Books for the Illiterate

Art as Information System: A Semiotic Evaluation of Medieval Stained Glass Windows as Information Systems and Lessons for the Future

M.Sc. Management of Information Systems

Dissertation

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Grant Munroe 11 June 2018

Abstract

Stained glass windows were used in Gothic cathedrals across Western Europe in medieval times. They depicted scenes from the Bible, miracles of the Saints, and other ecclesiastic subjects. Many historians believe that they were used for didactic purposes, and many art critics agree that they are an impressive medium that still resonates with viewers today. This paper explores the possibility that these stained glass windows constitute an information system and attempts to evaluate their effectiveness in that regard. The study of signs, or semiotics, is intricately related to the study of information systems, so Mingers & Willcocks proposed a semiotic framework for studying information systems in 2017. The framework involves analysing the signs in an information system from four different perspectives and the relationships among them: the personal, the social, the material, and the semiotic. Each perspective can be considered in segments that lend structure to the analysis, and allow the researcher to break the work in to smaller, more manageable pieces. This research concludes that stained glass windows do indeed constitute an information system, and that the system was very effective for four key reasons: the impact of the medium, scale of the images, accessibility of the visual code employed, and commonly held beliefs of the time. Furthermore, this paper provides evidence to support the proposition that the method put forth by Mingers & Willcocks is an effective one. Aside from confirming the method, this study aims to provide useful insight into what makes an effective information system. Analysis of modern day systems may benefit in the light of what made stained glass windows effective. Designers of new systems may be able to gain insight from these findings. In future research, it would be useful to take this line of investigation further by measuring the impact of stained glass windows on modern people and studying the particular mechanisms that are unique to the medium.

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I. Introduction

In the study of information systems, which are part of a burgeoning industry, it seems natural that we tend to be most concerned with those systems that are built in the latest technologies. As predicted by Moore's Law, our times have seen exponential growth in the ability to store, transmit, and receive data. The excitement of what is new and the anticipation of change makes for very interesting research, indeed. However, perhaps there are lessons yet to be learned from the past. After all, we are still human beings, and our physiology has changed very little in the past few millennia. Many of the things we made in the past still resonate with us in the present.

Before the advent of printing in the fifteenth century, all of our information systems were handmade. Libraries were filled with handwritten scrolls and leather-bound books. Due to the amount of labour and scarcity of resources involved in producing and keeping written information, these items tended to be expensive and rare. Perhaps out of respect for their preciousness, many early writings were lovingly crafted and adorned with art. There is a name for artistic writing, "calligraphy," and in some illuminated manuscripts, for example, the art and the words became indistinguishable from one another. Researchers might ask if this artistry added anything to the system of information.

Some art forms contain information. One could argue that all representational art contains information because it depicts people, things, and landscapes and often illustrates stories. However, researchers might ask what makes art into an information *system*. In this effort, we will attempt to take an example art form and establish that it is an information system. Furthermore, we would like to understand what aspects of it – particularly as an art form – influence its ability to act as an information system. There are many genres of art that were

used in information systems. However, our concentration shall be on medieval stained glass windows in cathedrals and great churches of the Gothic period.[1]

There was once a great abundance of medieval stained glass in Western Europe, and the people who paid to have them made were mainly from the Church. The windows have been well studied, both as an art form and as religious artefacts, so the literature is abundant. Most often, the windows contain stories from Christian religion, including biblical and later stories, so there is also a large amount of relevant literature from religious studies. A majority of historians believe that they were used as teaching tools as so many people of the day were illiterate. Although many stained glass windows from the period have been lost through war, neglect, or merely a desire for change, there are also many examples that remain intact.

The primary goal of this research is to determine how effective medieval stained glass windows were as information systems. This study will deal with a system of ecclesiastical stained glass found in churches and cathedrals in the early Gothic period (twelfth and thirteenth centuries). The initial question raises these key sub-questions:

- How can we describe stained glass windows as information systems?
- What was their purpose?
- What information did they contain?
- Who was that information for?
- Does the nature of the windows and their setting influence how the information they contain is perceived?
- How can their effectiveness be measured?

To answer these questions, we will follow a methodology proposed by Mingers & Willcocks in 2017. It uses a framework based on semiotics to evaluate the effectiveness of information

[1] For the purposes of brevity in this paper, and unless otherwise noted, we shall use “stained glass windows” to refer to those windows in Gothic cathedrals and great churches of the Gothic period, and focus on early examples of gothic art and architecture, from the twelfth and thirteenth centuries.

systems. In its most simple definition, semiotics is the study of signs and their meanings. Mingers & Willcocks (2014, 2017) argue that semiotics is inherent in the study of information systems because meaning is essentially information, and information can only be recorded, transmitted, and received in the form of signs. As the methodology is a new one, it is also interesting to ask if the method is fit for purpose. A secondary goal of this research is to evaluate the method in the context of analysing a historic information system.

In Chapter II, Literature Review, there are two subdivisions: a basic introduction to semiotics and a background on stained glass windows. The semiotics primer is intended to familiarise the reader with all of the concepts of semiotics that have been employed in the research and many of those that underlie the framework developed by Mingers & Willcocks. Through its evolution as a subject of study since the mid-nineteenth century, semiotics has been sliced and diced in several ways that allow the researcher to break down the semiotic question into manageable pieces. This section will explore a few of these that seem to be most relevant to the medium of stained glass and a historical investigation. We will then describe stained glass windows as an art form. Furthermore, we will look at the context of the windows as an intrinsic part of the architecture in the cathedrals where they are found and their importance in the lives of people in the times when they were made – the people who designed them and the people who built them.

In Methodology & Fieldwork, Chapter III, we will summarise key aspects of the approach that Mingers & Willcocks proposed in 2017. Some aspects of their methodology – particularly the later parts that formulate ways to improve information systems and implement those changes – are more appropriate to modern-day information systems and will be difficult to apply to stained glass windows within the scope of this paper. Therefore, this effort will primarily utilise the first two parts of the methodology while treating the third and fourth parts lightly. Furthermore, as we do not have access to the creators of the windows or their contemporaries for whom they were designed, this research will take an approach to the methodology where first-hand accounts and secondary research through the literature will be substituted for interviews and direct observation.

Chapter IV, Analysis, will take into account all the literature compiled for this paper to answer the research questions in terms of semiotics. We will look at three aspects of the "Semiotic World" as defined by Mingers & Willcocks (2017) – the Personal, the Material, and the Social – and how they relate to the Semiotic Domain. Finally, this section will investigate the implications of how the three worlds interact with one another.

The final section, the Conclusion, will complete the second part of the methodology and begin to address the third and fourth parts. Here, we will draw on the previous sections to propose that stained glass windows are, indeed, an information system. Four aspects of the windows and their semiotic context can be found to have contributed to their effectiveness as an information system. That they are illuminated makes them stand out from other forms of display, particularly at the time. The scale of the windows and their setting in cathedrals increased their impact on viewers, and by using pictures instead of words they were much more universally understandable than written information systems. Finally, the socially agreed code was a powerful one that included intrinsically held beliefs that lent the windows great credence.

The research was carried out over a seven-month period from December 2017 to June 2018. The findings are very much qualitative instead of quantitative, but the fact that the research could be undertaken helps to validate the relevant steps of the Mingers & Willcocks framework. It is hoped that this study will be useful in designing, analysing, and improving other information systems.

II. Literature Review

As this effort primarily involves the examination of a historical information system in the context of its use at the time, the opportunity for interviews, direct observation, and other primary research is limited. Therefore, much of the work herein is based on research into the existing literature about stained glass windows and their context. To follow the methodology described in Chapter II and establish a narrative for this paper, we will look at some of the literature in the context of background material and some in the context of answering the research question. This literature deals with the background material – an exposition on stained glass windows and their context – to set the scene for the research questions. However, we start with a primer in semiotics.

Semiotics

As the foundation of this paper is a semiotic analysis, it would be helpful to provide an overview of semiotics and how it applies to information systems. Semiotics is the study of signs, their meanings, and how we interpret them (Chandler 2007). According to Mingers and Willcocks (2017), the purpose of studying semiotics is to look at the meaning of signs and how they are interpreted to gain a better understanding of the cultural phenomena that underlie their creation. These basic statements seem to be largely agreed, but there is some divergence in the basic scope of semiotics.

The study of semiotics is often focused on language as the prevailing system of signs human beings use, but there are other sign systems. In terms of human language, words are signs that stand for other things, such as objects, actions, and ideas. The study of these relationships raises deep philosophical questions in the realms of ontology and epistemology. What is the nature of reality? How does the way we think relate to the real world? The discourse of semiotics is often caught up in these basic questions, and, depending on the answers, the discourse follows different directions.

For the purposes of this paper, we will follow a conventional, structuralist path through semiotics. Our research assumes that the nature of reality is observable in a scientific sense, and that thought correlates to a high degree with these observations. Furthermore, we shall

assume that individual people have a common epistemological frame of reference, but that individuals will sometimes have different interpretations of the same experiences. Allowing for more deconstructivist theories of ontology and epistemology might make it difficult to draw firm conclusions from this research.

Semiotics is fundamentally concerned with the relationship of signs to their meanings, which can be interpreted in the general *sense* and the more specific *reference*. (See Figure 1) For example, the word "queen" is a sign (or "sign vehicle," as Chandler notes in 2007). Its most basic meaning is a female monarch. The sense of the sign is any female monarch, but the reference would be to a specific queen, such as Elizabeth I of England. In this way, signs point to general concepts as well as individual entities.

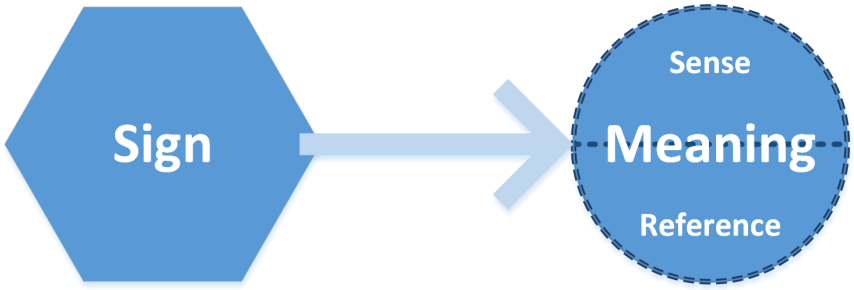

Figure 1: The Sign. Source adapted from Chandler, D. (2007) *Semiotics, The Basics* (3rd ed.). London: Routledge.

According to Morris (1946), the study of semiotics can be divided into three interconnected sub-categories. *Semantics* is the study of the meanings of signs. *Syntax* deals with the relationship between signs, where juxtaposition and combination of signs refines their meanings and allows for complex concepts to be represented. *Pragmatics* looks at the use of signs.

Saussure

Two building blocks of semiotics that underlie this research were established early in the study of semiotics by Ferdinand de Saussure (1857–1913), a Swiss linguist who also first referred to the study of signs as semiotics. Saussure postulated that each sign in its most basic form consists of the *signified* and the *signifier*. It is a two-way relationship between the

thing[2] itself and the thing that represents it. Although much of semiotics focuses on language, where the signifier is an utterance, the signifier can be non-verbal or not related to a verbal language at all. In fact, "everything that can be taken as a sign" (Eco 1976), written words, the sign language alphabet, social customs, and body language are all examples of non-verbal signifiers. These non-verbal signs can form languages of their own, which we sometimes give names, such as "body language," "sign language," "visual language," the "language of music," and the "language of architecture."

Chandler describes Saussure's signifier as a "mental representation" of the sign and the signifier as a "linguistic value" or "relational concept," both psychological constructs. In other words, to Saussure, the sign and the thing it represents both reside solely in the mind. Philosophically, this thinking allows flexibility in the application of ontology and epistemology, so long as the epistemological position is one that allows for constructs of the mind. In other words, the degree of faithfulness with which Reality or Truth is reflected in the mind is not so important because the signified is a construct of the mind anyway. So long as we accept that constructs of the mind exist, Saussure is safe. Nonetheless, for practical purposes, this research will assume a pragmatic approach to epistemology and ontology as described above. Saussure critics complain that he is philosophically idealist, placing so much distance between the sign, its physical manifestation, and the thing it represents in the real world. For these reasons, much of post-Saussurean semiotics views the signifier as a tangible sign, something that can be seen, heard, or felt (Chandler 2007). For the purposes of this research, we will assume the same.

Saussure also postulated that many sign systems, and verbal language in particular, have an arbitrary relationship to the signified (Chandler 2007, Mingers & Willcocks 2017). Johnson (1987) echoes this in his argument that words are meaningless in themselves and that their

[2] Despite the risk of self-reference and circular definitions, we will use the word "thing" to stand for anything that can be represented by a sign. Some examples of "things" are people, objects, actions, and ideas.

value is in their capacity to act as signs. Although there is often a logic associated with the construct of the system, it is only by convention that a particular word is associated with a particular thing. This is why there can be different words for the same thing in different languages, e.g. "*vache*" in French and "cow" in English. These words sound very different yet represent the same animal. Furthermore, Saussure maintained that the structure of language is arbitrary. The scope of signs can be different from one language to the next. Chandler (2007) uses the following example. "*Mouton*" in French refers to the sheep as an animal, and the same word is used to mean the meat of the sheep in French. In English, however, we use two different words – for the animal, "sheep," and for the meat from the animal, "mutton."[3] According to Chandler (2007), no two languages categorise reality in the same way, or "languages differ by differentiating differently" (Passmore 1985).

Language is a relational system in Saussure's thinking. He postulates that the meaning of signs is largely set out in contrast to one another. In effect, a sign's meaning is as much about what the sign does not signify as it is what the sign does signify (Chandler 2007, Mingers & Willcocks 2017). As such, signs only make sense in the context of other signs. Chandler (2007) uses the example of colour sign systems. Red and green represent traffic control instructions "stop" and "go" when they are juxtaposed at a junction.[4] When sailing, however, the same red and green colours represent port and starboard sides of a water channel travelling in a given direction. These associations are purely arbitrary but require

[3] It is surely no coincidence that "mutton" and "*mouton*" sound very similar. However, for the purposes of this argument, the most important thing is that they are distinctly different words in different languages. One must be careful with words shared between languages, for sometimes they are *faux amies* – fake friends. "Library" in English refers to a repository of books that, in many cases, are available to borrow. "*Librarie*" in French is a bookstore.

[4] One could argue that red has a non-arbitrary association with "stop" given that, in nature, many red things are harmful to humans, e.g.: venomous spiders with red markings and poisonous red berries. There have been studies about red and yellow being warning colours in nature. However, a great many red things in nature are also good for us and/or things that we tend to like: apples, raspberries, flowers, brilliant plumage on birds, etc. So the argument that red naturally equals dangerous or "stop" is a weak one.

each other and a setting for context.[5] Johnson (1987) suggests that the categorisation and relations between signs are dependent on our perceptual capabilities. The ability to differentiate between red and green allows one to use the colours as signs. In agreement with Saussure, Johnson (1987) sums up the argument saying that this categorisation takes the form of "imaginatively structured cognitive models" that correspond to nothing directly except human experience.

