

6. Results and recommendation

- ☒ There are many diversities in the dimension of handicrafts products in Tunis Village in Egypt that needs special protective package designs.
- ☒ Smart Structural Packaging Design SSPD is a new concept introduced by the researcher could help in packaging different sized products same dimension group in the standard smart package.
- ☒ The protective package, which includes corrugated board box with an internal protective structure like cushioning material – holders/folders -dividers, could be considered the suitable convenient package for Handicrafts products.
- ☒ Designers should follow sequential steps:
 - Focus on the protection function for such handicrafts products.
 - Determining cushioning material and specification.
 - Use of holders/folders inserts to void space inside the package.
 - Use outer smart protective packaging design.
 - Package prototype testing.

7. Reference

1. Ghose, S. M., 2010. *Indian Handicraft Industry: Problems and Strategies*. International Journal of Management Research and Review, 2 (7), 4-7.
2. Goodwin, D. and Young, D., 2010. *Protective Packaging for Distribution: Design and Development*. DEStech Publications, Inc. p.(81-85)
3. Osowski, P. and Piatkowski, T., 2017, March. *Analysis of corrugated cardboard influence on the protective properties of complex packaging system*. In *AIP Conference Proceedings*(Vol. 1822, No. 1, p. 020011). AIP Publishing.
4. Schueneman, H. *The Practical Aspects of Protective Package Design*: Westpak, Inc. retrieved from https://www.westpak.com/images/pdf/06_practical_aspects_protective_package_design.pdf access on 3-12-2017
5. Ups.com. (2018). *Internal Packaging: UPS*. [online] Available at: <https://www.ups.com/jm/en/help-center/packaging-and-supplies/packing-materials/internal-packaging>. page [Accessed 7 Jan. 2018].

























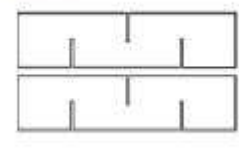
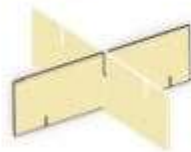

Product Types	Handicrafts Representative image		
Ceramic ware	 	 	 
			
			  
Pottery	 	 	 
	Limps (palm branch) - Wicker	 	 

Table (6) a : Smart packaging inserts (dividers) designs

Inserts	layout	Structure 1	Structure 2
Dividers			

HOLDERS: another Smart insert (holders) proposed design are illustrated in table (6) b: layout one can be build up to three structure to fit different size of product and package. Structure one illustrates a holder design that can fit the wider box with the double sided external structure for more edges protection. From the same smart layout, structure two can be built up to fit less width package by folding the outer part into walls three times. As for structure three; two products can be held together inside double sided stand holder from the same smart layout, furthermore two smart stand holders can be set against each other to fit longer packed handicrafts products.

Table (6) b Proposed Smart inserts design

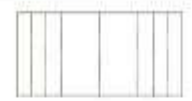







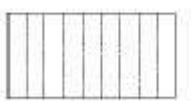



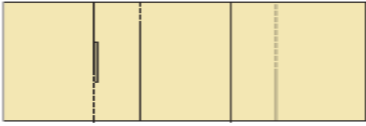
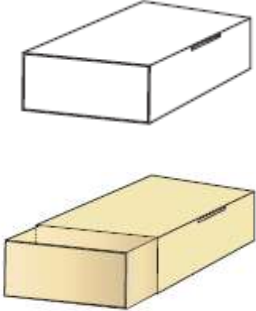
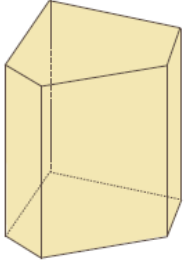
Inserts	Layout one	Structure one	Structure two	Structure three	
Holders/ Folders					
					
	Same smart Layout can be build up to three formats to fit different products				
					

Table (5) b: Proposed SSPD ideas for tray and sleeve package format

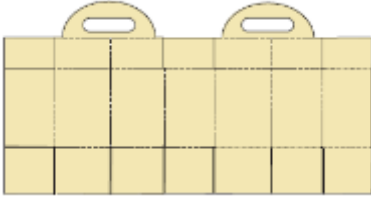
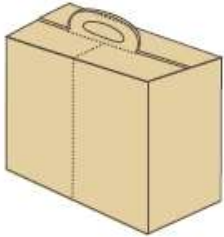
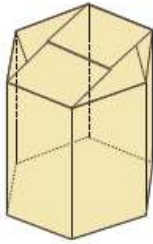
Second format	layout	Structure 1	Structure 2
Tray and sleeve			

C-Proposed Smart Structural - bag format- Design

For good protective package, a box bag can be designed to fit different products furthermore; it might be preferred by wide range of consumers for easy handling.

