CLASSIFYING THE CONDITIONS AND TYPES OF DEGRADATIONS OF *KELINGKAN* SHAWLS

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ABSTRACT
Kelingkan embroidery is a Malay traditional metal thread embroidery rooted since fifteenth century A.D. It is known in Peninsular Malaysia and Sarawak in Malaysia as well as in other Malay neighbouring regions including Brunei and Indonesia. Kelingkan shawl is one form of kelingkan embroideries which is distinguished by flat coated metallic threads of gold or silver embroidered on lightweight and translucent fabrics. This study aims to identify types and factors of degradations of kelingkan shawls from the collection of Department of Museums Malaysia located in Kuala Lumpur. The study was carried out through visual observation on twenty-two samples of kelingkan shawls in the museum textile storage room. The findings identify physical damages as the major factor constituting the instability of kelingkan shawls, followed by chemical and biological damages. Their conditions are also found to be in four categories which are good, fair, poor and very poor conditions. While factors lead to their damages are aging, the nature of materials and improper storage methods. Identification and classification of types and factors of damages are necessary to determine the correct preservation and conservation techniques of damaged objects in museum.

Keywords: *Kelingkan*, Malay embroidery, metal thread, museum, preservation.

INTRODUCTION
Kelingkan embroidery is a Malay historical textiles rooted since fifteenth century A.D. It is an art of embellishment on variant fabrics with flat coated metallic threads of gold and silver with customary two eyes needles. It is found in shawls, traditional costumes and wedding decorations of Malay community. *Kelingkan* shawl is traditionally worn by Malay woman, to cover her head or shoulder. The shawl is often worn with traditional Malay costumes like *Baju Kurung*, *Kebay*a and paired with *Sarong*. Historically, *kelingkan* shawls are made for noble Malay women and only worn during ceremonial occasions like coronation, wedding and engagement.

Fig. 1 *Kelingkan* shawls worn over the shoulders in variant forms of styles, paired with traditional Malay women costumes.
Source : Zubaidah Shawal (1994)

Kelingkan shawls are collected by many museums and considered as part of Malaysia national heritage. Apart of their historical, cultural and aesthetical importance, the acquisition of these embroideries by museums is necessary as they are in the state of declination in Peninsular Malaysia (Rusli & Nawawi, 2016). In Kelantan, there are only very few skilful Malay practitioners survives which are women of advanced age.

Preliminary study on the collection of *kelingkan* shawls in the Department of Museums Malaysia located in Kuala Lumpur has found multiple degradations on the objects. In museum environment, identification is the first and crucial step before any preservation and conservation treatment should be carried out. Hence, this paper aims to identify and classify the conditions and types of degradations of *kelingkan* shawls from the collection of the Department of Museums Malaysia located in Kuala Lumpur. This paper is also try to investigate factors of degradation of the *kelingkan* shawls in the museum textile storage room.

LITERATURES REVIEWS

Kelingkan embroidery is an art of embellishing gilded metal threads of gold and silver on commonly lightweight fabrics like silk, voile, net and chiffon (Azah , 2009 & Siti Zainon, et al, 2012). It is believed to originate from French word, c*linquant* which means glittering of silver and gold (Azah, 2009). Its origin in Peninsular Malaysia is said to root back to the era of Malacca Sultanate in fifteenth century A.D and evolved in the nineteenth century A.D under the patronage of the Malay female royals. This embroidery is worn on ceremonial occasions like engagement, wedding and royal events (Barakat, Abdul Ghani, & Heyes, (Eds). (2013). *Kelingkan* shawls as one form of *kelingkan* embroideries are worn on the head or shoulders to complement Malay traditional costumes (Azah, 2009).

Natural fibres come from living sources with biological functions. As they age and the structure of the fibre changes, they become less elastic and resilient (National Park Service, 2002). This process of natural decay can be accelerated by environmental factors, chemical reactions, physical forces, and biological growth. Environmental factors include light, temperature, humidity, air pollution, soiling and stains, intrinsic decay and disasters (Boersma, 2007 and Landi, 1998). Landi (1998) further states these factors exert influence not only individually but also through complicated interactions. These factors cause variant types of textiles degradations.