How can such arbitrary systems exist? Chandler (2007) says that, according to Saussure, whereas the sign systems of languages are constructs of the mind, they are also commonly understood by all individuals in a community defined by use of the language. In fact, it is only through cultural convention that it is possible to have an arbitrary relationship between signifier and signified. Languages are "social institutions" and cannot be separated from the "social reality" (Chandler 2007, Mingers & Willcocks 2014).[6] If we accept that the purpose of language is communication, then to be an effective language, more than one person must have the same or very similar understanding of its signs. Each must have the *code* to decipher meaning from the signs, as Jakobson (1960) calls it. Mingers & Willcocks (2014, 2017) define the community of common understanding as a group who share cultural references[7] and that these communities can be defined by things like age, nationality, gender, place, and time. In practice, languages and other sign systems are, or once were, understood by many people. This common understanding is an important concept for this research.

[5] The argument for context is particularly strong for the red and green buoy markers on either side of a channel. By seeing both, the channel is clearly marked, but if only one is seen, the pilot needs a chart and compass to determine on which side of the marker the channel lays.

[6] Chandler and Mingers & Willcocks cite Wittgenstien's *Philosophical Investigations* to support this argument

[7] This is a somewhat circular definition in this context, but the concept of cultural references helps explain the argument and will inform the research.

Pierce

Working unbeknownst to Saussure and starting a few decades before him, Charles Sanders Pierce[8] (1839–1914) was independently formulating a model of semiotics (Chandler 2007). Whereas Saussure implicitly focused on the semiotics of traditional spoken and written language, Pierce conceived of a semiotic model that could be applied to all sorts of sign systems. The model has its foundation in a triadic relationship within the sign (see Figure 2). The first leg of his model is the *representamen*, which is the perceptible form taken by the sign or the "sign vehicle." This is a tangible aspect of the sign – the sign as it is used in everyday language – and is similar to Saussure's signifier, except that it is real and not simply a construct of the mind. The second part the sign is the *object* or thing that is referred to ("thing" as defined previously in this paper). In a similar way to Saussure, Pierce postulates that at least part of the object is its manifestation in thought. Lastly, there is the *interpretant,* or the effect produced by the sign in the mind. Pierce refers to the interaction between the triadic as *semiosis*, from Greek, "the process of making meaning" (Chandler 2007).

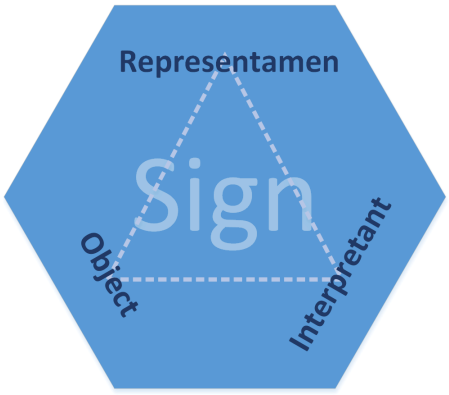

Figure 2: Aspects of the Sign. Source adapted from Mingers & Willcocks (2014) An integrative semiotic framework for information systems: The social, personal and material worlds. *Information and Organization*, 2448-70. doi:10.1016/j.infoandorg.2014.01.002

[8] Pierce is pronounced "purse."

Pierce describes semiosis as a process where the sign is seen or sensed through its representamen, interpreted as a thing or object in reality, and then represented again in the mind as an interpretant. In Pierce's thinking, the resulting interpretant can be the representamen for yet another sign with a new object in reality (Chandler 2007, Mingers & Willcocks 2014). For example, the silhouette of cocktail glass is often used in signage to represent a bar. We see the image of the cocktail glass (representamen), and this makes us think of a cocktail that exists both in reality (object) and its concept in our mind (interpretant). That might seem tasty, so the concept of the cocktail now becomes the representamen, leading us to think about where one can be procured: a bar. The bar is something that exists in reality (object) and is now a concept in the mind (interpretant). There should be a nearby arrow (yet another representamen) showing the way to go: a physical path in the real world (object) and a spatial concept in the mind (interpretant) that, hopefully, we have interpreted correctly, otherwise we will remain thirsty.

Continuous semiosis links signs together and relies on their relationships to operate. In a fashion similar to Saussure's concept of relational signs, the relationship of signs is critical to their definitions, and, as such, Pierce's interpretant draws on related signs to establish its meaning. The interpretant is itself representamen in other signs pointing to further meaning through comparison, contrast, and further interpretation (Eco 1976). We can take this on-going process of semiosis as a model of human thought, but where does it end? According to Chandler (2007), the deconstructivists use the concept of never-ending semiosis as an argument to support the assertion that reality is just a product of our interpretive systems. In contrast, Pierce assumes a referential realism where the real world exists independently of human interpretation, saying "we may define the real as that whose characters are independent of what anybody may think them to be" (Pierce 1933). According to Chandler (2007), the material world contributes to the process of semiosis by supplying natural boundaries to interpretation, and the process of semiosis is terminated by "pragmatic sufficiency" in Pierce's thinking.

Consistent with Saussure's assertion that language is a community construction, Pierce also argues that social "habits of mind" contribute to an end point of the on-going semiosis, and that these habits are agreed collectively, forming part of the fabric of community (Pierce 1933,

1935). As part of a community or society, we agree on the nature of reality by consensus. So according to Pierce, the process of continuous semiosis has a pragmatic stopping point that is influenced both by the nature of reality and the common agreement of our social groups. Reality is a constant, so where cultural norms are agreed and perceptions are not unduly distorted, people more or less interpret signs in the same way. For the purposes of this research, we shall agree with Pierce and assume that the vast majority of people within the same community come to very similar conclusions through semiosis.

Types of Signs

In cataloguing and studying signs, it can be useful to categorise them for comparison and better understanding. Chandler (2007) tells us that Pierce identified three primary groups of signs by the forms taken by the representamen. *Symbolic* signs are those where the representamen has an arbitrary relationship with the object. *Iconic* signs bear some resemblance to the object, usually in appearance, but signs perceptible in all senses are included. *Indexical* signs have a physical or causal relationship with their objects that can be observed or inferred.

As we have seen previously, Saussure argues that human language is arbitrary, and this is a good example of the symbolic type of sign. The word “cow” neither sounds like a cow when spoken nor looks like a cow when written; it has an unmotivated association with its object. Saussure argues that all language is arbitrary, and except for onomatopoeic[9] words that mimic a perceived sound, this seems to be true. Other symbolic signs exist of course, but many of the signs we call symbols in everyday language are actually of the other types

[9] Interestingly, Chandler (2007) points out that many onomatopoeic words are different from one language to the next, which dilutes the argument that they closely resemble their objects. For example, where the onomatopoeic words “chomp” and “munch” are used in English to describe biting or chewing, in French, the words “*miam*” and “*crounch*” are often used. Oftentimes, spelling in the two languages is somewhat different to describe the same sounds. Nonetheless, these are different-sounding words when spoken in their respective tongues. It is probably fair to say that onomatopoeia tends to more resemble a sound in the real world than mimic it.

(Chandler 2007). It is important to remember that because the relationship between representamen and object is arbitrary, it must be agreed by convention and it must be learned before it can be understood.

A symbol that looks like the thing it represents is iconic. This applies to all kinds of signs, so a visual similarity is not necessary – resemblance in any sense is the key. Portraits are good examples of iconic symbols that are particularly relevant to this research. Similarly, physical objects that are represented in visual arts are iconic symbols of the objects themselves. Chandler (2007) adds some other examples, including cartoons, scale-models, onomatopoeias, metaphors, and sound effects.

Many signs we commonly call symbolic are actually indexical in the Piercean taxonomy (Chandler 2007). These signs point to the things they represent – think of the index finger or the index of a book. In the example above, the image of the cocktail glass leads us to think of the bar through association of some attribute of the bar, but it does not look like a bar. A rising sun could stand for morning or daybreak. The hands of a clock can represent time. Smoke indicates fire. Many examples lend themselves to the same continuous semiosis as described in the case of the cocktail glass and the bar. A sign is interpreted literally and then its index can be interpreted as the thing it brings to mind.

Figure 3: Types of Signs. Source adapted from Chandler, D. (2007) *semiotics, The Basics* (3rd ed.). London: Routledge.

In this way, many signs fall into more than one category (see Figure 3). Signs can also have elements in different categories. In fact, Chandler (2007) argues that most signs are not purely in one category or another, but are mixed. Pierce's writings are along the same lines and he makes provision for signs that are of a hybrid nature. Highly pertinent to this study is the stylised portrait, which Pierce might have regarded as a "symbolic icon" (Chandler 2007). The medium of stained glass does not easily lend itself to detailed reproduction of human features, and this was not considered as important at the time like it has been in other times, such as the Renaissance. (Similar stylisation also occurred in other art forms, such as sculpture and painting during the medieval period.) Many figures are indistinguishable from one another as individuals without taking into account symbols placed with them and associated with particular people – their "attributes," in art history parlance. A man hung on a cross is almost certainly Jesus Christ; a woman in a blue robe is almost always the Virgin

Mary.[10] Jakobson & Halle (1971) propose to call these groupings of signs, particularly in language, *phrasewords* – collections of signs (words) that mean considerably more than the sum of their constituent parts. Pierce argues that stylisation is yet another agreed cultural convention within the context of their placement and understanding of their purpose. The community understands and accepts the departure from resemblance and interprets the signs as intended (Chandler 2007).

Assembly of Signs into Language

Johnson (1987) postulates that rational thought is simply a collection of algorithmically manipulated signs. In other words, we combine signs (the interpretant) in our heads through the application of syntax to represent ideas. More signs allow for greater subtlety and complexity of idea. Mingers & Willcocks (2017) draw a connection between information as the stuff of language and signs that represent the information. In their earlier paper, they state that semiotics "is at the heart of the representation and transmission of information… and is thus central to communication and information systems" (Mingers & Willcocks 2014). They point to the fact that information systems store encoded information, or signs that represent that information rather than the information itself – information being somewhat intangible. People put data into the system for the purpose of retrieval, immediately or eventually, and then people take data out of the system. Collectively, this data is information. Placement, storage, and retrieval are all part of a system.

[10] Very little was known about the actual features of the characters in Christian stories, so an accurate depiction of them was largely irrelevant. Their features are often portrayed within cultural norms. European features in Europe, the Black Madonna in Latin America. Of course, Jesus and Mary were middle-eastern, and almost certainly had features common to that region two-thousand years ago – neither Black nor European.

The combination and juxtaposition of signs is a building block of language. For language, or communication, to function, there must be more than one participant.[11] Based on work by Jakobson (1960), Mingers & Willcocks refer to these participants as *producers* and *consumers* (see Table 1). In the making and combining of signs, the producers seek to transmit some information. They have a purpose or intention in mind.[12] For that *content* to be received and understood, the *message* must be transmitted in a *medium*, and the consumer must be able to perceive the medium and share understanding of the code with the producer, and neither is free to change the code. For the message to be understood, producer and consumer must abide by the syntax, semantics, and pragmatics of the chosen sign system (Jakobson & Halle 1971). As we discussed above, producers and consumers in the same community share a code – a common understanding of the signs and their meanings with relation to one another.[13]

[11] Otherwise, we are simply talking to ourselves or simply thinking to ourselves. One might then ask, what is thought without language? That concept can lead back to the deconstructed epistemological theories that we have avoided for the purposes of this research.

[12] The purpose becomes important when looking at effectiveness. After encoding and decoding, did the information achieve the intended result? How well did it do that?

[13] Distance from the core of the community, whether social, special, or temporal, can result in progressively poorer understanding of the code. We will explore this concept in the Conclusion and suggest some further research. Other mistakes and misinterpretations can occur even within the core communal understanding. Mingers & Willcocks (2017) point out that what is decoded by the consumer may not be the same as what is encoded by the producer.

Development of Jakobson's Six Communication Elements		
Mingers & Willcocks	**Jakobson**	**Definition**
Producer	Addresser	The person(s) or system sending or initiating the message
Consumer	Addressee	The person(s) or system receiving the message
Content	Context	The meaning or information carried in the message within a particular context
Message	Message	The form within which the content is expressed or represented – a particular sequence of signs
Code	Code	The cultural system of meanings that underlies the message and allows the signs to convey the meaning that they do
Medium	Contact	The physical mode of transmission of the message

Table 1: Six Communication Elements. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Just as when strung together in a sentence, through syntax, words can individually take on different meanings, depending on their order and proximity. Other signs can do the same. In this way, signs put together collectively can amount to a meaning more than the sum of their parts. As in the example above, the stylised depiction of a woman is not very specific and means very little on its own. A blue robe also means very little on its own. Put the woman in a blue robe, and she is now the Virgin Mary, a person with character, a story, a following, and the embodiment of purity, amongst many other things associated with her. Just by combining two signs in a given social convention, the amount of information contained in the signs is multiplied many-fold.

Syntagmatics allow signs juxtaposed in a visual field, such as those in a painting or stained glass window combine to build further meaning. These visual fields can be "read" with agreed conventions, such as left to right and top to bottom, representing relationships such as

progression in time or relative importance. Signs for objects and places facilitate the telling of stories, and these images taken as a whole can be complex signs that represent what would be long passages of text. Cultural convention is used to interpret these signs. The stories can be written down or passed on by oral tradition.

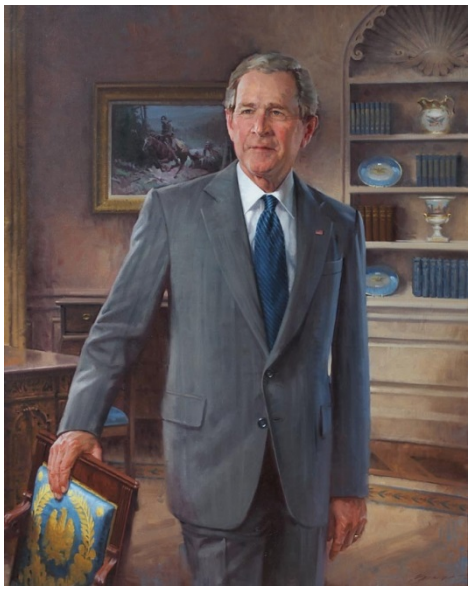

Figure 4: Portrait of George W. Bush. Retrieved from http://radio.foxnews.com/wp-content/uploads/2012/05/5-31-G-W-Bush-Portrait.jpg on 31 May 2018.

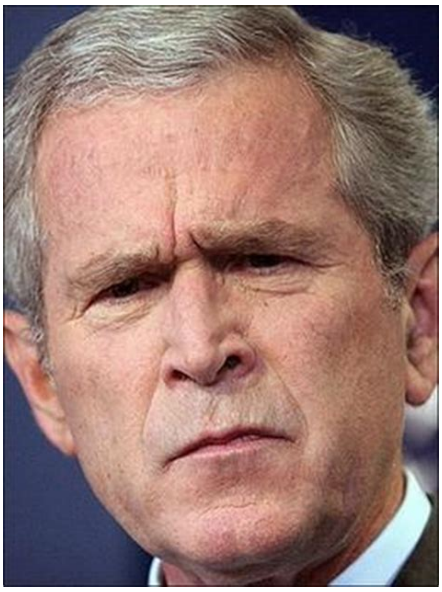

Figure 5: Journalistic Photograph of George W. Bush. Retrieved from http://trinities.org/blog/wp-content/uploads/confused-george-bush.jpg on 31 May 2018.

