgamesh



the Flood Episode

Figure 3. Definition of Hyperparameter for Apriori algorithm.

In the case of the Bible, association rules were generated low in 10% support, and numerous association rules were generated at 0.5%. Thus, after confirming that the rules equivalent to half of the entirety are generated uniformly at a minimum of 5%

support and a minimum of 50% confidence, these values were selected respectively as the hyperparameters of support and confidence.

In the case of Gilgamesh, it was found that rules were generated uniformly at a minimum of 1% support and a minimum of 60% confidence. To extract moderate support and confidence, initial values were set for support (0.1, 0.05, 0.01, and 0.005) and confidence (0.9, 0.8, 0.7, 0.6, 0.5, 0.4, 0.3, 0.2 and 0.1), and the process of extracting optimal confidence for each support was taken. As the result of analyzing the Apriori algorithm applied with the aforementioned hyperparameters for the Bible and Gilgamesh, 158 and 406 association rules were extracted, respectively. Table 1 contains the entire association rules and summarizes meaningful associated words based on support.

Association analysis traces the association between data through various indicators, and analyzes whether the left-hand side (lhs) and right-hand side (rhs) of the extracted words are related can express. Generally, the higher the value of ‘support’ is, the higher the association. Also, the closer the value ‘confidence’ is to 1, the higher the association. For example, if the keyword ‘seven days’ appears in the table below, it means that there is a 100% chance that the keyword ‘during’ will appear at the same time. Also when the keyword ‘gale’ appears, there is a 66% chance that the keyword ‘the flood’ will appear at the same time.

Table 1. Summary of Association Rules of the Epic of Gilgamesh.

rules		support	confidence	coverage	lift
lhs	rhs				
{ruin} =>	{people}	0.015503876	0.666666667	0.023255814	17.2
{gale} =>	{the flood}	0.015503876	0.666666667	0.023255814	9.555555556
{during} =>	{gale}	0.015503876	0.666666667	0.023255814	28.66666667
{seven days} =>	{during}	0.015503876	1	0.015503876	43
{to Enlil} =>	{Ea}	0.015503876	1	0.015503876	21.5
{hero} =>	{Ea}	0.015503876	0.666666667	0.023255814	14.33333333

From Table 1, the fact that an incident of a great flood has taken place is evident. It can be found that a great flood accompanying a gale occurred as a means of judgment on people, which went on for seven days. Moreover, it can be assumed that a certain behavior or story is told to Ea and Enlil, among several gods appearing in the Epic of Gilgamesh, by alluding to the word hero; the table above shows and confirms that this passage criticized the act of gods who chose the cruel way of flood people to punish them.

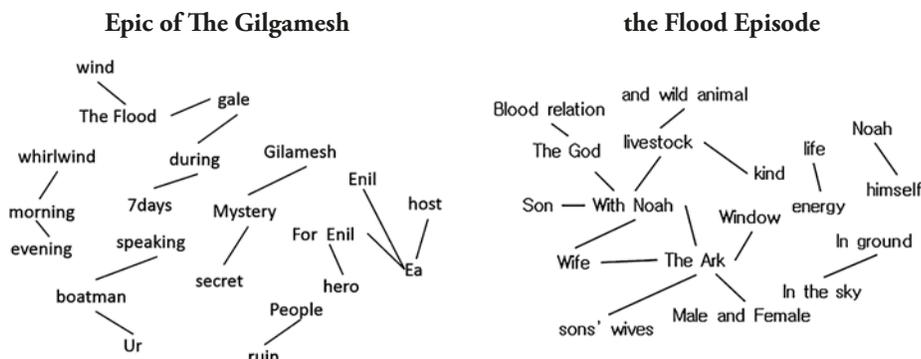
The summary of association rules indicated in The Flood Episode is presented in Table 2. Association rules include both rules between single words and rules between multiple words as well as single words. In the table below, the support of the keywords ‘livestock, with Noah’ and ‘ark’ is about 7%, and the confidence is 100%. This means that association rules containing the keyword ‘livestock, with Noah’ and ‘ark’ occur in approximately 7% of all association rules, and the probability of ‘ark’ is 100% when the keyword ‘livestock, with Noah’ appears.

Table 2 evidently shows the subject of the act that generated the flood. While the table above is insufficient in revealing the event of the flood itself, it can be identified that a certain action has happened. It is also confirmed that the subject of this act is God and that this act is instructed on one person, Noah. Furthermore, along with the detail of the act, it can be found that God has instructed Noah to make an ark.