Light causes fading and weakening of fibres (Thomson, 1986, & Government of Canada, 2013). High relative humidity (RH) cause shrinkage and mould growth on textiles as well as accelerates corrosions of base metals, particularly iron and copper. While high temperatures increase the rate of chemical decay of all materials (Government of Canada, 2013, Schultz, 1992). Tears, losses, splits and wear can result from previous use, internal stress inherent in the object, and handling (Government of Canada, 2013).

METHODOLOGY

A qualitative case study approach is adopted for this study. Information is gathered from visual observation and supported by literature reviews. The visual examinations on twenty two pieces of *kelingkan* shawls are assisted by tools which include checklists, digital camera, magnifier, portable digital microscope and measuring tools. This study is conducted in the textile storage room of the Department of Museums Malaysia located in Kuala Lumpur. Each shawl is given a research identification number and code based on their type of fabrics and *kelingkan* threads.

Table 1 List of samples of *kelingkan* shawls in the textile storage room. Each object is given a research number on which "C" refers to cotton and "a" refers to gold thread

Materials	**The Samples of *Kelingkan* Shawls**			
Cotton Fabrics	 Ca1	 Ca2	 Ca3	 Ca4
	 Ca5	 Ca6	 Ca7	 Ca8
	 Ca9	 Ca10	 Ca11	

Table 2 List of samples of *kelingkan* shawls in the textile storage room. Each object is given a research number on which "C" refers to cotton and "a" refers to gold thread

Silk Fabrics	 Sa1	 Sa2	 Sa3	 Sa4
	 Sa5	 Sa6	 Sa7	 Sb8
	 Sa9	 Sa10	 Sa11	

Physical examination on *kelingkan* shawls show that they have suffered multiple damages in varying degrees. These damages are categorized into physical damages which are the most crucial, followed by chemical and biological damages. The condition of the *kelingkan* shawls is further categorized into condition rating code which is devised based on the available literatures (Lennar, F. & Ewer, P., 2010; Kirti Manek, 2012; and Government of Canada, 2012).

Table 3 Classification of types of damages of *kelingkan* shawls

CLASSIFICATION OF TYPES OF DAMAGES			
Materials	**Physical Damages**	**Chemical Damages**	**Biological Damages**
Fabric	Tears and splits Loss Parts Weak Fibres Frayed Yarns Creases Permanent Folds Brittle	Discolouration Color Fading Darkened area Yellowing Stains	Black Mould Insect Stains

Kelingkan Threads	Loss Parts Detached Parts Tangled Dented	Tarnish	Nil

Table 4 Classification of damages of *kelingkan* shawls

Condition Rating Code	Description
Excellent	New, very stable and no evidence of use, very little or no conservation treatment required
Good	Usually stable, Evidence of use and need some degree of conservation treatment
Fair	Usually not stable, clear visible of use, damages may due to acquisition, storage and display, aged objects may face natural deterioration , required extensive treatment
Poor	Unstable condition, obvious evidence of use, damages due to poor storage, display or natural deterioration, required extensive treatment
Very Poor	Very unstable condition, extreme evidence of use, poor storage, display or natural deterioration, difficult to stabilize for safe display

RESULT AND DISCUSSION

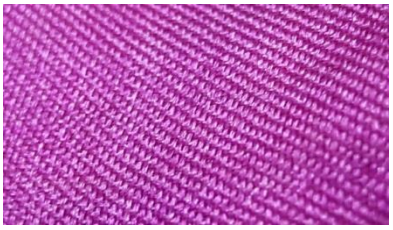
Visual observations found that twenty two samples of *kelingkan* shawls are mainly consists of thin and light weight fabrics of cotton and silks in varying degree of transparency. Visual observations also found that *kelingkan* threads on twenty one pieces of them are made from gold, and a piece is made from silver.

Cotton gauze

Cotton voiles

Fig. 2 Examples of category of *kelingkan* shawls that made from lightweight cotton fabrics

Crepe silk



Sateen silk

Fig. 3 Examples of category of *kelingkan* shawls that made from lightweight silk fabrics

1. Classification of Condition of Kelingkan Shawls

All of the samples of *kelingkan* shawls suffer multiple damages either physically, chemically and biologically. Their condition based on the devised object condition rating code is found to be in four categories; good, fair, poor and very poor condition.

i. Good Condition

Five pieces of *kelingkan* shawls in this category are in stable condition. However, they have shown certain evidence of uses and several damages which need some degree of conservation treatments.