Mingers and Willcocks (2017) add that, in terms of semiotics, the medium of representation imparts meaning to the sign. The medium is the physical embodiment of the sign that allows it to be communicated from producer to consumer, and it must be perceptible in some way, such as audible, visual, olfactory, tactile, face-to-face (such as with body language or gestures), electronic, or physical (Mingers & Willcocks 2017). Take, for example, two images of the U.S. President George W. Bush: a journalistic photograph (Figure 5) and a portrait in oil (see Figure 4). Both are complex signs that signify the President, but they have very different meanings. The oil painting can be interpreted (by semiosis, of course) to represent the dignified aspects of the man and the office he represents; it honours him. The journalistic photograph, however, could be interpreted to illustrate the more negative aspects of Mr Bush, catching him at a moment where he looks confused and distinctly un-presidential. Pearce

might argue that these interpretations, although they may be slightly different from one person to the next, are generally shared amongst a given community at a particular point in time. Mingers & Willcocks (2014) argue that the nature of information systems and the forms that their signs take can significantly affect the meaning that the information may generate.

In the next section, we shall see how a particular instance of this cultural phenomenon where medium plays a large role in the semiotic message became manifest in a particular art form at a particular time: Stained glass windows in great churches and cathedrals of the late-medieval, Gothic period.

Stained Glass Windows & The Gothic Cathedral

Scott (2003) uses the words awe, inspiration, and humility to describe the experience of the Gothic cathedral. It is amazing that ordinary people using ordinary materials could have made them. Styles of art and architecture normally evolve over time, and any strict boundary between one style and another is somewhat arbitrary. However, the Gothic period is generally considered to be from the early twelfth century to the early sixteenth century. The style started in Northern France, quickly spread to England, and then eventually spanned Western Europe. Many examples remain intact across the region (Trachtenberg & Hyman 1986, Scott 2003, O'Donoghue 2009, Cannon 2011). We will primarily concern ourselves with cathedrals and great churches of the Gothic style, nearly all of which were glazed with stained glass windows. Due to the fragile nature of glass, much of the original stained glass from the medieval period has been lost. However, examples do remain, and there are also restored examples that historians consider consistent with the original style and content (Baker 1978). Scott (2003) reckons that there were hundreds of cathedrals, 27 of these in England, and thousands of great churches built of stone in the Gothic style across Europe, claiming that this was the most enthusiastic ecclesiastical building campaign in Christian history.

There is a marked difference between the Gothic and the Romanesque style of building that immediately preceded it. Two key characteristics of Gothic architecture are ever more ambitious reaching for height and flooding the interiors with light. One of the most important technological advances that made taller buildings possible was a new way of combining

columns, ribs, arches, vaults, and buttresses. The pointed arch is perhaps the most obvious characteristic.[14] Advances in these components replaced walls in many cases and allowed remaining walls to be thinner at the base and lighter throughout their profile. Gothic buildings were built more like a skeleton than a skin. As a result, the interior spaces of Gothic buildings, cathedrals in particular, are remarkably tall.[15] Where Romanesque structures used barrel vaults and quadrant arches that had to be supported by heavy, thick walls with only small openings for windows (see Figure 6), Gothic buildings had taller, thinner walls that allowed for more and bigger windows (see Figure 7).

[14] Scott (2003) notes that pointed arches are 20 to 25 percent stronger than the rounded arches of the Romanesque and early periods.

[15] Medieval understanding of physics and engineering was limited. Reaching for new heights was often done by trial and error. In fact, many cathedrals suffered structural failures during or shortly after their construction, perhaps as many as 17 percent. (Trachtenberg & Hyman 1986, Scott 2003)

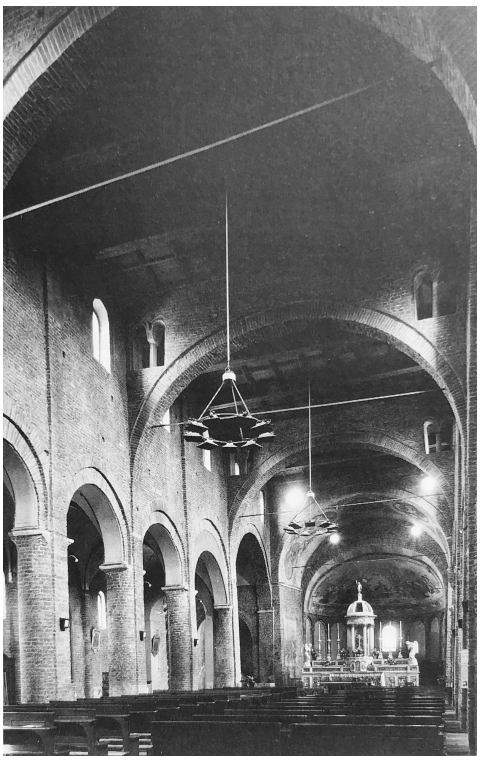

Figure 6: Romanesque Nave of Cathedral Sta. Maria Maggiore, Italy. Source adapted from Trachtenberg, Marvin & Hyman, Isabelle (1986) *Architecture: From Prehistory to Post-Modernism / The Western Tradition*. London: Academy Editions.

Figure 7: Gothic Nave, Ameins Cathedral Source adapted from Trachtenberg, Marvin & Hyman, Isabelle (1986) *Architecture: From Prehistory to Post-Modernism / The Western Tradition*. London: Academy Editions.

Opening up the Walls

With these structural innovations allowing for larger windows, the windows themselves became a more prominent feature in the wall. Baker (1978) cites the earliest surviving examples of Gothic stained glass windows as coming come from Ausberg Cathedral in Germany in the eleventh century. Where large expanses of wall remained unadorned in pre-Gothic times, now there were great openings to frame heavenly visions. According to Scott (2003), decorative windows were widely used previously, but in the Gothic period, windows covered much more of the visual field as a proportion of wall to window.

Michael (2004) writes that stained glass is made from very basic ingredients: sand, potash, and lime. It is coloured by adding different metals to the molten glass that impart different hues, such as gold for red, cobalt for blue, or copper for green. The molten glass is spun into flat discs and then cooled to harden. Once cool, light passing through the glass would be absorbed except for the particular wavelengths that give each metallic mixture its signature colour. The result is some of the most vibrant and saturated colours to be found.

Windows were designed according to a sketch or template. Lines were drawn for the seams of lead that held the window together. The windows were assembled by breaking or cutting the glass into the required shapes and sizes and fitting them together with the lead seams. Some pieces would be chipped away at the edges to ease their fitting into the lead framework. Then the widows could be painted with black paint to create more detailed features.

Medieval builders favoured deep primary colours for the glass (see Figure 8), and as a result, Gothic interiors are frequently bathed in rich, coloured light. These windows quickly became canvasses for artists. Frequently, but particularly in ecclesiastical settings, this meant the illustration of religious subjects.

Figure 8: The Crucifixion, Canterbury Cathedral. Source adapted from Michael, M. A. (2004) *Stained Glass of Canterbury Cathedral*. London: Scala.

According to many sources, these windows were a powerful means of spreading Christianity throughout medieval Europe (Baker 1978, Trachtenberg & Hyman 1986, Scott 2003). Baker likens them to the cinema and television of our day, noting that they were very effective at

"communicating spiritual truths." He goes on to call them the "poor man's bible," for two reasons. First, books were very expensive, and second, the vast majority of people could not read. About 5 per cent of people in medieval Europe could read, and only 2 per cent could write. The materials for writing, paper and velum, were scarce and expensive. It was, of course, not until 1450 that the printing press was invented (Scott). The Church used stained glass windows (and other art forms) as a vehicle of propaganda to convert people to the faith and to garner donations in return for intercession by the saints for miracles. These windows also served the function of instructing the congregation, not only in biblical passages, but also oftentimes in the religious rituals, such as when they illustrate the Stations of the Cross.

The decline of stained glass production – or at least the decline of innovation in its artistry – is, coincidentally, around the same time as the invention of printing and the dramatic increase in the availability of printed matter. According to Baker, during the fourteenth century, subjects in glass turned more to the patrons of churches and away from ecclesiastical subjects. During the fifteenth century, much stained glass was decorated with designs copied from woodcuts of the Renaissance masters – reproduced on the printing press. Baker sees this copying as a decline in the creative production of stained glass, which was bespoke and carried out entirely by hand during the earlier periods.[16]

Cathedral Construction

According to Scott (2003), Gothic buildings were extremely expensive and took a very long time to build. For example, a building project at Westminster Abbey cost 25 per cent more than England's entire annual income at the time. Although this cost was spread over 25 years, it still represented one twentieth of the realm's treasury each year for the duration of the project. At 25 years, this project was relatively quick, but the entire build at Westminster took 75 years. Primarily, poor weather or a lack of capital caused delays to these construction

[16] Baker notes that there was eventually a revival of stained glass as an innovative art form in the nineteenth century.

projects. Frequently, cathedrals took four or five decades to build, but there are many examples of building projects stretching into the centuries. Scott estimates that the average time from start to finish of major building efforts of Gothic cathedrals in England was between 250 and 300 years.

Cathedrals share many common elements, a similar basic floor plan and component parts, but they can be quite different from one another and each has a distinct character.[17] This character reflects the influence of local patrons and clergy who directed the building of the cathedrals (Scott 2003). Other researchers studying Gothic cathedrals and their windows point out that although there are common themes, there are stylistic differences within the Gothic tradition influenced by different craftsmen and different times[18] (Trachtenberg & Hyman 1986, Harris 2008, O'Donoghue 2009, Cannon 2011). The primary examples of these differences are the portrayal of local saints and, on many occasions, the likenesses of patrons and guilds who contributed to the Church.

Life in Medieval Times

For people of the medieval period, the spaces created by Gothic architecture were likely even more out of the ordinary than they are to us. According to Hobbes, life in the medieval times was "nasty, brutish, and short." Many people died from famine caused by years of wet or cold weather. Several outbreaks of plague killed millions, and people frequently fought one another in wars, petty local disturbances, and generally lawless activity. Scott argues that medieval people were in constant fear of violence, disease, starvation, death, and, for the faithful (nearly everyone), fear of Judgement Day and Hell.

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[17] As an example of this standardisation and customisation, we can refer to Moss who cites the 1453 decree at the synod of Cashel, dictating each Irish parish church should contain at least three images: a cross, the Virgin Mary, and their patron saint.

[18] Many cathedrals built over decades or centuries display stylistic differences between elements built at different times.

Habitations for the vast majority of people, and workplaces for those who worked inside, would have been small, low-ceilinged, and dark. Hanawalt (1986) describes a typical dwelling as an irregular, poorly ventilated, one-storey hovel. Interior spaces were dingy, colourless, and undecorated with dirt floors covered in straw. Domesticated animals would have wandered in and out freely. Windows, when they existed, were small, unglazed, and shuttered. Instead of glazing, animal gut was sometimes stretched thin and translucent across the openings, allowing a modicum of light to enter the space. Candles were expensive, so often the only interior light would come from the hearth fire. According to Moss, there was very little artistic imagery in daily secular life. By contrast, the Gothic cathedral was soaring, clean, colourful, bright, and adorned in art.

Those people who lived near a cathedral may have visited it weekly for mass or perhaps more frequently. Nonetheless, these spaces would have been very different from other spaces and experiences in their daily lives. For people who lived farther away, their experience of a cathedral would have been much less frequent – on pilgrimage or occasional visits to the nearest city. Mass for them would have been held in smaller, local parish churches, which may also have had stained glass windows, but built on a smaller scale.

Being in a Cathedral

The experience of the cathedral during this time would have involved several of the senses. The interiors soared above, much taller than other interiors. The great expanses of windows would have allowed sunlight to stream into the space, filling it with light and colour. Most cathedrals and even churches would have paintings, mosaics, frescos (more so in southern climes), and sculptures – freestanding and carved into the architecture. Sound in such a large space is alternately attenuated and magnified, with the periodic playing of music, signing, and chanting that could be heard from time to time. The acoustics amplify and elongate the musical notes. Incense was frequently used as part of the mass, so the scents of frankincense and myrrh would have covered up the smells of the great unwashed.

The windows themselves, when lit by daylight, are in strong contrast to the relative darkness of the interiors. Torches, candles, and other fires would have lit the cathedral, and these would have been plentiful and bright compared to most medieval interiors, but they would still

be dim compared to the strength of full sunlight streaming through the glass. The colours of the glass include jewel-like reds, blues, greens, and ambers, richly saturated, the likes of which are rarely found in nature. Compared to the pastoral greens, browns, and greys of the typical European landscape, stained glass windows are a riot of colour and vibrancy.

Harder to quantify and describe is the spiritual aspect of the windows. Scott says that to fully understand the Gothic cathedral, we need to understand the relationships between architecture, man, and God.[19] The medieval population was, for the most part, deeply religious. This was a time before the Renaissance and scientific enlightenment, so the great mysteries of the world were explained by religion, mysticism, and superstition as conventional wisdom. People very much believed in the omnipotence of God and that the relics and physical manifestations of Christianity were conduits of His power and Grace. Churches and cathedrals were (and still are) called the houses of God, and all that they contain is imbued with spirituality.

[19] In this capacity, Scott cites Clifford Geertz, *The Interpretation of Culture*.

III. Methodology & Fieldwork

The primary goal of this research is to determine how effective medieval stained glass windows were as information systems. This study will deal with the system of ecclesiastical stained glass found in churches and cathedrals in the early Gothic period, in the twelfth and thirteenth centuries. The initial question raises these key sub-questions:

- How can we describe stained glass windows as information systems?
- What was their purpose?
- What information did they contain?
- Who was that information for?
- Does the nature of the windows and their setting influence how the information they contain is perceived?
- How can their effectiveness be measured?

Research Questions

First, we must answer the question; do the stained glass windows in medieval, Gothic cathedrals constitute an information system? For if not, the remaining questions are irrelevant. With their wealth of pictorial signs and symbols, particularly from windows made in medieval times, semiotics seems to be a natural way to study stained glass windows. This paper shall use the definitions within semiotics and the strong linkage established within the literature between semiotics and information systems to answer the question in the affirmative.

After establishing that the windows are indeed a kind of information system, we aim to answer three questions. First, what was the purpose of the windows, and what did their creators hope to achieve with them? Second, how did the medium of stained glass in the context of a Gothic cathedral influence the transmission of the messages they contain? Third, can we measure the effectiveness of the windows in achieving their purpose?

Integrative Methodology for Information System Research

Mingers & Willcocks (2017) propose a four-part methodology for studying information systems based on semiotic analysis (see Figure 9). We will follow their methodology as far as possible given the scope of this paper. The four parts are designed to form an iterative loop for incremental research and improvement.