Smart box bag design as it is shown in table (5) c can be assembled from the same layout to box bag as well to form a hexagonal box for containing wider items.

Table (5) c: Proposed SSPD ideas for Bag package format.

Third Format	layout	Structure 1	Structure 2
Bags			

1-Proposed Smart Structural -inserts- Design

The same SSPD introduced concept can be applied to package inserts. Smart design for inserts are illustrated in table (6) a, b

Dividers: two pieces Smart dividers layout design can be assembled by three slits in each as it is illustrated in the layout to structure one for holding four items.

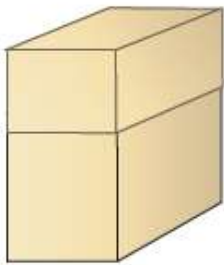
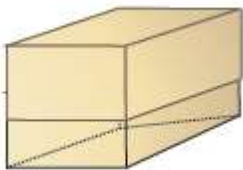
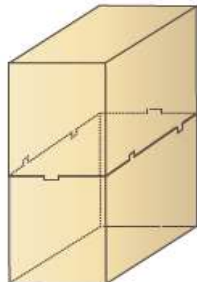
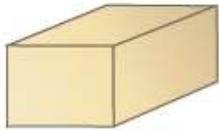
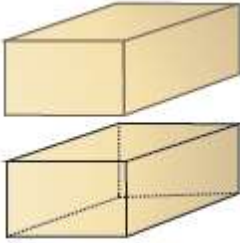
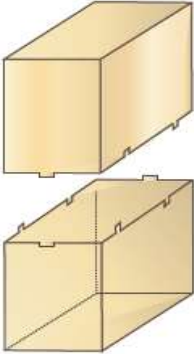
The same smart layout can be assembled as shown in structure two to hold one larger packed item with more outer edge protection.

Sleeve and tray format table 5 (b) are also well adapted of two pieces package so it can be fitted with standard trays design; like in the former selected one tray and lid table 5 (a).

The bag design is a one-piece package; it can be applied with corrugated board.

A-Proposed Smart Structural -two pieces box format- Design

Table (5) a: Represent proposed ideas of SSPD concept on corrugated board box.

First Format	Structure 1	Structure 2	Structure 3
Outer Package Two Pieces Tray/ Box			
			
	Two pieces Box (lid and base)	The same lid with different height matched the base	Same base with another base used as a lid with smart notches to fix the two pieces together.

Various height handicrafts products (Mugs, vases, teapots, etc.) could be packed in two piece boxes; Maximum package height can be reached as shown in structure three in the table (5) with two high height base and lid fitted together with smart notches. Structure two-represent package for minimum height products and structure one for medium ones.

* Smart notch is a new technique suggested by the researcher to help fit two pieces of package together with the help of corrugated board thickness.

B-Proposed Smart Structural -two pieces box format- Design

Table (5) b: represent the second format selected for the study tray and sleeve.

As shown in the following table smart design of the sleeve helps to be used with the former tray or box format. Furthermore, it can also be reversed vertically like gem shape to be used as a stand holder to fit other higher products.

In the table (4), the researcher shows an applicable example of compromised package size sample as a designer guideline for designing package of different sized products; First, grouping product dimensions together then suggest the package size that can fit all. This coming example is to indicate how to apply the first step.

Table (4) Compromised package size for different product sizes

Dimension groups	Product dimension range	Compromise Package Size (Two pieces box)
Group 1; Small	(5*5*2),(10*10*20),(12*12*15),(15*15*25)	(16.5*16.5*4),(16*16*26)
Group 2;Medium	(20*20*10), (20*20*18), (25*25*12), (25*25*70),	(26*26*15), (26*26*36)
Group3; Large	(35*35*45),(35*35*125),(35*20*30), (40*40*80), (45*45*3),	(46*46*10), (46*46*70)
Group4; Large	(50*50*25), (60*60*2)	(61,5*61,5*6), (61*61*25)

5.2 Proposed Smart Structural Packaging Design SSPD concept

Introduction of new Smart Structural Packaging Design concept could be the proper solution To pack different products with different sizes, the researcher introduces Smart Structural Package Design SSPD concept. Smart structural package design SSPD can be defined from the researcher view as: A structural design of package that can give dimension range, this could be benefit in packing different sized products in same dimension group, and the same concept can be applied with inserts (folders - holders).