Table 5 The *kelingkan* shawls in a good condition

Materials	Research Identification Number
Cotton	Ca5, Ca9, Ca10 and Ca11
Silks	Sa6

Ca5, Ca10 and Ca10 have previously gone through conservation treatments and currently in stable condition. While Ca11 which has been previously conserved and Sa6 have several physical damages like tears and loss parts of *kelingkan* threads. Several white spots and brownish stains have also been founded on the Sa6. However, these damages are not major and do not require any extensive conservation treatment.

a. Ca10 b. Ca11

Fig. 4 *Kelingkan* shawls which have been previously conserved with adhesive treatment

ii. Fair Condition

Six pieces of *kelingkan* shawls are categorized into fair condition based on the following characteristics; evidences of previous use include worn out and aging, as well damages that may acquire from improper storage or display like tears, darkened folded lines and discolouration. These damages also influence the stability of the *kelingkan* shawls. However, they can be handled with care, and stored with proper methods of object supports. Mould, form of biological damage is a also found on several pieces of *kelingkan* shawls.

Table 6 The *kelingkan* shawls in a good condition

Materials	Research Identification Number
Cotton	Ca7, Ca7 and Ca5
Silks	Sa3, Sb8, and Sa10

Loss of *kelingkan* threads that require extensive treatments

Discolorations include stains, fading and darkened folded lines that weaken the fibres strength

Fig. 5 Types of damages on *kelingkan* shawls

iii. Poor Condition

This category comprised of sixth (6) pieces of *kelingkan* shawls that clearly in unstable condition. They are fragile, suffer multiple major physical and chemical damages and show obvious evidences of previous uses. All cotton *kelingkan* shawls except C1g are black gauzes and they are mostly affected by physical damages particularly tears and splits. C1g and both silk *kelingkan* shawls suffer major chemical damages like darkened fabric surfaces and folded lines, stains and fading. These objects should be handled with extreme care and require extensive conservation treatments and proper storage system for their continuous sustenance.

Table 7 The *kelingkan* shawls in a poor condition

Materials	Research Identification Number
Cotton	Ca2, Ca3, Ca6, and Ca5
Silks	Sa2 and Sa7

Fig. 6 Obvious evidences of previous uses as well as physical and chemical damages include fragility, obvious worn out, and extreme discoloration

Fig. 7 Tears, and splits on very thin and worn out fabrics of *kelingkan* shawls

iv. Very Poor Condition

Four (4) pieces of *kelingkan* shawls in this category is in very extreme condition and unstable. They are severely torn on which even handling might cause further damaging effects. All of them are very thin and have high level of transparency. This category of *kelingkan* shawls shown obvious evidences of major physical damages which critically affecting their stability. The fabrics of both cotton and silks have become brittle, and the yarns are severely split and easily shattered into dusts. Tears in large and small sizes, as well as loss of fabrics and *kelingkan* threads are commonly found on the body of all *kelingkan* shawls.

Table 7 The *kelingkan* shawls in a very poor condition

Materials	Research Identification Number
Cotton	Ca10
Silks	Sa1, Sa5 and Sa11

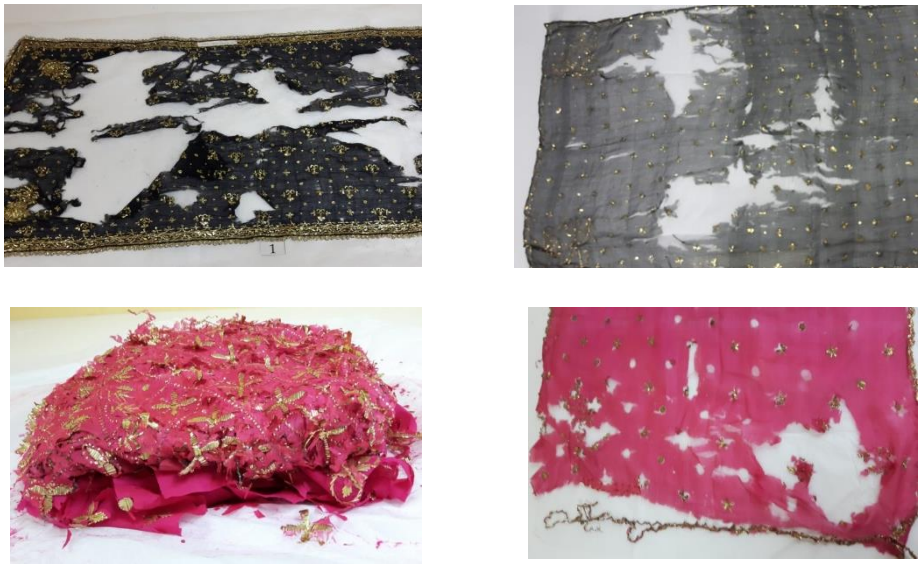


Fig. 5 Shattered pieces of *kelingkan* shawls of cotton and silks which handling may further damages the objects