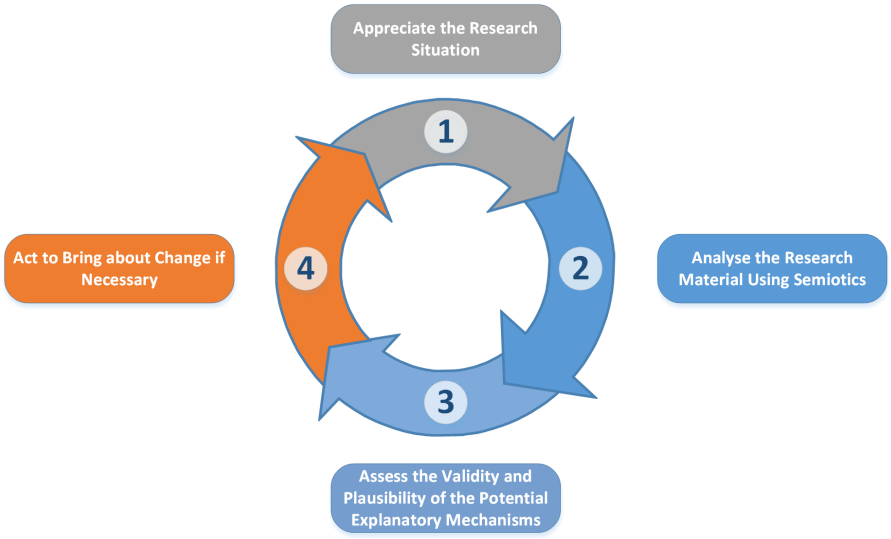

Figure 9: Methodology Overview, adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Fortunately, the methodology is a flexible one, allowing the researcher latitude to choose some steps and leave out others while still producing useful results. In particular, initial findings can be reached in the first two parts alone. Furthermore, the methodology provides a framework for research, rather than a prescriptive formula that must be followed exactly. Some elements that may not be relevant can be excluded without compromising the results. This flexibility has advantages and disadvantages. It will accommodate a wider variety of research areas, but it may leave the researcher without a clear path to follow at times. Mingers & WIllcocks partially mitigate this liability by providing a large variety of perspectives from which to undertake the research. If one point of view fails or is not relevant, they suggest many other potentially useful ways to look at the problem.

In this instance, the subject is a historical system, so some aspects of the methodology will not be possible to investigate fully. We do not have access to the people who made or used the system for direct observation or interrogation. The research must rely on primary accounts from the times, which are rare, and secondary sources, which will always be to some degree speculative. With this approach, we can expect that the findings will be more qualitative than quantitative. However, this is not unusual for historical research.

As it is a new method, published in full in 2017, the research is at the cutting edge of thinking with regards to semiotics and its application to information systems. Having evolved from earlier work by the authors and others, there are examples of the methodology, or something similar, having been used. Mingers & Willcocks (2017) cite several examples of research where elements or early versions of the method were employed (Scott & Orlikowski 2009, Beynon-Davies 2010, Kallinikos 2011). These research efforts give some insight into how the methodology works and how it can be applied. The Benyon-Davies' (2010) work looking at Khipu in the ancient Inka civilisation is a particularly interesting example as it deals with a historical information system.

In short, the methodology suits this research because of its basis in semiotics, which is fundamental to the study of information systems (Benyon-Davies 2010, Volkoff & Strong 2013, Mingers & Willcocks 2014, 2017). The flexibility of the method will allow for the investigation of a historical system where it is not possible to directly interrogate the producers of the system or the intended consumers.[20] The methodology is organised into four parts based on the work of Mingers & Brocklesby (1997), with twelve steps in total. This research will primarily encompass the first two parts containing the first seven steps, and it will briefly address the second two parts in the conclusion.

[20] One could argue that the builders of cathedrals with stained glass windows intended their message to be consumed ad infinitum. However, they could not have known how the communal understanding or code would change in the future. Despite the best efforts of the producers, some of that code is lost to consumers today and/or has become less accessible than it was in the medieval period.

Appreciate the Research Situation (Part 1: Steps 1 and 2)

Goal: Identify problems and research questions	
Step 1	Collect Initial Data; Identify semiotic questions, problems, and challenges
Step 2	Generate semiotic research questions

Table 2: Methodology Part 1. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Not surprisingly, the first phase of this approach deals with establishing the research question. In steps one and two, the researcher should gather information about the situation to be studied and frame research questions in terms of semiotics.[21] Mingers & Willcocks (2017) recommend a framework based on Jakobson's (1960) communication model that identifies discrete elements and actors[22] in the system. In step one, we identify these elements within the system to be studied and describe each.

[21] The Literature Review contains much of the information needed to frame the question, and further additional information is presented in the Findings section in an attempt to answer the questions.
[22] See Table 1 in the Literature Review for a brief description of these elements.

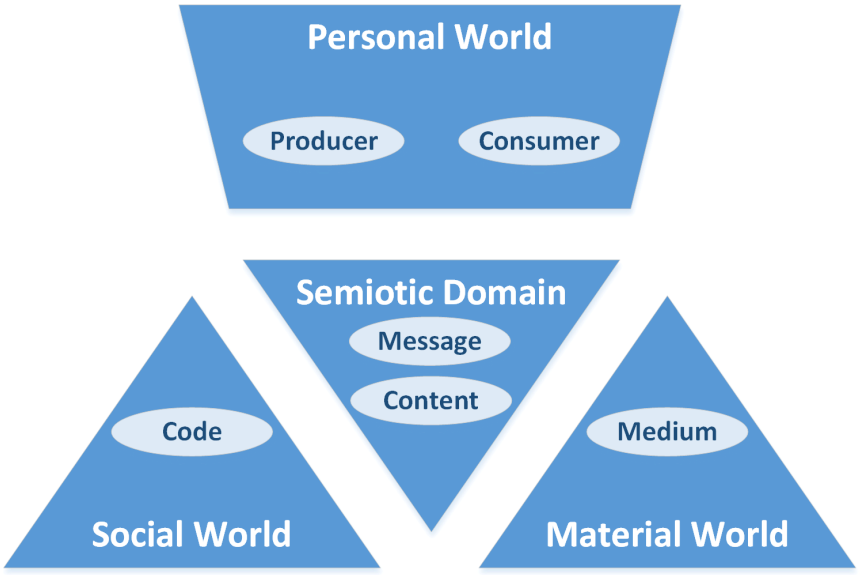

Figure 10: Research Framework with Jakobson's Communication Model. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Mingers & Willcocks (2017) place the content and the message at the core of the model. This is consistent with Peirce and Saussure who agree that the meaning and sign are the fundamental study of semiosis (though they split the two concepts up differently). Therefore, we identify what is being communicated and how. In the first instance, the message can be interpreted differently, depending on its context and the state of reception of the consumer. We can also identify the meanings that were intended as well as those that were unintended.

Next, we identify the medium of the message – stained glass windows in this case. Mingers & Willcocks (2017) are quick to point out that the medium is not neutral. They cite Volkoff & Strong (2013) to support their argument that the medium will affect the transmission of the message, through "affordances and liabilities" or aspects that enhance or detract from the effectiveness of transmitting the message. Identifying these attributes of the medium can play a large role in the analysis of a particular information system.

In order to understand the message, we need to know the code. As discussed previously, the code must be shared between producer and consumer, and it is based in a communal understanding. The producers themselves have some purpose for sharing the information,

and this intention is important as a benchmark to measure effectiveness. The consumer, then, must also value the message. We will look at the import of the message to the consumer. Examining the producers and consumers, their motivations, habits, and beliefs provides insight into the communication model.

Analyse the Research Material Using Semiotics (Part 2: Steps 3 through 7)

Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2	
Step 3	Investigate personal world and semiotics
Step 4	Investigate material world and semiotics
Step 5	Investigate social world and semiotics
Step 6	Investigate: a) Social and material world and sociation b) Personal and material world and embodiment c) Social and material worlds and socio/materiality d) How all three worlds interact semiotically
Step 7	Generate hypotheses and possible explanations

Table 3: Methodology Part 2. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

The purpose of the second part of the methodology is to find potential explanations for the observations and answers to the questions asked in the first part. This is done through a collection and analysis of semiotic materials. In order to put this information in context, Mingers and Willcocks (2017) have cross-referenced Jakobson's (1960) six elements of communication with their own general framework for information systems research (Mingers & WIllcocks 2014) that places semiotics at the intersection of three "worlds:" the personal, the social, and the material. Semiotics interacts with the personal world through the making and reading of signs. The material world provides the vehicle for making signs – they must be

manifest in some way to be perceived.[23] This cross-reference provides a taxonomy that allows the research to be segmented into smaller, more manageable pieces. Each component allows the researcher to look at the problem from a different perspective, and each looks at the relationship of the "world" in question and the Semiotic Domain where the message and the content reside.

Investigating the Semiotic Domain (Part 2: Steps 3, 4 and 5)

Here there is some incongruity within the work by Mingers and Willcocks (2017) describing their methodology. The description of their methodology does not follow the same order as the steps in the summary diagram, and there is an additional step within the text, "Investigate the Semiotic Domain: Message." However it is not in the summary of steps.[24] Noticing that the Semiotic Domain contains both message and content, it may be important to explicitly include both. We will rename the additional step "Investigate the Semiotic Domain: Message & Content" and integrate it into the other three steps (see Table 4 and compare to Table 3), and perhaps this was their intention in any case.

[23] One could argue that the material world also houses many of the things that signs represent. We may find that this argument is moot, and in any case may not be relevant to answering the research questions in a realm that is so very concerned with faith. Whether the things are real or not may turn out to be less important than whether or not the people who read the signs believed them.

[24] This is a minor complaint. It does not take a great leap to reconcile the text with the overview diagram, but if these were more closely aligned, it would be helpful.

Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2		
Step 3	Investigate personal world and semiotics	Investigate the Semiotic Domain: Message & Content
Step 4	Investigate material world and semiotics	
Step 5	Investigate social world and semiotics	
Step 6	Investigate: a) Social and personal worlds, and sociation b) Personal and material worlds, and embodiment c) Social and material worlds, and socio/materiality d) How all three worlds interact semiotically	
Step 7	Generate hypotheses and possible explanations	

Table 4: Methodology Part 2 (Revised). Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

To this effect, Mingers & Willcocks (2017) recommend the selection of specific messages to analyse. For each message, the researcher should be clear as to the reason for choosing it. The producer should be identified for each and the purpose of the message along with the intended consumer. Other consumers can be identified as well, those not intended but recipients nonetheless. We must also understand the context of the message. Related messages should be selected to understand how the signs in the messages fit into a cultural landscape of symbolisation.

The researcher should identify specific signs within the messages for further analysis. The researcher should be able to describe each sign in semiotic terms, and there are several perspectives on this. We can look at each one in the context of Peirce's taxonomy of signs: icon, index, symbol, and the hybrid categories. One should also consider each sign within the overall code. As Saussure postulates, signs are often defined by what they do not represent as much as what they do represent. Where signs can have more than one meaning –

polysemy –it can be difficult to interpret them correctly, particularly without the full syntax of the message. The syntax helps determine which meaning is intended.

Metaphor and metonymy play a large role in the definition and evolution of signs within the code. In fact, Mingers & Willcocks (2017) cite Lakoff & Johnson (1980, 1987) to argue that nearly all language is metaphorical in origin. Metaphorical signs are related to their signifiers through resemblance, and these are frequently iconic signs. Like indexical signs, metonymic signs are related through causality. Furthermore, it is important to recognise that the meanings that signs denote – their explicit definitions should be analysed alongside their connotations – are not directly indicated by the signs but might go along with the sign through metaphor or metonymy, particularly when interpreted by specific audiences.

Next, Mingers and Willcocks suggest that we examine the syntagmatic aspect of the system. How do relationships between the signs give meaning to the message? Look at how the signs are organised and displayed with relation to one another – left to right, top to bottom. This spatial orientation (for visual signs) can have cultural meanings. For example, in most Western cultures, left to right often represents progression in time, and a higher position frequently represents more or better, whereas lower represents less or worse.

These aspects of the code, messages, and signs under consideration should be kept in mind and explored further as the researcher looks at each of the “worlds” in turn.

The Personal World (Part 2: Step 3)

Following the path set by Mingers and Willcocks, the personal world is largely concerned with the producers and consumers of the message. With respect to the producer, the researcher should be looking for the intent when creating the message. Not only are we interested in the purpose of the message itself, but any action or reaction that the producer hopes to promote in the consumer. With regard to the consumer, we are interested in their receptiveness to decoding the message. The motivation of the consumer and their desire to receive the message is important to understand. We must also consider that the message may have been to some degree lost in translation. What is decoded is not always what is encoded, particularly when the consumer of the message is not the same as was intended or

anticipated by the producer. We have already established that in order for these two to share information, they must have a common understanding of the code.[25] In the example at hand, it is hardly likely that the producers of medieval stained glass windows could have anticipated the state of mind of today's consumer.

The Material World (Part 2: Step 4)

For information (content) to be transmitted, the message must be perceptible to the recipient (consumer). Mingers & Willcocks (2017) argue that by virtue of the message and its signs being observable, they must be of the material world, and thus be transmitted via some medium. As mentioned previously, they also argue that the medium is not transparent and will have some effect on the message (a key point in this research). Different media transmit different richness of information.[26] For example, an email message contains less richness than a face-to-face conversation. The email message is primarily constituted of text with the occasional images as illustrations, whereas the face-to-face conversation is a layered, nuanced form of communication, including verbal language, facial expression, body language, intonation, and the opportunity to respond and request clarification in real-time. Mingers & Willcocks (2017) encourage the researcher to examine the medium's affordances (those things that enhance the message and work in favour of the producer's intent) and its liabilities (things that work against the purpose of the message).

The Social World (Part 2: Step 5)

A "semiotic ladder" is proposed by Mingers & Willcocks (2017) to analyse the code. They use the work of Stamper, which builds on the Morris three-legged model. As previously mentioned, Morris (1946) divides semiotics up into semantics, syntactics, and pragmatics. Stamper (1991, 1997) adds three categories of study: social, empirical, and physical. The social angle looks at the effects of signs on a community. The empirical aspect deals with

[25] We shall explore this further when we look the social world.
[26] We may consider the possibility that richness can be measured in more than one dimension.

how messages are transmitted, and the physical attributes involve the embodiment or the medium of the sign itself.

The primary concern of the social world is the commonly understood code and how well it is understood between producer and consumer. Mingers & Willcocks (2017) would argue that although each code has its denotative definitions, and these can be more or less easily transcribed and understood between disparate communities, the connotative definitions are subtle and harder to translate. To understand this subtlety is to understand the society that generated the code. Thus a wider examination of the culture is required.

Semiotic Ladder: Morris (1946) and Stamper (1991, 1997)		
Dimension	**Questions**	**Attributes**
Social	Is it right and trustworthy?	Social consequences, effects, and conditioning
Pragmatic	Is it useful?	The uses and effects of signs
Semantic	Is it meaningful?	The meaning of signs; The relationship with that they represent
Syntactic	Is it understandable?	The rules and grammar relating to signs
Empirical	Can it be transmitted?	The communication and transmission of signs
Physical	Does it exist?	The embodiment of a sign, “no it without bit”

Table 5: Semiotic Ladder. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Mingers and Willcocks also encourage the use of an approach where the code is studied in terms of genre, myth, and discourse. Genres are many and include common characteristics in the form of archetypical plots, characters, themes, and settings. Genres are frequently shared across cultures, so their meanings can often be effectively translated from one community to another. However, genres can evolve so that they mean different things to people of the same community at different points in history. Signs and messages in the

context of a genre can impart more and different information when the genre is understood in terms of the community to which it belongs.

Myth is the set of beliefs that a community accepts as truth, whether myth or reality in conventional terms. These beliefs are rarely challenged and are conventionally held to be true without argument. Because myths are assumptions that frequently go unstated, Mingers & Willcocks (2017) would argue that myths can provide insight into the interpretation of signs and that understanding cultural myths is necessary for the complete translation of a code. They go further to provide examples where myths, held by a community and unchallenged in an information system, resulted in undesirable outcomes for the system when judged against the intentions of its producers.