Table 2. Summary of Flood Episode Association Rules.

rules	support	confidence	coverage	lift
{to Noah} => {God}	0.096153846	0.833333333	0.115384615	3.611111111
{to Noah} => {ark}	0.076923077	0.666666667	0.115384615	2.166666667
{livestock, with Noah} => {ark}	0.076923	1	0.076923	3.25
{livestock, organism} => {ark}	0.057692308	0.75	0.076923077	2.4375
{male and female} => {ark}	0.057692308	0.75	0.076923077	2.4375
{sky} => {ground}	0.057692308	0.75	0.076923077	7.8
{sons' wives, wife, son} => {ark}	0.076923077	1	0.076923077	3.25

Meanwhile, it can be seen that Noah and his sons’ wives, wife, son and all male and female pairs of livestock and creatures of this world in the air and on the ground aboard the ark. The details of visualizing the association rules of the Epic of Gilgamesh and Genesis are presented in Figure 4 below.



can be known intuitively from the visualization of the Bible in Figure 4 is that one single god of “God” appears in it. This confirms that God is the only god in the Bible. In Figure 4, God and Noah are shown to have the highest association. Through this, it can be analyzed that the one and only God directly instructed one subject Noah to make an ark.

The keyword “ark” is found to be highly associated with keywords related to family, for instance, “son,” “son’s wife,” “wife,” and “blood relation.” It can be interpreted from this that people who boarded the ark were limited to the family. Moreover, the association among the keywords “wild animal,” “animals,” “livestock,” and “creatures” enables the interpretation that Noah’s family and creatures boarded the ark together. Furthermore, the keywords “male” and “female” appear among keywords related to creatures, and this is a part showing God’s order of instructing Noah to load the ark with one pair of male and female creatures. By including information that is visually identifiable, a centrality analysis was additionally performed for a more quantitative association rules analysis. As a result of the analysis, it was confirmed that the numerical value reflects Figure 4 as it is.

4.3 Wordcloud analysis

The frequency of concurrent words is fundamental to association analysis. Thus, words with merely high occurrence frequency may not be extracted. As mentioned earlier, there are key terms that determine the context and flow of the text regardless of the word’s concurrence frequency in interpreting a specific text. To identify these, word cloud analysis was conducted.

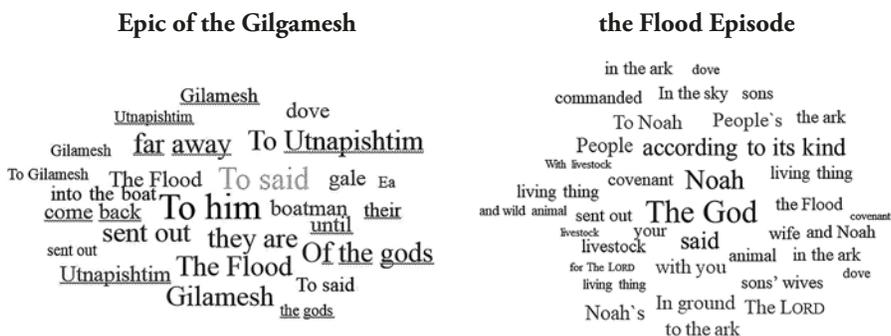


Figure 5. Wordcloud Analysis.

In the word cloud of the Epic of Gilgamesh, the keywords “to him,” “to said,” “gods,” “they,” “the flood,” and “said” are found to have a high occurrence frequency, suggesting that the subjects who caused the great flood are gods and that they

instructed the great flood to him (Utanapishtim). Such direct instruction can be interpreted as the display of the omnipotent abilities of gods. The keyword “into the boat” confirms that god instructed him to load creatures on the boat. Keywords such as “dove,” “sent out,” and “came back” confirm that there is a mention of checking, by using a dove, whether the water inundated by the flood was drained.

In the Bible’s word cloud, the occurrence frequency of keywords “God,” “said,” “to Noah,” “the God,” “with you,” “in ground,” “to the ark,” and “Noah” were shown to have high occurrence frequency. These keywords signify that the subject of the act is the one and only God and indicates instructions given to Noah to make an ark. In addition, there is a high occurrence frequency of “flood,” “with wife,” “with sons,” “with son` wife,” “with livestock,” “living things,” and “to the ark.” This means that a flood episode is mentioned in Genesis and that the family and creatures were loaded on the ark in absolute obedience to God. Furthermore, although the keywords “from the ark,” “dove,” and “sent out” do not have high occurrence frequency, they have meaning by themselves. For instance, it refers to Noah sending out a dove to find land to get off from the ark, and this content is a keyword that acts critically in intertextuality analysis. These outcomes validate the reason for combining association analysis and word cloud analysis for intertextuality analysis.

4.4 Comprehensive comparative analysis

In the previously stated intertextuality analysis results and the results of the association rules analysis and word cloud analysis, the interrelationship is partially found in the great flood episodes of the Epic of Gilgamesh and the Bible. The results of analyzing the two episodes through intertextuality analysis and association analysis (Table 3) are as follows.

Table 3. Comparative analysis through intertextuality and association rule analysis.

