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Bedouin Weaving Techniques: Source of Textile Innovation

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***Abstract*—**Nomadic tribes have always had the need to relocate and build shelters, moving from one site to another in search of food, water, and natural resources. They are affected by weather and seasonal changes and consequently started innovating textiles to build better shelters. Their solutions came from the observation of their natural environment, material, and surroundings. 'AlRahala' Nomadic Bedouin tribes from the Middle East and North African region have used textiles as a fundamental architectural element in their tent structure, 'Bayt AlShar' (House of Hair). The nomadic tribe has innovated their textile to create a fabric that is more suited to change in climatic and weather conditions. They used sheep, goat, or camel hair to weave the textiles to make their shelters. The research is based on existing literature on the weaving technicalities used by these tribes, based on their available materials encountered during travel. To conclude how they create the traditional textiles and use in the tents are a rich source of information for designers to create innovative solutions of modern-day textiles and environmentally responsive products.

***Keywords*—**AlRahala Nomadic Tribes, Bayt AlShar, tent structure, textile innovation.

I. Introduction

NOMADS travel from one site to another in search of food and other resources. Nowadays, this phenomenon manifests everyday due to economic changes, lack of jobs, war, and exhaustion of natural resources in some cases. Nomads encounter new experiences and create objects based on the environment and integrate them into their everyday life. Every society adapted their own method of design according to their needs and their spatiotemporal relations.

The 'AlRahala' Bedouin wander in the desert while herding their animals. They started using their skin and hair to build their tents, called 'Bayt AlShar,' or 'House of Hair.' Their shelters are based on textiles using the traditional 'AlSadu' [1] weaving patterns made by women. The construction of tents takes place from early stages i.e., shearing the animals and spinning the hair to weaving the threads.

The woven structure protects the tent from the heat in summer and rain in winter. The fabric panels that make 'Bayt AlShar' can be draped to allow a breeze [4]. The tent structure is divided based on privacy to women's section and storage space for cooking [3].

Fig. 1 shows an example of a typical Bedouin 'House of Hair' built by their tribes. Fig. 2 elaborates the main Bedouin tent structure aspects and parts it is made of.

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Fig. 1 Typical black-and-white Bedouin tent [4]

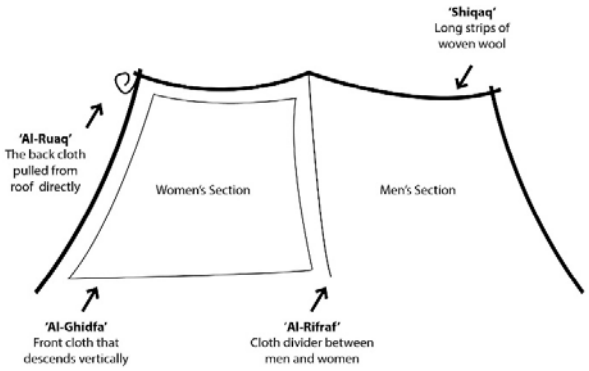

Fig. 2 Traditional Tent parts [3]

The nomadic 'AlRahala' Beoduin tribes of the Middle East region used textiles as means of keeping written records, through weaving their symbols of local traditions. They further relied on textiles as a main part of their shelter, due to the climatic properties they hold [4]. Moreover, various adaptation techniques in building shelter could be understood from these tribes. Designers have been influenced by nomadic textile innovations. Yet a question leads the discussion further: 'How did the tents of 'AlRahala' Bedouins tribes influence designers to innovate textiles?'

II. Definitions and Methodology

"The tent changes from wool to yarn to dyed yarn to a weaving in progress and then becomes a home when set up." [4]. The tents are built by weaving the fibers of local animals raised by the Bedouins, their weavings suited the desert environment. The yarns from goat's hair are woven for the roof that serves the climate change, where the warps and wefts expand creating tiny holes to release the hot air that touches the bottom part of the roof and creates a breeze in sunny summer. Whereas in the rainy winter, the warps and wefts swill and tighten with the water during the rain [1].

The Bedouin tribes weaved their shelters. "So the textile

tradition is very much a part of their architecture, they are weaving architecture here!" [6]. They invested in the thermal qualities of natural fibers by weaving its walls using their goats' black hair [10]. The tools used in 'AlSadu' traditional weaving technique come from animals. Fig. 3 shows the Bedouin loom and the tools used.

Fig. 3 Gazelle horn used in 'AlSadu' weaving [4]

The 'AlSadu' craftsmen use four types of weaving techniques that differ based on the product. When it comes to tents, the weaving technique used is called 'Warp faced weaving,' a durable and practical way to weave textiles for 'Bayt AlShar' furniture and decoration. In this technique, the warp yarns only show, whereas the weft are hidden between the warps [1]. Fig. 4 demonstrates the intersection of the weaving technique used to create the Bedouin tent textiles.