Finally, discourse is a particular way of representation that is emblematic of a particular sub-culture. Mingers & Willcocks (2017) use political discourses as an example, such as liberal, conservative, or social democratic. Academic discourses provide other examples, such as branches of philosophy, sciences, and religion. Mingers & Willcocks (2017) cite Foucault (1972) to say that discourses provide a framework within the code to produce the "subjects" and "objects" of knowledge practices. Generated by sub-cultural populations, discourses have their own special version of the community code where, in many cases, only the sub-cultural population understand fully.[27]

[27] Mingers & Willcocks (2017) also cite later work by Foucault (2003) where the argument is put forward that discourses are used as differentiators and in power relations in the development of knowledge. Without knowledge, one is powerless. If you can't understand the discourse, how can you possibly gain the knowledge?

How the Worlds Interact with One Another (Part 2: Step 6)

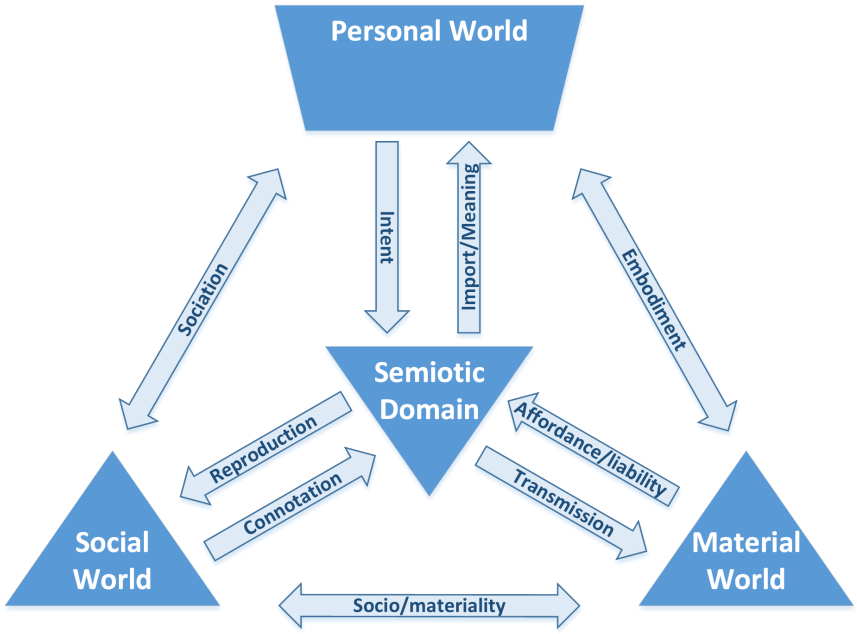

Figure 11: Interactions between Worlds. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Mingers & Willcocks (2017) propose that the three relationships directly between the three worlds, on a one-on-one basis, are embodiment, sociation, and socio-materiality. Embodiment is how the personal and material worlds interact. This will be the area where we would hope to find some insight into the impact of the medium on the consumer. Sociation is the relationship between the social and the personal worlds. In this area, we can explore how the social conventions affect the individual and how the code becomes universally understood. Mingers and Willcocks recommend exploring the relationships of embodiment and sociation by example.

Numerous studies on socio-materiality, the relationship between the social world and the material world, are mentioned by Mingers & Willcocks (2017). The material world will have an effect on the social as argued by Peirce, but it is also interesting to look at the impact that the social world has on the material. These are in fact the things that we make as a community to

shape our material worlds: the spaces we inhabit, the transformations we make on the landscape, and the changes we make to our environment.

Hypotheses and Explanations (Part 2: Step 7)

Finally, the method takes into account all of these relationships and asks the researcher to generate hypotheses and possible explanations of the phenomena discovered. These are covered in the conclusion to this paper.

Assess the Validity and Plausibility of the Potential Explanatory Mechanisms (Part 3)

The third part of the methodology goes on to test hypotheses generated in Part 2 and suggest new or modified "semiotic worlds" that could address the challenges identified in the first two parts of the methodology.

Goal: Verify rigor of the research and establish the more likely explanations for the phenomena identified.	
Step 8	Validate results
Step 9	Confirm, eliminate the hypotheses, or generate new ones
Step 10	Develop possible semiotic worlds in which the communication problems identified would not occur

Table 6: Methodology Part 3. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Although it goes beyond the scope of this paper to properly challenge the research contained within, in the limitation section of this paper, we will attempt to call out its shortcomings and ways in which the findings could be challenged as part of a future investigation.

Act to Bring about Change if Necessary (Part 4)

Finally, the method deals with acting to make a change in the system and correct those problems – particularly useful for an information system currently in use.

Goal: Contribute new understandings, critiques, research proposals; improve semiotic and communication processes.	
Step 11	Disseminate results to correct, and improve upon earlier understandings; identify further research gaps
Step 12	Take action if necessary to improve the semiotic and communication process

Table 7: Methodology Part 4. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

One can question the value of changing a historical information system. However, we might take a larger view of this step than simply the information system under examination and think about how the research can influence other systems. We will touch upon these ideas in the future research section.

IV. Analysis

Appreciating the Research Situation (Part 1)

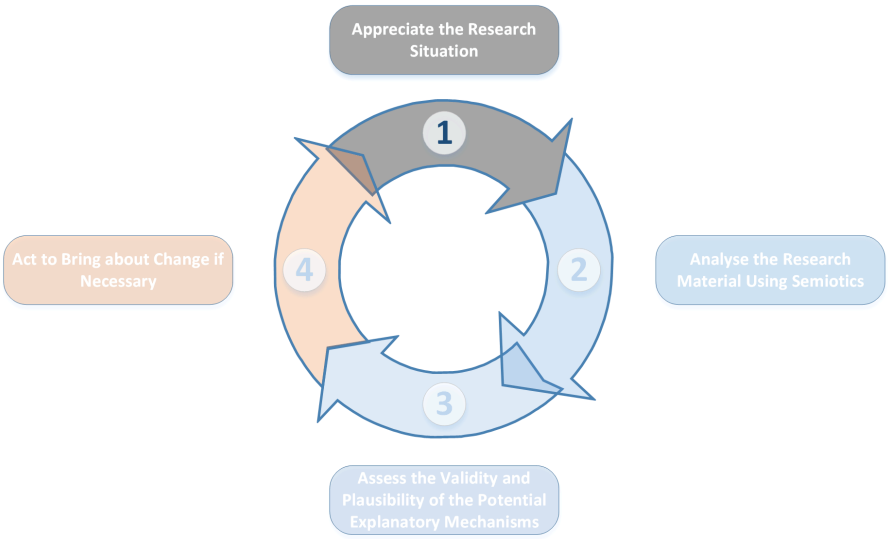

Figure 12: Methodology Overview, adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. Doi:10.1016/j.infoandorg.2016.12.001

Collect Initial Data. Identify semiotic questions, problems, and challenges (Part 1: Step 1)

In order to gain an understanding of stained glass windows and their context from a historical point of view, the research in this paper is of a secondary nature. Some first-hand sources are available, but to a much larger extent the review and analysis of other researchers from later periods are required to gain an understanding of the time. The literature falls into several categories of study, but primarily deals with anthropology, the history of art and architecture, and religious studies. To establish a sort of narrative line in this paper, the Literature Review is largely concerned with background material on semiotics and setting the historical context of the stained glass window: their nature, where they are found, when and how they were built, by whom, and for whom. However, many of the same sources provide support for the findings covered herein.

Describing Stained Glass Windows as Information Systems

Mingers & Willcocks (2014) define information systems as anything that stores, transmits, and represents content[28] and that the study of semiotics is fundamentally the study of transmission of information, from one person to another. In this way they link semiotics integrally with the study of information systems. The contemporary information systems researcher should be familiar with computer-based information systems, and studies of these are frequently referenced by Mingers & Willcocks (2017) in describing their methodology. However, we would argue that a computer is not required to have an information system, and the Mingers & Willcocks' (2014) definitions allows for this. Libraries are paper-based information systems predating computers by millennia, and Khipu – an accounting system based on string and knots – was an information system in the Inka civilisation (Benyon-Davies 2010). Therefore, why not art as an information system?

Let us assume that Mingers & Willcocks (2014) are correct in their linking of information to semiotics. In the following pages, we will demonstrate that stained glass windows can be described in terms of semiotics, and, therefore, contain information. Let us also assume that the Mingers and Willcocks definition of an information system is also correct. Certain steps of their methodology, the results of which are presented herein, will establish that the windows do, in fact, store, transmit, and represent information.[29]

What Information Is Contained in Stained Glass Windows?

Glazing of twelfth and thirteenth century early Gothic cathedrals commonly portrays biblical passages and scenes of saints, both local and more widely known. There are examples of

[28] As discussed in the Literature Review, "content" is defined by Jacobson (1960) as the meaning of a sign and one part of his six-part Semiotic Communication Model. (See Table 1)

[29] Furthermore, one could argue that if we are able to obtain sensible results from the Mingers & Willcocks (2017) methodology for studying information systems when applied to stained glass windows, then there is strong evidence that they are, indeed, an information system.

other more secular subjects, including patrons, monarchs,[30] and scenes of everyday industries. However, the sacred subjects are the focus of this effort, and they were far more common. Several of these religious themes could be reliably found in every cathedral, such as the crucifixion and events surrounding the birth of Christ.

[30] Monarchs of the time were frequently seen as representatives of God on Earth and received their power through Him, so these portrayals could also be considered ecclesiastical.

Figure 13: Canterbury Cathedral. Keates, J & Hornak, A. (1980). *Canterbury Cathedral*. Summerfield Press Limited, Russell Chambers, Covent Garden, London.

For the examples in this paper we will primarily use the windows of Canterbury cathedral, for several reasons. It is one of the earliest Gothic cathedrals in England and there is glass surviving from as early as the twelfth century – a period well before printing and the associated increases in literacy. It's location in England means that the vernacular spoken tongue was very different from Latin, and it is doubtful that many people outside the clergy would understand spoken Latin or any Latin inscriptions found in images.[31] Furthermore, the cathedral is well studied, and literature about its windows is relatively abundant.

Michael (2004) provides a brief history of the cathedral. Established in the sixth century, it has always been one of the more important Christian sites in England. It is the seat of the Archbishop of Canterbury, the senior bishop and principle leader of the Anglican Church.[32] He is also the symbolic head of the Anglican Communion, which includes the Episcopal Church. However, at the time we are studying, before the reformation and the separation of the Church of England from the Catholic Church in the sixteenth century, Canterbury was a Catholic cathedral. With the martyrdom of Archbishop of Canterbury, Thomas Becket, in 1170 and his subsequent beatification, he became patron saint of the cathedral. People from near and far would have visited Canterbury to seek healing in the proximity of St. Thomas' relics.

[31] This will allow us to focus on reading the images and largely discount any contribution that inscriptions in the windows would have on their legibility.
[32] The reigning monarch of the United Kingdom is the head of the Anglican Church, Queen Elizabeth II.

Figure 14: Nave of Canterbury Cathedral. Source adapted from Cannon, J. (2011). *Cathedral: the Great English Cathedrals and the World that Made them*. Constable, London.

Canterbury Cathedral is well studied and has a number of windows surviving largely intact from the early Gothic period. There is a series illustrating the genealogy of Christ, depicting many of his biblical ancestors. A collection of typology windows illustrate stories from the Old Testament that reoccur in some form in the New Testament of the Bible. The Trinity Chapel Ambulatory was glazed in the early thirteenth century with scenes of St. Thomas Becket, the Redemption, and the Tree of Jesse – all religious subjects.

In modern times, the code employed in Canterbury's windows, and most medieval art, can be interpreted by a number of methods. There have been efforts to document historic symbolic imagery, such as Hall's (2007) *Dictionary of Subjects and Symbols in Art.* It is a 400-odd page reference guide translating imagery into words from Ancient Greek art through that of modern times. Michael (2004) gives us several pages on the "reading" of stained glass windows. His work decodes elements unique to the medium and elements that are found in many other art forms of the time. We will largely rely on the interpretations of experts such as these to "read" stained glass windows for us. However, as we shall see, it is important to try and understand how well the lay people of the time could read the windows, for they were the primary intended consumers of the content.

Generate semiotic research questions (Part 1: Step 2)

Having established a background understanding of semiotics and defined medieval stained glass windows in the terms of semiotics, we can fairly easily translate the initial research questions into semiotic research questions:

Initial Research Question	Semiotic Research Question
What was the purpose of stained glass windows?	What was the goal of the producers in creating a system of stained glass windows?
What information did they contain?	What was their content?
Who was that information for?	Who were the consumers?
Does the nature of the windows and their setting influence how the information they contain is perceived?	How does the medium influence the message?
How can their effectiveness be measured?	How well did they accomplish the producers' goals?

Table 8: Translation of Research Questions into Semiotic Research Questions

Analysing the Research Material Using Semiotics (Part 2)

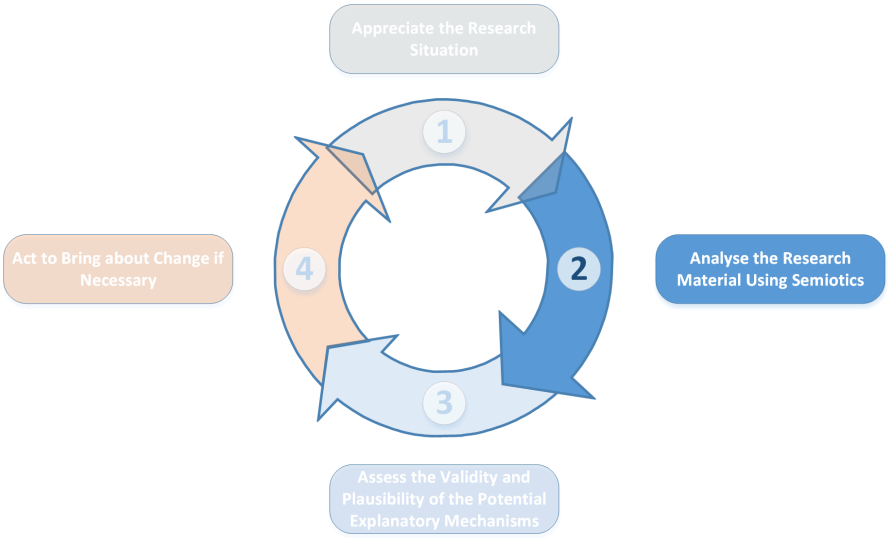

Figure 15: Methodology Overview, adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. Doi:10.1016/j.infoandorg.2016.12.001

To explain a stained glass window in terms of semiotics, some examples are useful. We will start with two examples from Canterbury Cathedral, which are featured in Michael's (2004) *Stained Glass of Canterbury Cathedral*.

Although the cathedral was fully glazed in the twelfth century, there have been many subsequent changes to the building and its windows. Fortunately, much is known about these modifications and repairs, and much of the original glass survives. The first example is from the Genealogy of Christ and is currently positioned in the main west window at the centre of the lowest register. The window depicts Adam, the first man, working with a spade (see Figure 16). The second example depicts Noah in the Ark (see Figure 17) and is situated on the third register[33] of the third typological window in the north quire aisle. These two examples

[33] English stained glass windows are usually read from top to bottom, so this is the third register from the top.

were chosen because they are both from the twelfth or early thirteenth century, they depict subjects which may be familiar to many people still today, and they are relatively simple images that fit into a larger context of other images either thematically related or part of a narrative. Each window contains a collection of signs that allow the reader to identify the subject and understand the story.