Comparison Item	Analysis of Intertextuality		Analysis of Text mining	
	Epic of Gilgamesh	The Bible	Epic of Gilgamesh	The Bible
Contents	The Flood	The Flood	The Flood	The Flood
Subject for the Flood occurrence	God (Several Gods)	The God (The One and Only God)	God (Several Gods)	The God (The One and Only God)
Reason for the Flood Occurrence	-	People’s Sins	-	-
Targets	People	People	People	People

Instruction Contents	Ark Crafting	Ark Crafting	Ark Crafting	Ark Crafting
Instruction methods	Command	Command	Command	Command
Directed to	Utnapishtim	Noah	Utnapishtim	Noah
Obey	Absolute Obedience	Absolute Obedience	Absolute Obedience	Absolute Obedience
Ark Crafting Planner	God(Ea)	God(The God)	God(Ea)	God(The God)
Ark Materials	Bitumen	Bitumen	Bitumen	Bitumen
Boarders on the Ark	Family, Master	Noah`s Family	-	Noah`s Family
Animals on the Ark	Animals	Animals (Male and Female)	Animals	Animals (Male and Female)
The Flood Period	7days	40days and 40nights	-	-
How to Find Land	Sent Out a Birds	Sent Out a Birds	Sent Out a Birds	Sent Out a Birds
kind of Bird	Raven, Dove, Swallow	Raven, Dove	Dove	Dove
What to Do After the Flood	Holocaust	Holocaust	-	-
What Comes to After the Flood	blessings of the Gods	blessings of the God	-	-

It can be seen that when excluding some items such as the subject of causing the flood, the cause of the flood, and the period of the flood, the rest of the items are the same in the two episodes. While the subject of the flood being “several gods” and “the one and only God” is different, what is evident in both episodes is that a god/ gods commonly planned the great flood and the production of the ark by himself/ themselves that was given to a human being as an order. This indicates that both episodes portray the ability granted to the god as omniscient and omnipotent, and the human who was instructed is a subject who obeys absolutely before God by immediately implementing the instruction and making an ark.

They also commonly feature the fact that bitumen was used as a material for making the ark, and that despite slight differences in the creatures that boarded the ark, there were families and animals. The details on finding dried land (ground) to disembark

from the ark are also the same including the manner of doing so. Each protagonist of the two episodes gets off the ark after sending out birds (both use a raven and a dove) several times and seeing the bird not returning. Besides, the episodes commonly describe each protagonist giving a burned offering to the god afterward and receiving blessings from the god/gods.

The text mining analysis shows mostly the same keyword collection as the results of the intertextuality analysis (Table 3). In other words, results derived from the intertextuality analysis coincide considerably with the results of the association analysis among words and the analysis of words' occurrence frequency. It can be proved from this that the great flood episodes of the Epic of Gilgamesh and the Bible have many similarities.

5. Conclusion and future research

A number of flood episodes appear in the myths created in each civilization, but their forms and content are displayed differently per civilization. In the case of the Mesopotamian region where the Epic of Gilgamesh was created, the area is now the Middle East and is very geographically close to Jerusalem, the birthplace of Christianity. Situated within the Mediterranean civilization, the two regions also share a history of exchange through numerous conquest activities, trades, and so forth according to the historical development of the Mediterranean Sea. Based on these geographical and historical facts, it is reasonable to claim that Christian civilization, which came about from the Mediterranean region, has partially accepted and succeeded in the cultural and academic achievements of Mesopotamian civilization that progressed ahead. Moreover, the fact that the hometown of Abraham, called the father of the people, is Ur suggests that Jews' acceptance of the Mesopotamian culture is a rather natural phenomenon.

Data-based quantitative analysis also guarantees the efficiency of a study in scholarly research in diverse fields such as humanities, regional studies, and history. In particular, it can elevate the credibility of the study by extracting insights (significant information that has not been known before) through data analysis or proposing objective and quantitative data as the grounds for the presented logic.

In the future, conducting a clearer analysis of the interrelationship of ancient civilizations such as Egypt and Mesopotamia is necessary, including multiple episodes that are suggested to have similarities with the Bible based on the method presented in this study. This is not an approach from a religious perspective but from the perspective of civilization exchange studies. It is also an attempt to correctly interpret history by approaching the developmental process of a specific region's

civilization (academics, technology, science, and culture) from the perspective of exchange. Finally, it is a practical suggestion for the research method for interpreting humanities, regional studies, and history.