Benefits of SSPD concept in packaging may include the following:

- Introduction of the standard size of a package of different format to pack numbers of different size products.
- Saving time and money in package production for each unique product.
- Environmental benefit.
- Convenient for packing at the point of purchase for cases like handicrafts products and other similar products.

In the following tables, the researcher illustrated how to apply this suggested concept on different package design format as well as inserts.

Three Outer package design format has been selected for the study based on:

- Two pieces tray format one (base and lid)
- Two pieces tray format two (base and sleeve)
- Bags design format

Three kinds of inserts are used:

- Dividers (multiset partitions)
- Folders/ holders
- Cushions

1-Proposed Smart Structural outer Package Design

The reasons for selecting the two pieces tray or box format is the flexibility in controlling package height with the possibilities for exchanging standard package parts (base – lid) as it is indicated in table (5) a.

- ☒ The risks that products should be protected from are; breakage for ceramic ware and pottery, temperature and compression for old palm leaf products.
- ☒ Almost all of the artisan are interested in good packaging and consider it important for marketing as well as protecting their products.

Table (3) the dimension of Handicrafts Products

Dimension	Product1	Product2	Product3	Product4	Product5	Product6	Product7	Product8	Product9	Product10	Product11	Product12	Product13	Product14	Product15	Product16	Product17	Product18	Product19
L	10	20	35	40	60	5	15	10	20	20	50	45	25	25	45	25	25	45	35
W	10	20	35	40	60	5	15	10	20	20	50	45	25	25	45	25	25	45	20
H	20	10	45	80	2	2	25	15	10	18	25	3	70	12	3	70	12	3	30

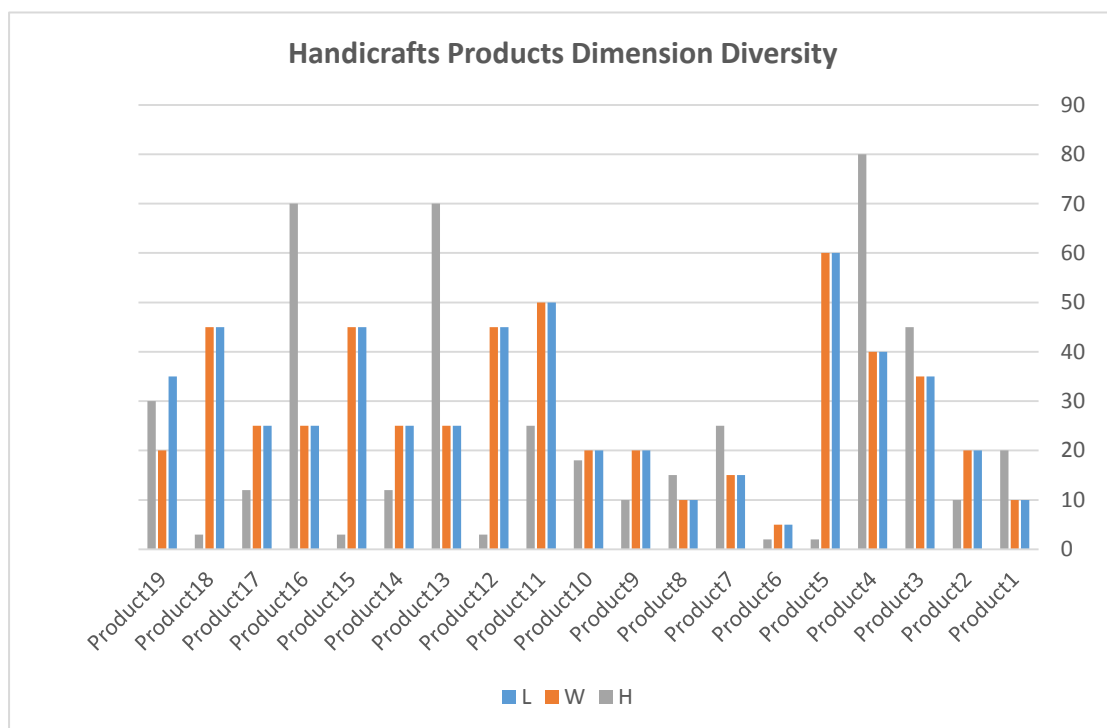


Figure (2) Handicrafts Products Dimensions (L, W, H)

For each handicrafts products with the unlimited number there are indefinite products sizes that need unlimited numbers of packages, one package for one item is not a practical solution.