Figure 16: Adam Delving, Canterbury Cathedral. Source adapted from Michael, M. A. (2004) *Stained Glass of Canterbury Cathedral*. London: Scala.

Figure 17: Noah in the Ark, Canterbury Cathedral. Source adapted from Michael, M. A. (2004) *Stained Glass of Canterbury Cathedral*. London: Scala.

Analysing the Semiotic Domain: Content and Message (Part 2: Steps 3, 4 and 5)

Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2		
Step 3	Investigate personal world and semiotics	Investigate the Semiotic Domain: Content and Message
Step 4	Investigate material world and semiotics	
Step 5	Investigate social world and semiotics	
Step 6	Investigate: a) Social and personal worlds, and sociation b) Personal and material worlds, and embodiment c) Social and material worlds, and socio/materiality d) How all three worlds interact semiotically	
Step 7	Generate hypotheses and possible explanations	

Table 9: Methodology Part 2. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. Doi:10.1016/j.infoandorg.2016.12.001

Adam Delving

In Adam's window, there is a portrait of Adam himself. He is depicted as a man who appears to be wiry, but strong. Michael (2004) points out that Adam's features give him more humanity than would normally be the case in previous centuries of medieval art. Adam's face is not simply an icon of a human face, but painted with attention to detail with features that could be recognised as an individual's. The painter of this window and several others in the cathedral, the Methuselah Master, was at the forefront of his artistry. However, from a semiotic point of view, the figure of a man is not enough to tell us who man this is, so this is a symbolic icon from a Piercian perspective. We can see the legs of the sheep dangling from the man's fleece loincloth, which would have been interpreted as primitive dress, an indexical sign. He digs in the earth with a spade. Michael (2004) comments that the spade is accurately depicted and would have been easily recognised in the time. This sign of the spade is an icon representing manual labour. When taken together, the phraseword of the man in the loincloth with the

spade, the consumer would see that this is an early man needing to toil in the field to survive. Peasants would see a reference to themselves in this image, because working in the fields is their daily grind. The need to work is a metaphor for the expulsion of Adam and Eve from Paradise. The word Adam is superimposed, leaving no doubt (to those who can read) who this man is.

Figure 18: Genealogy of Christ Windows, Canterbury Cathedral. Source adapted from Michael, M. A. (2004) *Stained Glass of Canterbury Cathedral*. London: Scala.

However, Michael (2004) asserts that the consumers of the time would have been able to figure out this man's identity without the label. There is a further clue in the syntax of the windows. This window is the first in a series of what would have been as many as 86 portraits depicting the genealogy of Christ based on those people listed in the Gospels of Luke and Matthew. Only about half of the series survive today, and they have been moved around and arranged differently, with 12 of them in the great west window (see Figure 18 and Figure 19). When they were first installed, they were placed in chronological order down the north wall and then up the south wall, from Adam through to the Virgin Mary and Christ Himself.

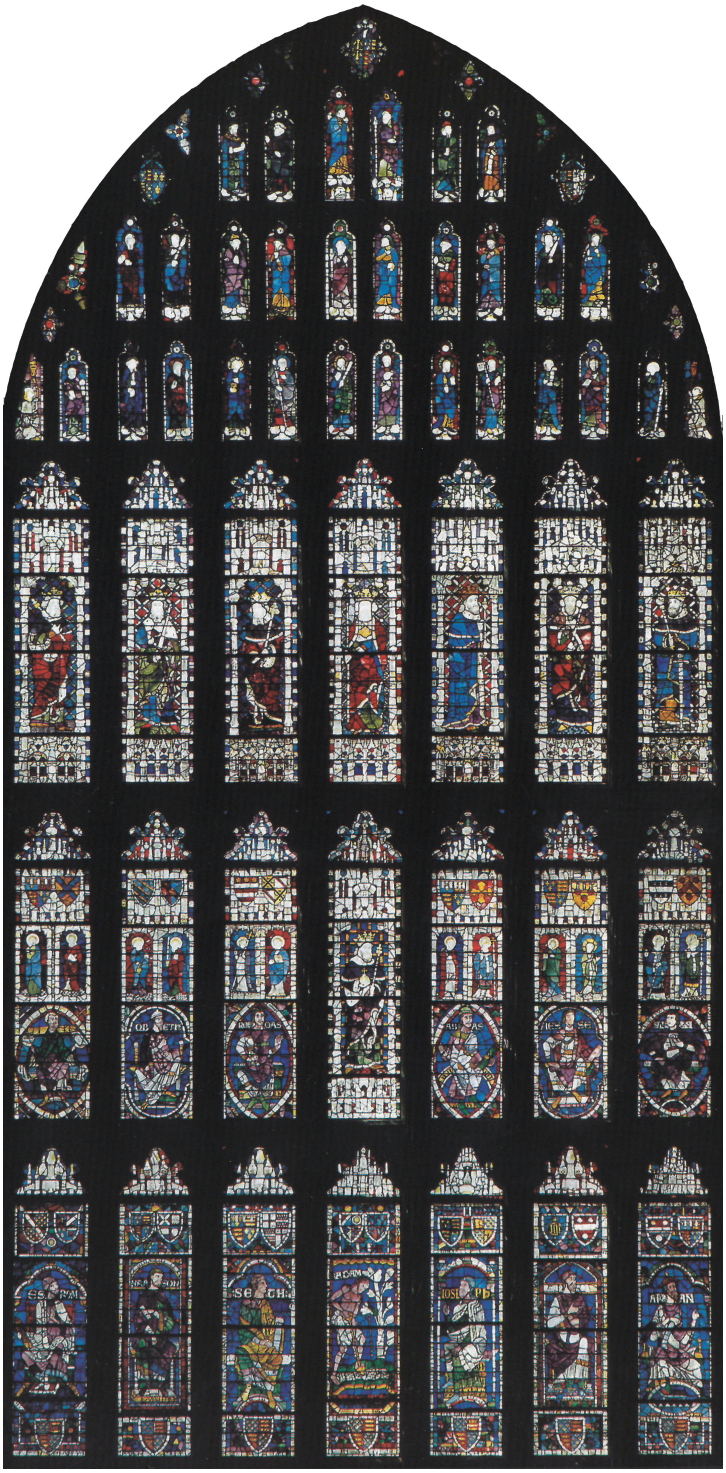

Figure 19: West Window, Canterbury Cathedral. Source adapted from Michael, M. A. (2004) *Stained Glass of Canterbury Cathedral*. London: Scala.

Noah in the Ark

In the second example, we see what to the modern eye might appear to be a building in the sea with a man leaning out of an upper story window. A dove returns to him with an olive branch in its beak, and a raven pecks at something on a rock. There is an inscription around this half-roundel and a title block near the bottom, including Noah's name. Both are in Latin. As with Adam, Noah's portrait is a stylised one, a symbolic icon. We don't know what Noah might have looked like, so his features are painted to resemble his supposed character. He looks like he might be kind and wise. He has long hair and beard, indicating that he was not a young man. Unlike Adam wearing a loincloth, Noah is dressed in robes like many biblical figures would have been portrayed during the time. Michael (2004) points out that early Christian art often portrayed the ark as a casket rather than a boat, and caskets were frequently adorned with sculpture and architectural elements. This thing that looks like a building floating on a turbulent sea is in fact the ark Noah built to survive the great flood. It is highly stylised, including Greek key borders and Roman Corinthian capitals. The sea is stylised as well: all symbolic icons. The dove, the raven, and the olive branch are all iconic signs. They are, to some degree, symbolic of their subjects, but to the extent the medium allows, they are painted in a fairly detailed fashion and are faithful to what they represent.

Without the ark, Noah could be any man. The olive branch is an ancient, pre-Christian, symbol[34] of peace. Without the olive branch, the dove could also simply be an indexical symbol for the Holy Spirit (Hall 2007). However, by putting these things all together, a phraseword is formed that represents the end of a story, when Noah sent out a dove. The dove returned with an olive branch and Noah knew that the floods were receding at last.

The dove and the olive branch are particularly interesting. According to Hall (2007), it is this story about Noah that has caused the olive branch to be associated with reconciliation in

[34] It is a "symbol" in everyday language and in Pierce's taxonomy for the representamen has an arbitrary relationship with the object and bears no resemblance to it. Once could argue that peace as an intangible concept has no appearance and could not possibly have a symbolic representamen.

addition to peace. The phrase “extend the olive branch” is commonly understood to mean sue for peace. After the flood, God had reconciled with the Earth. Therefore, the olive branch is also a symbolic type of sign when it represents peace.

This small panel of glass represents the following passage in the Bible (Genesis 8: 6-12):

> *6 And it came to pass at the end of forty days that Noah opened the window of the ark which he had made:*
>
> *7 And he sent fort a raven which went forth to and fro, until the waters were dried up off the earth.*
>
> *8 Also he sent forth a dove from him, to see if the waters were abated from off the face of the ground.*
>
> *9 But the dove found no rest for the sole of her food, and she returned unto him into the ark, for the waters were on the face of the whole earth: then he put forth his hand and took her, and pulled her in unto him in the ark.*
>
> *10 And he stayed yet another seven days; and again he sent for the dove out of the ark;*
>
> *11 And the dove came in to him in the evening; and lo, in her mouth was an olive leaf pluckt [sic] off; so Noah knew that the waters were abated from the earth.*

This passage and its implications, interpretations, import, and metaphorical allusions are all contained in one pane of one window, there to be read by all who understand the code.

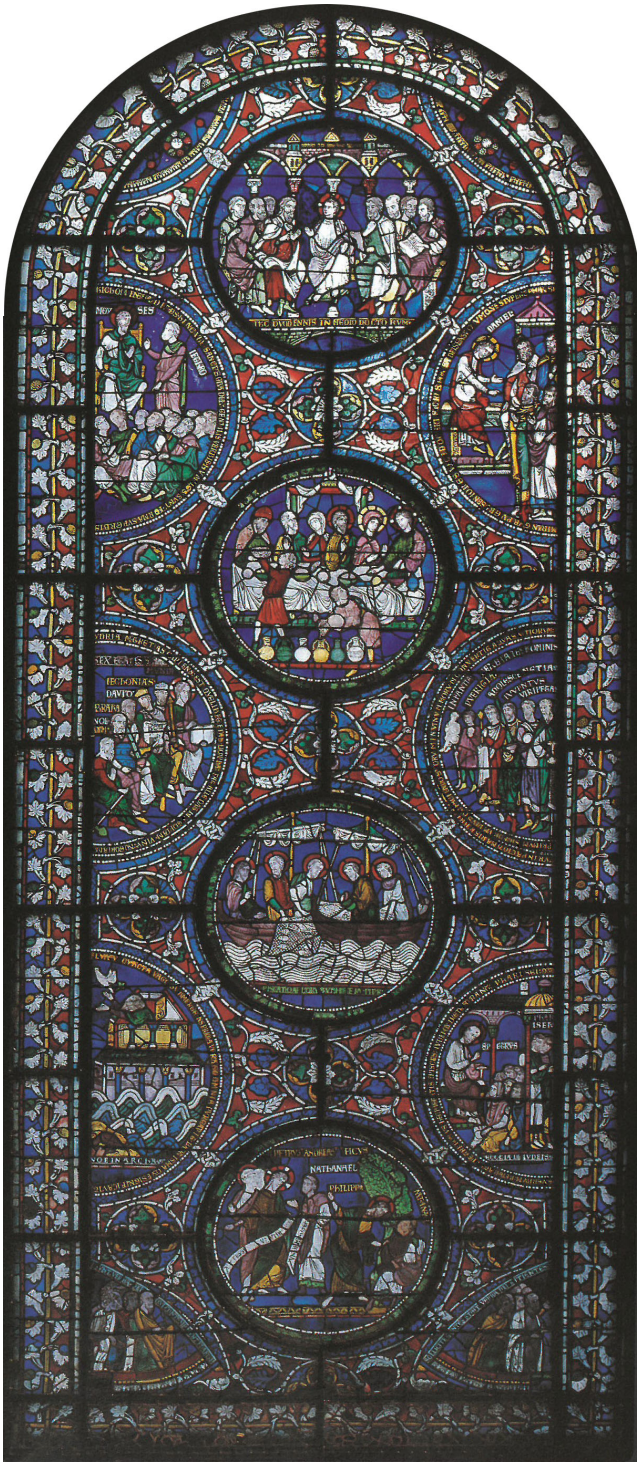

Figure 20: Third Typology Window, Canterbury Cathedral. Source adapted from Michael, M. A. (2004) *Stained Glass of Canterbury Cathedral*. London: Scala.

According to Michael (2004), this image of Noah in the Ark is part of a larger group of Old Testament stories that, through the study of typology, were seen to predict events in the New Testament. Michael says that in this discipline, Noah's flood is seen as a metaphor for baptism. The baptismal water washes away sin in the same way that God's flood washed away all the bad things on the Earth. The Latin inscription around the edge of the half-roundel draws this connection, but most people would not have been able to read this. The literature reviewed for this paper supports the idea that many of the consumers of the time would have been able to read these windows, recall the stories, and understand the connections like this one has through metaphor to other biblical stories (Duby 1981, Scott 2003, Michael 2004, Cannon 2011, Nolan & Sandron 2015). Although she does not seem to be completely convinced, Moss (2006) acknowledges the commonly held belief that religious imagery was used for didactic purposes. She goes on to say that in order for imagery to be effective in a teaching capacity, the images need to be easy to read, and that images needed to be presented in series, related to one another, so that a narrative could be established. As such, stained glass windows in cathedrals would be well suited for this purpose.

The Personal World: Producer and Consumer (Part 2: Step 3)

Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2		
Step 3	Investigate personal world and semiotics	Investigate the Semiotic Domain: Content and Message
Step 4	Investigate material world and semiotics	
Step 5	Investigate social world and semiotics	
Step 6	Investigate: a) Social and personal worlds, and sociation b) Personal and material worlds, and embodiment c) Social and material worlds, and socio/materiality d) How all three worlds interact semiotically	
Step 7	Generate hypotheses and possible explanations	

Table 10: Methodology Part 2. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. Doi:10.1016/j.infoandorg.2016.12.001

In looking at the personal world, it is important to understand the way people think. This is difficult enough to do with living people, so understanding how people in the past were thinking is nearly impossible. Nevertheless we must attempt to do so, and once again we will rely on primary and secondary accounts of the times.[35] A first-hand account of the time and the works of Carruthers (1990), Duby (1981), Harris (2008), Scott (2003), and von Simson (1988) may give us some insight. Two key scholarly disciplines played a role in medieval thinking, scholasticism and mnemonics. These ways of thinking and remembering may have had a profound influence on the design of cathedrals and their windows. They both point to a

[35] To make this link, we must eschew the discontructivist epistemologies and assume that there is a strong connection between evidence to and reality of what was going on in peoples' heads.

rational organisation of information, and are consistent with the rational, modular design of structure and space within the cathedral.