2. Degradation Factors of *Kelingkan* Shawls

Textiles are organic materials with biological functions. They are characterized by polymers which are subjected to ageing. As they age and the structure of the fibre changes, fibres become less elastic and resilient (National Park Service, 2002). This process of natural decay can be accelerated by physical forces, environmental conditions, chemical reactions, and biological growths (Boersma, Van Den Berg, and Tegelaers, 2007). Landi (2008) further states that this process occurs either individually or through complicated interaction towards each other regardless of the textile origin of either natural or synthetic fibres.

i. Physical forces

Physical forces include stresses like previous use, mounting and storing methods imposed on the *kelingkan* shawls s that may cause damages to them. Tears, losses, splits and wear can result from previous use, internal stress inherent in the object, and handling (Government of Canada, 2013).

Storage method is the first and foremost factor of the physical damages of *kelingkan* shawls in the museum. Improper storage methods put stresses on *kelingkan* shawls resulted in several forms of physical damages. Ideally, textiles with heavy beading or metallic embroidery should be stored in a flat position (National Park Service, 2002). Preference should be given to flat storage as placing the objects of composite materials on top of each other may cause damages to the fabric (Boersma et al, 2007). While Landi (1998) states that textile bearing surface decoration in storage need to be protected from frictions resulted from contacts with other objects and surfaces.

Nevertheless, space limitations restrict the ideal practice for storing decorated textile collections. Most of the *kelingkan* shawls are stored in folded positions in a long period of time, pile onto each other with a thin layer of acid free tissue paper as barrier in disarray position in a drawer. Textiles in folding positions lead to creases and folded lines. Schultz, A.W. (1992) states that it is important to avoid making creases, as these area of stress are prone to splitting as the fabric ages.

ii. Environmental Conditions

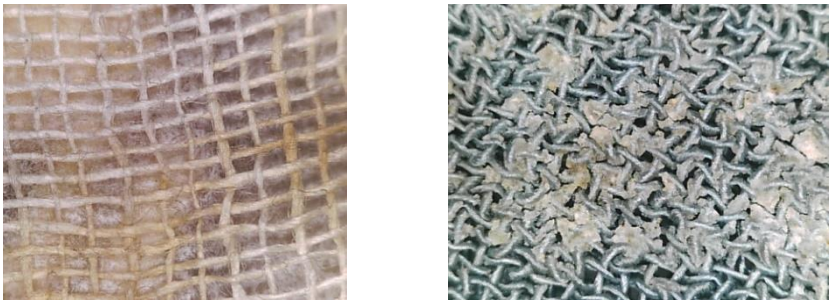
According to Boersma et al (2007), the longevity of a textile collection is influenced by the properties of the environment to which it is exposed. Environmental factors include temperature, relative humidity, light, and dirt are main factors contributing to the degradation of textile collections in museums.

High temperatures increase the rate of chemical decay of all materials while high humidity also cause shrinkage and allows mould to grow on textiles. (Government of Canada, 2013, Schultz, 1992). High relative humidity accelerates corrosions of base metals, particularly iron and copper. Noble metals like gold do not corrode and silver has resistance to corrosion. However, they are naturally soft and have to be alloyed with other base metals, particularly copper alloys which tend to corrode under certain circumstances (Landi, 1998, Eastop & Timar Balazsy, 1998). The microscopic examination that *kelingkan* threads are a combination of gold with other forms of metals that may prone to corrosion.

Discolouration of *kelingkan* shawls includes fading, fabric darkening, yellowing effect and stains are found to be in major conditions. According to Landi (1998), Boersma et al (2007), Thomson (1986) and Government of Canada (2013), light causes fading, colour changes and weakening of textile fibres.