5- Results and Discussion

If there is a product that comes in different sizes, we may well be able to design two different sized packages that will accommodate all (rather than producing all separate packages) by being economical with the dimensions, and smart with its design. This will not only save time and as a result, money, it will ensure consistency throughout products.

There are three product types – Old pottery, Ceramic ware, Old palm leaf/ wickers. These types can be divided by its dimensions into product dimension groups. The combinations of product dimensions determine which package size can be used.

4. Materials and Methods

A questionnaire was directed to eighteen Egyptian artisans in Tunis Village in El-Fayoum city in Egypt, aimed to:

- 1- Collect data about Handicrafts types and categories they produced, which is the most common in their areas.
- 2- Determine the handicrafts specification; kind, weight, Dimension (Width, Length and height).
- 3- The main risks that handicrafts products in Tunis Village may get exposed to.
- 4- The way the artisans used to pack Handicrafts sold products in Tunis Village.
- 5- The awareness level and the interest of Handicrafts artisans to the necessary need for convenient packaging for their products.

Table (2) Summarize the collected data about Egyptian "Tunis Village" Handicrafts products.

Products Classification	Product Type Examples	Product Dimension		Product weight gm
		Height, length, width ;cm		
Old pottery	Jar Qola	10*10*20	20*20*10	1000 to 30.000
	Large Water container	35*35*45	35*35*125	
	Zeer Heater, Casserole, lightning lamp, Lantern	40*40*80	60*60*2	
Ceramic ware	Statues, Solids, Plates, Containers, Mugs, Teapots, Hangers, Vases...	5*5*2	10*10*15	150- 5000
		15*15*25	25*25*70	200 – 3000
		20*20*10	25*25*12	150 - 5000
		20*20*18	45*45*3	
		50*50*25	35*20*30	
Palm leaf/wickers	Bags, Hats, Baskets; Breadbasket, Phone holder basket, baby basket, Boxes, Lamps...	4*4*6	8*8*10	100 to 650
		8*8*12	10*10*20	100 to 750
		15*15*15	20*20*25	1000 to 5000
		20*20*40	20*10*15	
		27*27*35	30*30*1	
		48*48*55	50*40*44	
	60*60*10	80*50*60		

4.1 Data Analysis

- ☒ Handicrafts in El-Fayoum city are varied among ceramic ware, pottery and palm tree/wickers products.
- ☒ There is a high range and wide diversity in products dimensions see table (3) and figure (2)
- ☒ Over Sixty percent of products are medium- high weight, heavy products; pottery and ceramic ware, otherwise the old palm leaf and wicker products are not.
- ☒ Pottery and ceramic ware are not only heavy products but also fragile easy to break.
- ☒ The packaging used at the point of purchase based mainly on newspapers as a wrapping and plastic bags as a secondary package, less than ten percent use a textile bag as a gift package.
- ☒ Only thirty percent use bubble film as a protecting lining film for their products.
- ☒ Most of the products are sold locally and about only twenty percent are exported.

Cushioning material	Description
1- Air-encapsulated plastic Bubble sheets	It is a plastic sheet with enclosed air bubbles, which is designed to protect and cushion packed objects. Using several layers and multiple wraps maximize the padding effect. Handicrafts products corners and edges should be fully protected.
2- Polyethylene foam sheets (Ethafom, Volara)	This material is produced with different textures, densities and thickness. It is light shock absorbing barrier to moisture. [4]
3- Expanded polystyrene Plastic "peanuts"	It is commonly used for protection as it void space inside the package for lightweight products. It is not recommended to be used with a narrow flat product that may move to the edge or bottom of the package.
4- Corrugated liners and inserts	Maybe added to the package to increase strength and improve package protection performance. It is recommended to be used with light-to-medium weight item, and it should be tightly wrapped surrounding the product. [4]

Determine Cushion thickness

☒ Determining the cushioning material thickness is necessary to achieve the desired protection performance. It is the next step after selecting the suitable cushion material.