Scholasticism

Revolutionising scholarship, Scott (2003) says that scholasticism completely changed the way people studied and learned.[36] The discipline started taking shape in the eleventh and twelfth centuries when the works of Aristotle were being translated in French cathedral schools, and promoted by the likes of Peter Abelard (1079–1142) in France, Thomas Aquinas (1225–1274) in Italy, and Albertus Magnus (1206–1280) in Cologne. Scholasticism marked a radical change in the formulation of arguments and organisation of ideas where information is structured in a hierarchical manner. These organisational schemas are not so different from the ways in which information is organised in modern systems, and they have artefacts that still exist, such as the rules around sentence structure and punctuation in use today. Scott (2003) argues that scholasticism heavily influenced the rational design of Gothic cathedrals, and that this is evident in the repeating divisions and subdivisions of their constructed elements, spaces, and even the windows.

Information was regularised to make it easier to categorise and organise. This extended to teaching and communication, which may have directly influenced the design of stained glass windows – particularly when considering the possibility that they were used for didactic purposes. Scott (2003) cites Thomas Aquinas (via Yates) in saying that the medieval priests would have used “unusual” similitudes to help the laypeople remember the characters and stories of their sermons. Aquinas was effectively teaching the priests that he trained with to simplify and exaggerate for impact. This approach gave the characters distinctive attributes. We can draw a comparison to medieval art, which was heavily stylised to emphasise

[36] Bearing in mind that very few people would have been educated, the clergy and much of the nobility might have studied this way. They were the producers of the content in the windows.

important traits in the subjects. Each character had its visual attributes. This stylisation made for subjects that were easier to represent and recognise.

Mnemonics & Cathedrals of the Mind

Scott (2003) maintains that the ancient Greek system of memorisation, mnemonics, was still in widespread use amongst the scholarly in an effort to organise and preserve memory. In this discipline, one creates mental images and stores them in a sequence of steps. Traditionally, these images were stored in an imaginary place based on architectural metaphors. Quintilian, a master of the discipline, instructed his students to create imaginary "icons" for each of the things that they wanted to remember and place them in the imaginary building until they were needed. Practitioners could then retrieve the stored information by entering the imaginary structure and navigating to the room that held the icons that it represented. Scott cites Carruthers who describes medieval monks using the discipline as "processing" through their mental spaces, passing each icon to remember long passages of text used for meditation and worship. Through the clergy, scholasticism and mnemonics may have influenced the design of actual cathedrals and the placement of information within them in the form of stained glass windows and other artwork.

Producers

Despite records of documented disciplines, we cannot really know what was going on in the heads of medieval church planners and parishioners, the producers and consumers of the content in stained glass windows. However, through archaeology, we can hope to gain some understanding of their lives and times. We will assume that the literature in this field cited herein is correct. Although views of the past have evolved over time and may continue to do so, it is beyond the scope of this paper to make a challenge in this field.

To understand the intentions of the producers of stained glass windows, it is important to understand the function of the ecclesiastical orders. Scott (2003) asks, "What was the purpose of those who prayed?" He means the religious orders and indicates that they claimed to be "spiritual mediators" between their communities and God, and they ensured the peace through intercession with God. Fortunately, there is a first-hand account from one of the great

architects of the Gothic cathedral, according to Von Simson (1968). “Architect” is meant in the more general sense because the man in question, Abbot Suger (1081–1151) was an architect of the faith, or “ecclesiastical programmer,” as Harris (2008) put it.

In this course of this work, almost every paper or book on Gothic cathedrals or medieval stained glass windows cites Suger. He was appointed Abbot of Saint-Denis in 1122 by French King Louis VI, and he was responsible for directing some of the earliest Gothic building projects at Saint-Denis. Fortunately, his own chronicles survive – a rare first-person account of the times and a glimpse into the purposes of the church building as executed by an individual abbot. He details the intentions, approach, and results of his renovations at Saint-Denis and the commissioning of major building works there. According to Scott (2003), he may have also had some political influence (research differs on this), but he was certainly named an advisor to King Louis VI and King Louis VII. Scott (2003) also argues that Suger’s intentions quickly spread across the continent and into England, his purposes and means for achieving them embodied in the Gothic style of building. Therefore, we will assume that the intentions of all Gothic church builders were similar to Suger’s intentions. As a producer, we shall try to understand what Suger wanted to communicate. To understand more about the medium, we shall investigate how Abbott Suger and his contemporaries utilised art and architecture to enhance the effectiveness of the message.

Scott (2003) says that growing heresy was a motivating factor for the established Church to build cathedrals in the late-eleventh and early-twelfth centuries. He says that they were also used by monarchs to strengthen their positions with regard to nation-building, as it was widely believed that the wellbeing of the realm depended upon the monarch’s gifts to God. Therefore, Scott (2003) would say that cathedrals were used to disseminate propaganda to assist in the Church’s fight against heresy. God was portrayed as light in orthodox Catholic theology, and the universe was seen as a luminous sphere with God at its centre. The light infused the body of Christ, who linked ordinary mankind with God as Christ was made man Himself. As masters of the orthodoxy, the bishops whose seats were housed in cathedrals built them to be vectors through which light radiated from God through Christ to mankind.

Consumers

As outlined in the Literature Review, the everyday life of medieval people was mundane at the best of times; frightening, violent, and painful at the worst. Literacy rates were very low, and when they had time, people mostly entertained themselves by singing, playing the occasional instrument, and telling stories. Oral tradition was the main method for passing on knowledge.

Jakobson & Halle (1971) would argue that consumers need a motivation to receive content. For the medieval consumer, this need seems to be one of seeking comfort. By today's standards, people did not live very long, so one of the biggest fears was of death. Most people were faithful, and they knew that good people went to Heaven and sinners went to Hell. The clergy encouraged them to believe that donations[37] to the Church could redeem their sins, earn the good will of saints who could intercede with God on their behalf in worldly matters, and ensure favourable placement in the afterlife. Scott (2003, p. 211) attributes this tremendous faith in the Church and belief in intercession as the main remedy for people, providing hope against the "backdrop of fear" plaguing daily medieval life. He argues that the Church served an essential social function: ensuring that God was benevolent and drawing the Holy Spirit into the community for protection, succour, and support. Because the majority of people could not read, a visual language was required – pictures that anyone could understand. It helped understanding that these pictures told the same stories that were handed down in the oral tradition.

According to Scott (2003), medieval theologians believed that all visible objects contain the potential to reveal the divine and that through the contemplation of these material things one can directly experience God. The perception of the divine in the material world was the path

[37] These donations caused the monastic orders to accumulate a great deal of wealth during this period, "exceeding anything previously experienced in the history of the Christian Church." This wealth allowed the monks to spend lavishly on art and artefacts to adorn their settings for worship – including the cathedrals and great churches. (Scott 2003, p. 60)

to understanding it. Perception was only possible through light – the vehicle "*par excellence*" to experience the divine. Therefore, God reveals himself through light. Scott (2003) also argues that light is the most distinctive element of Gothic architecture. Worshipers would be bathed in this light, cast into multiple colours by the stained glass windows. People believed that this light was God's grace. "In this view, the universe, born of an irradiance, is tantamount to a descending flood of light that touches everything and unites it, giving order and coherence to the entire world." (Scott 2003, p. 132)

Material World: The Medium (Part 2: Step 4)

<table>
<tr><th colspan="3">Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2</th></tr>
<tr><td>Step 3</td><td>Investigate personal world and semiotics</td><td rowspan="3">Investigate the Semiotic Domain: Content and Message</td></tr>
<tr><td>Step 4</td><td>Investigate material world and semiotics</td></tr>
<tr><td>Step 5</td><td>Investigate social world and semiotics</td></tr>
<tr><td>Step 6</td><td colspan="2">Investigate:
a) Social and personal worlds, and sociation
b) Personal and material worlds, and embodiment
c) Social and material worlds, and socio/materiality
d) How all three worlds interact semiotically</td></tr>
<tr><td>Step 7</td><td colspan="2">Generate hypotheses and possible explanations</td></tr>
</table>

Table 11: Methodology Part 4. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. Doi:10.1016/j.infoandorg.2016.12.001

Transmission of the message is the domain of the material world, and each medium will have affordances and liabilities (Volkoff & Strong 2013). It is these aspects of stained glass windows that distinguish them as a medium and play a key part in the effectiveness of the system. Scale, setting, artistry, and the transmission of light are the key affordances for stained glass windows. That they are pictorial instead of text-based meant that most anyone could read them. That they were fixed in location was a liability and an affordance. It is a liability in the sense that many people would have had to travel in order to see them.

However, it is an affordance in that the cathedral was a place that people were drawn to by their faith, and such a great number of them were built.[38]

The Importance of the Art

As to their artistry and ability to transmit light, Baker (1978) says that it is not possible to reproduce the experience of seeing the actual window. Michael (2004) claims that stained glass makes an impact on the senses like no other medium. Its use of colour and the transmission of light would only be surpassed with the invention of colour photography and cinema in the twentieth century. The scale of cathedrals allowed so many people to see these images at the same time that only the invention of broadcast television would allow for more simultaneous viewing. Perhaps we take this brilliance for granted in our modern day of illuminated screens, but the medium of stained glass moves people still today.

Scott (2003) cites Hegel's argument that art is capable of conveying spiritual content that otherwise does not appear in material things, and that it reflects a deep human need to make something special. He goes on to say that art is used in the cathedral to make the space worthy of the divine. Works of art, such as the stained glass windows, were offerings to God. These offerings were to appease God, win His leniency, and avoid His fury.

Heaven on Earth

The ecclesiastical and architectural setting of the windows was an affordance to their understanding and import for the consumer. The Cluniacs believed that the liturgy should be celebrated with in magnificent splendour to magnify the glory of God. (Scott 2003) They decorated their churches with the most lavish ornaments, and built them in spectacular fashion, with the aim of transforming their interiors into "Heavenly Jerusalem" on Earth. Their interior spaces and the relics, statuary, altars, and even windows are all sacred objects. (Scott 2003)

[38] We can draw a parallel here to the modern concept of redundancy in information technology.

As Jesus Christ was God made man in the Catholic belief, cathedrals were the house of God made incarnate on earth – heaven on earth. Just as Jesus connected living beings with the divine, the cathedral connected nobility, the clergy, merchants, and peasants with God. Scott (2003, p. 68) quotes Duby (1981), "At the junction… where the created and the uncreated, the natural and the supernatural, the eternal and the historical came together, is where Christ was situated, as God made man. He was 'light born of light,' yet was made of solid flesh. Even since the building of Saint-Denis, Gothic art had strained to express the incarnation."

Von Simson (1988) says that Suger intended the cathedral at Saint-Denis to provide an "image" of heaven. According to Scott (2003), the medieval concept of "image" is slightly different that the modern meaning. It stems from "*mimesis*" in Greek, which means "imitation" or a copy of the actual form. It implies that the copy embodies the thing it stands for. So Suger's intention is not so much image in the modern sense, but embodiment and physical manifestation, a literal rendition of heaven on Earth. Suger describes his cathedral as the great intersection between God, the Church, St. Denis, and the monarch. He rebuilt the abbey church at Saint-Denis in the very early Gothic style – his largest building project.[39] According to Scott (2003), Suger's vision of the basilica was a space where one could get a glimpse of heaven: geometrically regular, enduring, and filled with light.

The Social World: The Code (Part 2: Step 5)

Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2		
Step 3	Investigate personal world and semiotics	Investigate the Semiotic Domain: Content and Message
Step 4	Investigate material world and semiotics	
Step 5	Investigate social world and semiotics	

[39] Scott (2003) positions *The Chronicle Tradition of St. Denis* as Suger's greatest work.

Step 6	Investigate: a) Social and personal worlds, and sociation b) Personal and material worlds, and embodiment c) Social and material worlds, and socio/materiality d) How all three worlds interact semiotically
Step 7	Generate hypotheses and possible explanations

Table 12: Methodology Part 2. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. Doi:10.1016/j.infoandorg.2016.12.001

Saussure and Peirce agree that the communal understanding of the code is crucial for effective semiosis and, therefore, communication. How, then, is the code employed in stained glass windows agreed and passed on within the community? In large part, this is through religion, a social construct. Moss (2006) says that imagery in churches and cathedrals was crucial to faith in the medieval period. She argues that art was a powerful tool for communication – the dissemination of information. Although contemporary accounts of responses to religious imagery are rare, and it is impossible to be certain how such imagery was received, Moss (2006) sees value in analysis of imagery in different media to give insight into its function.

Furthermore, Scott (2003) argues most medieval people had great faith in the Christian Church and the protection of the saints, and that this is widely agreed by historians. People believed the claims of miracles occurring, and these were frequently associated with cathedrals and great churches where relics of the saints were held. They would visit these places where relics of the saints were kept to receive blessings from being in the proximity of these holy objects. Many medieval people undertook pilgrimages to seek intercession from one saint or another, and they would have seen many different churches and cathedrals that way. These cathedrals and their stained glass windows were the medium to convey the content of ecclesiastical programming.

According to Scott (2003), visitors to cathedrals of all social orders would have been very familiar with the symbols in stained glass windows. They would have been able to identify each person depicted by their attributes. For example, St. Thomas Becket could be identified

by episcopal robes, a mitre, a crozier, and a sword embedded in is skull (Hall 2007). Peasants would have seen themselves in the ordinary items of daily life, such as the spade employed by Adam in Figure 16. They would have known what each flower and bird stood for. Colours had deep meanings, too. Blue and gold were associated with wealth and power due to the value of gold and the historically high cost of making blue paint out of lapis lazuli. Red glass is made with gold, so it was also expensive to make (Michael 2004). These colours and materials represented the wealth and power of the Church and its noble patrons.

Active participation in religious rituals was essential for nearly everyone. This would include the telling and re-telling of the stories in the Bible. Everyone would be familiar with all the characters, major and minor. People would attend mass on a regular basis, a communal activity, and spend time together in churches and cathedrals when they were seeking succour, which, given the conditions of daily life, must have been frequently. This active participation in religious ritual, frequent visits to the places where the stories of the faith are told in pictures, and the telling and retelling of the same stories in the oral tradition ensured the communal understanding of the code. The persistence of the code was such that it is not completely lost to this day.

Mingers & Willcocks (2017) encourage the researcher to consider three aspects of the code: genre, myth, and discourse. In the case of stained glass windows, we see examples of all three. The windows at Canterbury fall into several genres, including the crucifixion, redemption, genealogy, miracles (see Figure 21), and stories of the saints.[40] The typology windows are another example of genres. As with the Noah story discussed above, these Old Testament stories are seen as portent to New Testament stories. In this genre, dozens of stories are linked between the two testaments, and windows are organised to juxtapose the

[40] The fact that most cathedrals had illustrated stories of local saints that were not well known elsewhere was a form of the modern concepts of localisation and globalisation. Much of the content was the same from one church or cathedral to the next, but each one had its own local stories to tell (Scott 2003).

related stories.[41] Each story includes a script in Latin that explains the connection between the two stories. This script is a form of discourse. It is a sub-section of the code that only the academics can fully understand. Firstly, the script is in Latin, so we cannot expect most people to be able to read it, but, in addition, the connections are sometimes indirect, and only someone who studies typology would fully understand them (Michael 2004).

Figure 21: The Cure of 'Mad Henry of Fordwich,' Canterbury Cathedral. Source adapted from Michael, M. A. (2004) *Stained Glass of Canterbury Cathedral*. London: Scala.