The most dangerous light effect is ultraviolet radiation. Even fading does not occur, the light already affecting the strength of textiles, making it weaken (Thomson, 1986). It should be also be noted that light is the most damaging factor of textiles. A textile can often recover from a change of relative humidity. On the other hand, damage caused by light is irreversible and

cumulative (Boersma et al, 2007). Besides light, high humidity also accelerates discolorations on textiles stored in damp conditions.



(a) (b)

Fig. 6 Magnifying pictures of stains in *kelingkan* shawls

Kelingkan shawls due to their metal threads decorations, in practice are not cleaned by water. Traditionally, they are aired in a room temperature before kept for storage. It should be noted that hygroscopic nature of textile fibres makes them as excellent absorbents of dirt and pollutants. Dirt like sweats and stains are source of food for pests and microorganisms. Dirt also contain small and sharp particles that easily cut off the textile fibres especially when the fibres expand and shrink during fluctuation of temperature and humidity (Boersma et al, 2007).

Boersma (2007) also states that factors challenging the preservation of textiles are vulnerability, manufacturing, decoration and diversity of textile materials. The vulnerability of *kelingkan* shawls are easily seen by the thinness of their textiles selection, the sharpness of *kelingkan* threads often made into delicate and intricate motifs that put stress on the textiles especially during embroidery process when the fabric is stretched to maximum.

Fig. 7 The fabric is stretched during the embroidery process. The sharpness of *kelingkan* threads easily cut off the thin fabric if improper handling or storage is applied.

iii. Chemical Reactions

Oxidation, hydrolysis and crosslink are chemical reactions that contribute in the degradation of textiles. However, they do not work in isolation. They react to environmental factors like humidity, oxygen and light that accelerate the degradation process of textiles (Boersma et. al, 2007; Timar-Balaszy & Dinah Eastop, 1998, and Landi, 1998). On cellulose fibres, yellowing effect is an indication of oxidation while hydrolysis results in a decrease of the degree of polymerization and a loss of strength. Crosslink resulted in noticeably stiffer and brittle textile materials (Boersma et al, 2007).

The selection of material for textile storage also plays a role in its degradation. Textiles may suffer

from acidic degradation and cotton may darken and brittle when placed directly in contact with wooden materials (Schultz, 1992). While gilt silver, reacts to hydrogen sulphide in the air will form a black, silver sulphide corrosion layer over the gilding. Corrosion of gilt copper reacts to air pollutants in the presence of water will form green and blue copper salts on the surface (Eastop & Timar Balazsy, 1998, National Park Service, 2002).

(a) (b) (c)

Fig. 8 Tarnished silver *kelingkan* threads on (a), and darkening of *kelingkan* threads on borders (b) and laces (c)

iv. Biological Growths

Biological growths of pests and microorganisms are strongly stimulated by environmental factors. High humidified and dark areas are favourable for pests like cockroaches and silverfish. They are attracted to textiles fibres as their sources of nutrients and habitat. Similarly, mould and fungi actively grow in damp condition. Few pieces of *kelingkan* shawls are found to be effected with mould and this particular condition is often accompanied by fabric discolouration, darkening and stains. Mouldy textile is often acidic, identified by its mass of black or grey specks (Landi, 1998). High relative humidity of 70% enables the growth of mould within three (3) months of time. Worst, 90% of relative humidity enables mould to grow merely within few days of time (Government of Canada, 2013).

Fig. 9 A silk organza has been badly affected by mould and pest residues. It has released a smelly and musty odour upon opening of the fabric.

CONCLUSION

Kelingkan shawl consists of fabrics and metallic threads and hence, is more vulnerable to risk of degradations and complicated process of conservation.

The risk of *kelingkan* shawls to degradation is due to the nature of its composite materials, as well as the physical, environmental, chemical and biological factors of degradations. The outcome of these factors resulted in the physical, chemical and biological damages of already aged *kelingkan* shawls in the storage room. The gilded *kelingkan* threads embroidered on the thin fabric of *kelingkan* shawls, the physical forces endured by them during previous usage, and improper

storage methods, accelerated by incorrect environmental monitoring lead to the chemical reactions and biological growth of this valuable natural heritage.

The conservation treatment of composite materials is highly risky as Landi (1998) states that the closeness of the relationship between metal and fibre means that it is virtually impossible to clean one without involving the other, and unfortunately all the methods of removing tarnish from metal are to some extent harmful to the fibres and to some dyes. Hence, preventive measures to maintain the well-being of *kelingkan* shawls should be properly applied for their continuous sustainability.

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