☒ Cushion absorbs energy by deflecting under the force of an impact [2]

; This comes from the simple expression ; $\Delta X = 2h / (G-2)$

Where ΔX = cushion deflection (not cushion thickness),

h = design drop height,

G = product fragility level. [4]

☒ Using each type of foam correctly helps to achieve adequate shock and vibration protection.[5]

☒ Select appropriate density of foam to meet packaging needs, which can range from void-fill applications to high-performance cushioning. [5]

2.2.2 Dividers

Dividers are structures usually corrugated board used inside the package. It is considered important packaging inserts that can be used to divide packaging internal space to make a separated partition for preventing packed items from mechanical hazardous; vibration, shock, abrasion or rubbing to each other.

2.2.3 Holders

Holders are also used as its name to hold the product or the packed item tightly and protect it from mechanical hazardous it can be expressed also as folders when it is designed with a folded lid.

researchers meant to use this term Protective Packaging to describe package with additional protection aids figure (1):

- ☒ The outer package with protective material and design.
- ☒ protective inserts that might include;
 - Cushioning material
 - Dividers
 - Holders



Figure (1) Protective Package

For fragile breakable items package should cross the gap between the shocks levels that unpackaged item can withstand and the hazards levels of the distribution system. [2] The protective package should prevent the shock that the product may expose to from affecting of the packed products and maintain its safety. This could be achieved by carefully selecting of the packaging inserts.

Instead of using the box in a box format, the right inserts could be used.

2.1 Protective Package

Corrugated board is a stiff material that adds a protection feature to the package by its structure. Various levels of protection can be achieved with corrugated board different structure.

How to choose the Right Corrugated Box?

Selecting the right size is an important step for selecting the right convenient box. Box sizes are measured by using inner dimensions. The size of packed products determines the inner box dimensions.

Dimensions are based on the layout of an assembled box; the longer of the two sides is considered the "length" L. The shorter of the two sides is the "width" W. The side perpendicular to the length and width is the "depth or height" H of the box.

2.2 Packaging Inserts

To protect the product from physical and mechanical stress, protective inserts should be used; cushioning materials, dividers, folders.

2.2.1 Cushioning Materials

Fragile objects; pottery, ceramics artworks require special packaging for safe shipment. Packages containing these products and similar items may require added cushioning or a double box (box in a box) format to void space inside the package and add more protection.

Cushioning materials are designed to absorb shocks and prevent humidity. Usually these materials are foam products that can be used in different cushioning techniques.[2] These materials may include expanded polystyrene, polyethylene polypropylene, or foam mold around the product.

The following table gives an abbreviated brief of materials used for cushioning:

Table (1) Cushioning material for the protective package

البيانات التي تم جمعها من الحرفيين المصريين في قرية تونس في مدينة الفيوم أكدت أن هناك حاجة لتغليف مناسب. وعلاوة على ذلك ، أشار إلى نطاقات أبعاد واسعة لمثل هذه المنتجات التي يمكن أن تكون مشكلة حقيقية على تغليف المنتج والمستويات الاقتصادية.

الحرمة الواقية ذات التصاميم الجيدة الملائمة هي حل جيد. قدم الباحث مفهومًا جديدًا يساعد على تجميع أحجام متنوعة من المنتجات مثل الحرف اليدوية المصرية. تصميم الحرمة الهيكلية الذكية يمكن أن يساعد SSPD المصمم على تكييف تصميم الحرمة القياسية للمنتجات المختلفة الحجم التي يمكن تعيينها في نفس مجموعات الأبعاد. كما يتم وضع المبادئ التوجيهية للمصممين من خلال مفهوم التصميم الجديد ، لإضافة قيمة إلى المنتجات الثمينة الحرف اليدوية من خلال التعبئة والتغليف.

1. Introduction

What is Handicrafts Products?

Handicrafts are kind of products, which, are produced by hand or with the help of tools. These are made from raw materials and can be produced in unlimited numbers. Such products are decorative, artistic, and creative. It reflects culture, tradition, mostly with function.