Then there is myth. Aside from the fact that we are dealing with a faith-based content, which one could argue is myth itself, myth in the sense of semiotics is merely something that everyone believes, whether it's true or not, and, therefore, it is taken for granted and frequently left unspoken. There are several myths at play in this system. Belief in the religious promises of intervention, healing, and redemption are key myths. A challenge to fundamental

[41] Sadly, the story juxtaposed with our example of Noah is lost. Michael (2004) has some evidence that it would have been a baptismal story and probably featured John the Baptist.

needs of life and a promised fulfilment of those needs motivated both producers and consumers to use the system.

Relationships between Personal, Material, and Social Worlds (Part 2: Step 6)

<table>
<tr><th colspan="3">Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2</th></tr>
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</table>

Table 13: Methodology Part 2. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. Doi:10.1016/j.infoandorg.2016.12.001

Embodiment

Mingers & Willcocks (2017) cite a study where Schultze (2010) examines the embodiment elements of virtual reality systems that allow participants to create avatars to represent themselves in the digital worlds – the intersection of the personal and the material worlds. These avatars open up the possibility for participants to communicate more richly, employing body language and facial expressions. Unlike with interactive media where true embodiment is not possible, in a real space, such as a cathedral, this substitution of the real is not necessary. However, the real physical presence in the real physical space has an impact on the senses. Separate from the medium itself is the relationship of the personal to the physical. Scale plays a large role in this instance, and the setting magnifies the effect of scale. There is complete agreement among the authors of the papers cited herein on the

impact of the cathedral space. It is an awe-inspiring place impacting on all the senses (Trachtenberg & Hyman 1986, Scott 2003, Harris 2008, O'Donoghue 2009, Cannon 2011). This sense of awe must contribute to the effectiveness of the system.

Socio-materiality

Here we are looking at the intersection of the social and the material worlds. According to Mingers & Willcocks (2017), there have been many recent studies of socio-materiality in various social media systems. These are virtual places where people come together in the context of sharing information about a particular topic. The church of medieval times was a very social place. Religion is certainly a social activity, but Scott (2003) also tells us that much everyday social activity took place in and around the church. This is the same setting for the stained glass windows and the information they hold. This social activity serves to solidify the communal agreement on the code and helps pass the understanding of the code from person to person. The religious side of the socio-materiality perpetuates the myths associated with the code.

Sociation

The relationship of the individual to the group is the essence of this relationship between the person and the social worlds. Although churches were in some ways places that make all mankind equal – "we are all sinners" – there were clear hierarchies in the way they were organised. The clergy is separate from the laypeople, and both groups have hierarchies of importance. From bishop to monk, and from lord to peasant, each group had a place in the cathedral. That they were all there made them equal, that they each had their own places, roles, and robes, evidenced their differences.

V. Conclusions & Future Work

Hypotheses and Possible Explanations (Part 2: Step 7)

<table>
<tr><th colspan="3">Goal: Collect and analyse semiotic materials to explain observations in Steps 1 and 2</th></tr>
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Table 14: Methodology Part 2. Source adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

First, we have established that medieval stained glass windows in early Gothic cathedrals and churches constituted an information system from a semiotic standpoint. They provided an organised framework to store and transmit information. Ecclesiastical programmers were their producers who planned their content to promote the faith through illustrating biblical stories and recording subsequent deeds of the saints. The consumers were the laypeople and, to a lesser degree, other clerics who could receive the message due to the pictorial aspect of the medium, whether they were able to read or not. Religious ritual, scarce written documentation, and oral tradition was used to share and preserve the common code that allowed everyone in the community to understand the windows.

These windows were very effective at achieving their purpose. By several accounts (Duby 1981, Lee 1977, Scott 2003, Michael 2004, Harris 2008), the experience of stained glass windows in great churches and cathedrals was (and still is) a profound one. Light filtering

through the stained glass was integral to the experience, and taken as a whole, the cathedral was believed by most medieval people to be a little piece of heaven on earth – a sacred place for healing and protection. The stories in its windows were true, and by looking at them, one could receive the divine light of God.

It is, however, probably more accurate to describe the windows as part of a larger system. Although we can dissect them into their component parts and interpret their content, their setting within the cathedral and all of its other trappings must have contributed greatly to their effectiveness. In semiotic terms, this is the larger extent of a medium within the context of its setting. The setting is made possible and the message reinforced through the communal belief in the Christian doctrine that promised salvation from the fear and pain of everyday medieval existence.

The research suggests that the key contributors to the effectiveness of stained glass windows are these four elements. First, the medium channelled and filtered light in a way that was very different from other media at the time. No other art form was lit from within,[42] nor was any other information system. With stained glass, light and colour were brighter and more saturated than was possible in any other medium. This intensity magnified their impact. Second, the setting of the windows permitted them to be created in a massive scale. Gothic buildings were the tallest in the world until the industrial revolution and the use of iron in construction. Their interiors were cavernous, and their architecture allowed vast sections of the walls to be pierced with windows. Scale alone made them supremely impressive. Third, everyone could read them. Everyone but visitors from the remotest places would be fluent in the pictorial language of people, animals, and everyday things combined with religious symbols and attributes. The windows illustrated stories that even the illiterate would have

[42] The windows are actually lit from behind with daylight.

heard over and over again from their youth. Fourth, a powerful myth,[43] made possible through a strong community of faith, related their content to daily life. According to the myth, the windows were part of a system that provided access to intercession, healing, and redemption. The myth cast the windows as holy objects themselves, part of the fabric of heaven on earth, transmitting light, the vehicle of His grace.[44]

This effectiveness came with a cost. Medieval cathedrals were tremendously expensive and took decades if not centuries to build. Glass is fragile. Through wars, iconoclasms, neglect, and desire for change, few windows survive fully intact from the early Gothic period. There may have been a moral cost as well. Corruption in the Church – selling of indulgences, trade of supposed relics, and exploitation of the poor to enrich the lives of the clergy – was rampant in the middle ages. These cathedrals were key components of a system that supported these activities, and these activities partially funded their construction. Although they can be viewed as objects of great beauty, they can sometimes be seen to represent exploitation of the many for the benefit of the few.

[43] "Myth" is used here in the terms of semiotics: those parts of the code that are believed by a community of people so fundamentally that they are taken for granted and often left unspoken. The truth or falsehood of the myth is irrelevant.

[44] Whether or not we believe in the Christian faith ourselves, and however different that doctrine is today from what it was 800 years ago, all accounts of the time cited in this paper agree that the vast majority of people – producers and consumers alike – were likely to have truly believed the Christian doctrine and the divine power of its earthly manifestations.

Assessing the Validity and Plausibility of the Potential Explanatory Mechanisms – Limitations of this Research (Part 3)

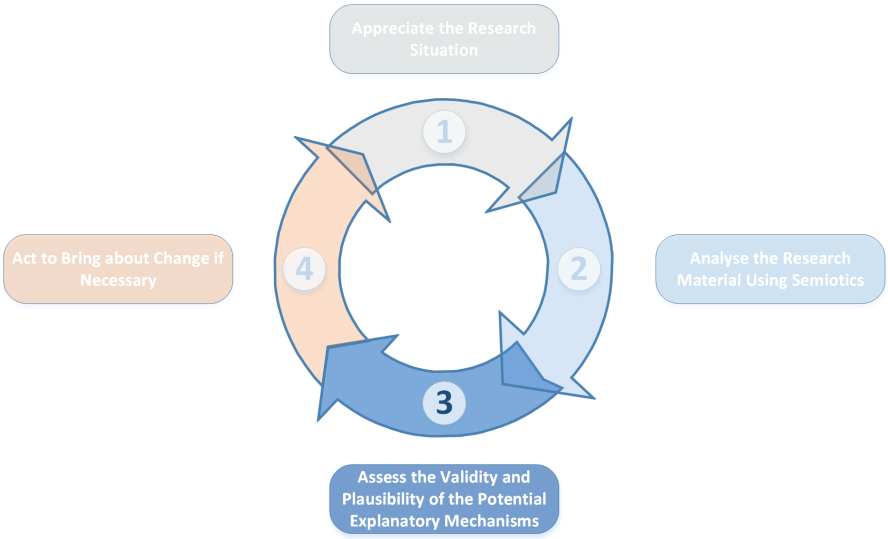

Figure 22: Methodology Overview, adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

In that this investigation deals with information systems of the past, it is impossible to interrogate either the producers or consumers of the information. Although we could interview modern consumers of the information, and this is interesting in the context of further research, from a semiotic point of view modern day people are not in the same community of common understanding as the medieval producers. The intervening years have changed language, culture, religion, and many of the things that would otherwise form the necessary "common frame of reference" discussed in the Literature Review section on semiotics. For both producers and consumers we must rely on written primary and secondary sources. The primary sources are rare, such as Abbot Suger's *Chronicle,* and furthermore, they require expert interpretation and analysis from a linguistic and anthropological point of view. In fact, this paper relies on interpretations of Suger's text rather than citing it directly. Secondary sources cannot avoid subjectivity and some measure of unproven hypothesis.

This research relies heavily on several key sources and may have neglected to take in alternative views other sources may have described. With regards to semiosis, the Chandler (2007) textbook and the work by Mingers & Willcocks (2014, 2017) have been very influential. *The Gothic Enterprise* by Scott (2003) provides the core research on medieval times and the building of cathedrals. The research on stained glass is broader, but leans heavily on Michael's (2004) study of Canterbury Cathedral. It also seems likely that the authors of those works share this author's own personal appreciation of the medium. Those who did not care so much for the art form might not have been as complimentary, and this would alter the findings somewhat. This paper has attempted to treat the Roman-Catholic religion of Western Europe from an objective, historical point of view. However, the author himself was brought up in the Western culture in the tradition of modern Christianity, and it can be difficult to divorce oneself from one's own upbringing to examine it from an external point of view.

Acting to Bring about Change (Part 4)

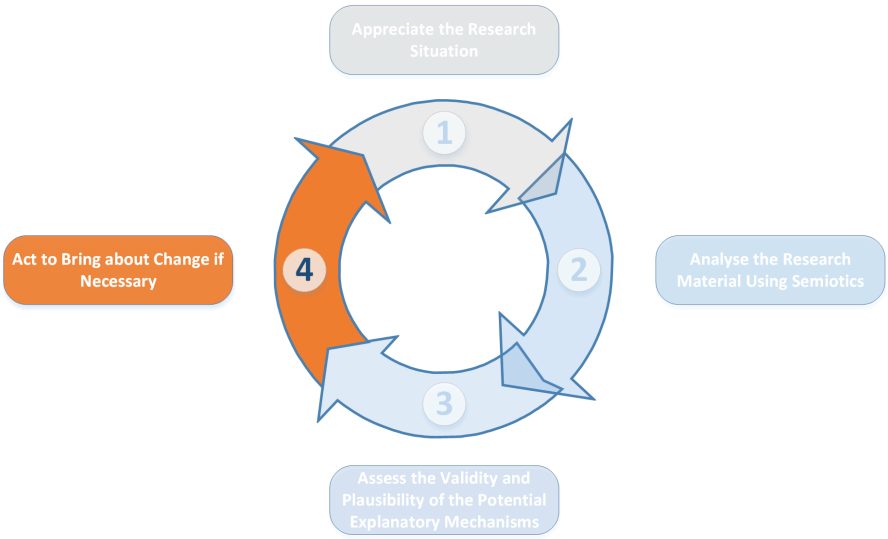

Figure 23: Methodology Overview, adapted from Mingers & Willcocks (2017) An integrative semiotic methodology for IS research. *Information And Organization*, 2717-36. doi:10.1016/j.infoandorg.2016.12.001

Lessons for the Future

What can we learn from studying stained glass windows and their ability to impart information? If we look at the four key contributors to their effectiveness, two of them have changed very little in 800 years – illumination and scale. The other two, communal understanding and myth, are not completely lost on modern mankind, but they are certainly diminished or different since medieval times. With regards to illumination, this technique is widely used. Cinema, television, computer monitors, and smartphones all have this quality. It may be fair to say that this lesson has been retained.

Scale is also frequently employed today. Cinema is projected on large scale, and the IMAX format is a popular type of cinema on a very grand scale. Illuminated billboards in places such as Piccadilly Circus and Times Square mimic, in some ways, the scale and illumination of the cathedral in an outdoor space. Giant multimedia scoreboards can be found in sports stadia around the world. This lesson may also be one that needs no repeating for the time being.

How can we use codes that are more universally understood? The medieval religious code was part of everyday life and the community fostered its dissemination. Perhaps because there was little else to do, people became very familiar with the biblical passages and stories of saints that adorned their cathedrals. Is there a modern equivalent? Perhaps not, and perhaps that says something about the fragmentation of our globally connected society. There seem to be many more options to satisfy our need for information and entertainment. The rising popularity and expanded vocabulary of Emojis in the past few years may be a clue suggesting the need of a universally understood language – independent of verbal and written languages that vary from place to place. Is Emoji truly inherently understood, and are there other native languages associated with the human condition? This broad area for future research and its aspects have been considered in literature uncovered in this effort (e.g., Bolter & Grusin 1999, Dansesi 2017).

Finally, the biggest lesson is perhaps about myth. In the era of fake news, it has become obvious that what we believe has a very strong influence on the effectiveness of our information systems. We are much more inclined to absorb information if we have faith in its

source and agree with its purpose. The question becomes, how do we foster this belief? What are the moral implications of generating myths? Can we escape our own communally understood code to reveal fallacious myths?

Future Research

Although we cannot directly ask medieval people about their perceptions of stained glass windows without a time machine, it would be interesting to see what impact this medium has on modern day people. Jakobson & Halle (1917) suggest that “contiguity” is required between producer and consumer, and that any separation between the two in space or time must be bridged by some relationship. To what degree do these relationships still exist between modern-day people and the cathedral builders of the Gothic period? To what extent do they still understand the code? Perhaps the relationship has reversed: where once the pictorial code was universally understood and the written language only known to the elite, now only the written words are universally understood, and the picture symbols are forgotten except to a few scholars and enthusiasts of religion and art history.

If the cultural understanding of religious imagery has changed since medieval times, what impact does the medium have without that understanding? How much meaning is still transferred from those ecclesiastical programmers to the information consumers of the modern age, and how has time eroded the effectiveness of this transfer? Perhaps the medium itself is powerful enough that some of the same intangible concepts around divinity and grace are conveyed without a strong cultural link. To find out, it would be useful to survey people from a variety of religious (and non-religious) backgrounds from a range of cultural and geographical origins or devise an experiment to gauge their reactions to seeing the windows or experiencing the space of a cathedral. If the windows can only be understood through their impact as an art form, have they lost their classification as information system? If we lose the code, do we lose the system as well?

In any case, a better understanding of the mechanisms that make stained glass windows such a powerful medium for transmitting information would be helpful in applying the lessons we have learned. For example, what is it about illuminated media that we find so compelling? It would certainly be possible to devise experiments to better understand the mechanisms,

whether physiological or psychological. Scale could be treated the same way. With regard to belief and common understanding of the code, we can look at modern stained glass windows. However, as the code has moved on, so has its myths and the pervasiveness of its understanding in the population. Christianity was the key to common understanding and the source of many of the semiotic myths that supported the system. With the secularisation of society prevalent in today's world, we would expect that the level of common understanding has diminished, and that the myths are less powerful. Perhaps the most interesting question is what are the myths of today, are they as pervasive as they once were, and what impact do they have on our understanding and dissemination of information?

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