References

- An, C. O. (2007). Plagiatstext, berücksichtigt hinsichtlich der Intertextualität in der Textlinguistik. *txtlng*, 22, 121-142. 10.22832/txtlng.2007.22..005
- Chen, Y. S. (2013). *The Primeval Flood Catastrophe: Origins and Early Developments in Sumerian and Babylonian Traditions*. Oxford: Oxford University Press.
- Chul-Hyun, B. (2002). The Bible and Myths The Story of Noah's Flood. *Journal of Christian Thought*. The Christian Literature Society of Korea.
- Fisher, E. (1970). Gilgamesh And Genesis: The Flood Story in Context. *The Catholic Biblical Quarterly*, 32(3), 392-403.
- George, A. (2020). *Epic of Gilgamesh: The Babylonian Epic Poem and Other Texts in Akkadian and Sumerian 2nd Edition*. Penguin Books.
- George, A. (2003). *The Babylonian Gilgamesh Epic: Introduction, Critical Edition and Cuneiform Texts, Volumes 1 and 2*. Oxford: Oxford University Press.
- Hwang, S.-I. (2008). Epic of Gilgamesh and the Bible. *The Journal of KwangShin University*, 17, 77-113.
- Kim, J.-S. (2020). Noah's Flood and History. *Hapsin Theological Journal*, 38(2), 343-388.
- Kim, M.-J. & Kim, C.-J. (2017). Analyzing Architectural History Terminologies by Text Mining and Association Analysis. *Journal of Digital Convergence*, 15(1), 443-452. 10.14400/JDC.2017.15.1.443
- Kim, S. (2021). *A Study on the Interrelationship between Egyptian Mythology and the Bible*. Busan University of Foreign Studies.
- Kim, Y.-W., Kim, K. H. & Lee, H. C. (2018). Dynamic Text Categorizing Method using Text Mining and Association Rule. *Journal of The Korea Society of Computer and Information*, 23(10), 103-109. 10.9708/jksci.2018.23.10.103
- Korean Bible Society (2022). The Bible, <https://www.bskorea.or.kr/>
- Lee, I. (2022, September 15). Sumer and Gilgamesh [수메르와 길가메시], <https://www.breaknews.com/924124>
- Njozi, H. M. (1990). The Flood Narrative in The Gilgamesh Epic, The Bible and The Quran: The Problem of Kinship and Historicity. *Islamic Studies*, 29(3), 303-309.
- Park, H. S. (2011). The Mesopotamian mythologies and the Bible. *European Society and Culture*, 5, 228-252. 10.23017/eurosc.2010.1..228
- Pryke, L. M. (2019a). *Gilgamesh: God and Heroes of the Ancient World*. London: Routledge.
- Pryke, Louise M. (2019b). The Influence of Gilgamesh on the Bible, <https://bibleinterp.arizona.edu/articles/influence-gilgamesh-bible>
- Seong, Y., Lee, D. & Jung, U. (2022). Group-wise Keyword Extraction of the External Audit using Text Mining and Association Rules. *Journal of Korean Society for Quality Management*, 50(1), 77-89. 10.7469/JKSQM.2022.50.1.77
- Yoo, H. J. (2017). *Text, Hypertext, Hypermedia*. Munhakdongne Publishing Corp.

Studija o analizi međuodnosa između Epa o Gilgamešu i Biblije pomoću rudarenja teksta; fokusiranje na epizodu velikog potopa

SAŽETAK

Razvoj ljudske civilizacije kontinuirani je proces oponašanja i stvaranja temeljen na razmjeni. Većina povijesnih istraživanja provodi se kvalitativno, zbog čega su povijesne interpretacije nerijetko pristrane, s osobnim ili subjektivnim stajalištima. U tom pogledu Biblija je najčitanija knjiga u povijesti te su komparativne studije često rađene zbog njezinih sličnosti s mitovima drevnih civilizacija. Ova studija kombinira kvalitativnu i kvantitativnu analizu kako bi analizirala međuodnos između mita i Biblije. Točnije, analiza intertekstualnosti provedena je na osnovi epizode velikog potopa u mezopotamskom Epu o Gilgamešu i biblijskom Postanku. Analiza pravila asocijacija temeljena na rudarenju teksta i analiza oblaka riječi kombinirane su kako bi se to potvrdilo. Kao rezultat analize intertekstualnosti, potvrđeno je da je otkriven međuodnos između Epa o Gilgamešu i Biblije, a kao rezultat rudarenja teksta, povezanost se može provjeriti u analizi intertekstualnosti. Slijedom rezultata studija predlaže istraživačku metodu za proučavanje civilizacijske razmjene objektivnim pristupom tijeku i usmjerenosti razmjene među civilizacijama u drevnim mediteranskim regijama. Štoviše, uz studije civilizacijske razmjene, predložena je praktična konvergentna istraživačka metoda za studije u područjima humanističkih znanosti, regionalnih studija i povijesti.

Cljučne riječi: znanost o podacima, Ep o Gilgamešu, Veliki potop, Mezopotamija, mit, mezopotamska civilizacija, Biblija, rudarstvo teksta, analiza asocijacija, studije civilizacijske razmjene, metodologija istraživanja.