As well, handicrafts are considered an essential productive sector and export commodity for many developing countries and in some countries constitutes a considerable part of the export economy. [1]

Unlike automatic production, handicraft products are unique; each piece is different from the other. These products are sold in "Tunis village" in El-Fayoum city in Egypt in artisan gallery or small stores, booths that are packed at the point of purchase with poor package or wrapping.

The paper attempted to answer the following questions:

What is the main problem in packaging Egyptian Handicrafts products?

What are the convenient package design and material for Egyptian Handicrafts products?

What are the briefed guidelines for designers to follow for packaging such products?

Packages for handicrafts products should be: Protective, compact but changeable in size. This could be the research main question.

1.1 The main hazards that handicrafts products may get exposed to

Packaging is essential for any product. The hazards of shipping or transporting product are numerous. Inappropriate packaging can cause an object to be damaged or destroyed. A properly packed container is fundamental to ensure packed objects arrive safely.

The package should guarantee product safety. Handicrafts products in "Tunis village" in Egypt are different in material most of them are fragile. A key role in the design process of the packaging of the protective package; is the selection of the cushioning material. [3]

The protection function of a package system refers to its ability to limit physical hazards to a level, which is below the product's fragility (or maximum tolerable level). These hazards can be; mechanical shock, vibration, temperature or humidity extremes, compression. [4]

Since our ability to change the distribution environment is very limited, product fragility becomes the main component of the package cost. [4]

2. What is the Protective Package?

Basically, the functions of packaging include protection of the contents. Protection is one of the three basic functions that pushed the need for packaging invention from the first days. The

Smart Structural Protective packaging Design Approach for Handicrafts Products

Case Study on Tunis Village (El-Fayoum city Egypt)

Assist. Prof. Dr/ Noha A. Mohamed

Assistant professor, Printing, Publishing and Packaging dept., Faculty of Applied Arts, Helwan University, Egypt

Abstract

Various and Fabulous handicrafts products increased in its popularity as a special product; it can be a gift, souvenir taken by the Egyptian and foreign customers. Great efforts have been made by the Egyptian government in the last few years to highlight El-Fayoum city as an environmental touristic city especially in "Tunis village" in which many festivals are held. Handicrafts Products sales increases in these festivals. The paper study the poor packaging of one of the most distinctive handicrafts for one of the famous environmental touristic city "Tunis village" in El-Fayoum city, Egypt.

The especial Egyptian handicraft products are sold in very primitive poor packaging. Plastic bags and paper wrapping are used. They not only do not reflect the good image of products or the Egyptian heritage identity, they also are not protective and do not guarantee products safety.

Data collected from the Egyptian artisan in Tunis village in El-Fayoum city assured that there is a necessity for a suitable packaging. Furthermore, it indicated wide dimension ranges for such products which could be a real problem on the product packaging and economic levels.

Protective Package with good fit inserts designs is a good solution. The researcher introduced a new concept that helps to package versatile sizes of products like Egyptian Handicrafts. Smart Structural Package Design SSPD could help the designer to adapt standard package design for different sized products that can be set in same dimension groups. Guidelines for designers are also set through the new design concept, for adding value to Handicrafts valuable products through packaging.

Keywords

Handicrafts, Packaging, Corrugated board, Smart design, Dividers, Protective

المخلص:

زادت منتجات الحرف اليدوية المختلفة ورائعة في شعبيتها كمنتج خاص. يمكن أن يكون هدية وهدية تذكارية من قبل العملاء المصريين والأجانب. لقد بذلت الحكومة المصرية جهوداً كبيرة في السنوات القليلة الماضية لتسليط الضوء على مدينة الفيوم كمدينة سياحية بيئية خاصة في "قرية تونس" التي تقام فيها العديد من المهرجانات. تزيد مبيعات منتجات الحرف اليدوية في هذه المهرجانات. بحثت الورقة في التغليف الفقير لواحد من أكثر الحرف اليدوية تميزاً لإحدى المدن السياحية البيئية الشهيرة "قرية تونس" بمدينة الفيوم بمصر.

تباع منتجات الحرف اليدوية المصرية الخاصة في عبوات سيئة بدائية للغاية. تستخدم الأكياس البلاستيكية ولف الورق. فهي لا تعكس فقط الصورة الجيدة للمنتجات أو هوية التراث المصري ، ولكنها أيضاً ليست واقية ولا تضمن سلامة المنتجات.