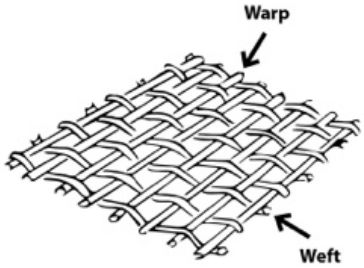

Fig. 4 Illustration of a plain weave fabric [5]

III. Literature Review and Analysis

"The black Bedouin tent is an ingenious design, locally relevant and culturally rich and makes the desert skyscraper." [3]. The tent's adaptability to climatic conditions is taken into consideration and its dark colors provide it with thermal properties. The coarse weaving of its fabric illuminates the interior and allows hot air rising to the top for cooling [3]. The fabric used to make 'Bayt AlShar' is fire-resistant, because goat hair does not burn and it is a naturally fire-resistant material. This property allows lighting a fire inside, it breezes the smoke outside the material. Fig. 5 shows a traditional Bedouin tent that is made from ordinary goat hair.

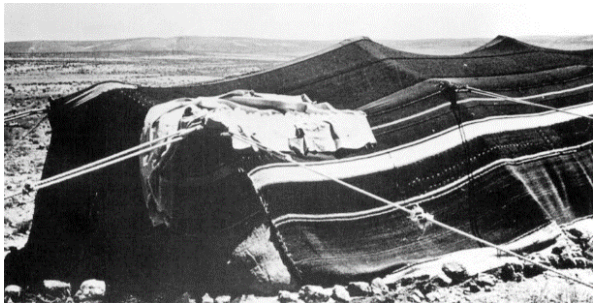

Fig. 5 Bedouin tent in the South Jordan [10]

The Bedouin tent properties were considered in Mekkah, Saudi Arabia after a fire took place in the early 90's killing nearly 300 pilgrims. This was established by using advanced fabrics of fiberglass coated with Teflon to build the tents during pilgrimage [9]. Fig. 6 shows side of Mina, where pilgrims practice the stoning ritual.

Fig. 6 Mina, the city of tents replaced with high resistant material [9]

The following case studies exemplify how designers used the techniques used in the textiles of 'AlRahala' Bedouin tents directly in their design process. The examples include modern textiles in the form of architecture and products.

A. 'Smocking' Traditional Textile by Architect and Textile Designer, Vera Ceginskas Lindström

Ceginskas Lindström studies the structure and building materials of Bedouin tents, "It is a material with tensile properties that can be stretched and pulled into different shapes." [6]. Firstly, the structure of the wool tent membrane naturally proves the tent with ventilation. Secondly, wool fiber has insulation properties due to its crimped shape. Fig. 7 shows details of her analysis.

Lindström uses the cactus as a smart self-shading surface present in nature. The cactus shape contains a cooling-ribs self-shading system. Fig. 8 is a resemblance of natural surface design that prevents overheating.

Her results suggest innovating a self-shading tent membrane ideal for the desert climate. She uses knowledge from Bedouin Black tent and cactus self-shading by proposing

a 3D tent surface that. She further suggests a tent structure with a creased surface to enhance its insulating properties, whereas the fold of the textile created multiple air pockets. The experimentation is achieved using 'Smocking' traditional technique and with a cea3D form, by marking the fabric with a grid of points and connecting them to give the fabric a new creased structure. The architect further intends to experiment with the 'honeycomb/diamond' technique for textiles with double-sided patterns [6]. Fig. 9 shows details of the innovative 'Smocking' technique.

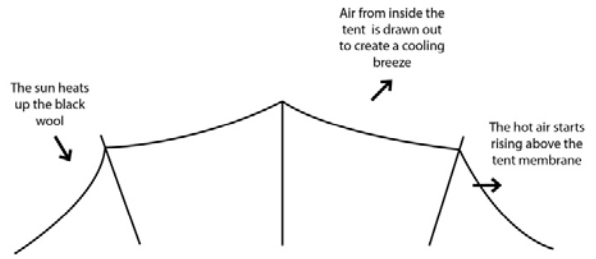

Fig. 7 Bedouin tent structure analysis [6]

Fig. 8 Peruvian Torch Cactus self-shading system found in nature [6]

Fig. 9 Smocking traditional textile technique for 3D pattern [6]

B. Nomad Pavilion by Architects Dina Haddadin and Rasem Kamal

Architects create the Nomad pavilion project using local materials to reinterpret authentic local Bedouin tents into a sustainable water-collecting tower in the desert of Jordan. The facade references the wild cactus for the self-shading surface [2]. Fig. 10 shows a full view of the structure.

The structure is covered with the same native breathing skin of Bedouin tents. This texture/skin is created by manipulation of weaving goat hair coarsely using the 'traditional smocking technique' with the cactus self-shading effect to keep the air trapped within the diamonds of the skin. The air is drawn towards the ceiling causing a cooling breeze, while the heat is collected during the day to be released at night providing a warm temperature. The center of the pavilion contains a self-sustained drinking fountain harvested from dew and fog and that same empty water basin can act as a fire in winter [2]. In Fig. 11, details of pavilion textile show the lighting and air circulation properties in the tower.

Fig. 10 Nomad Pavilion structure of overlapping multiple-layers [2]

Fig. 11 Nomad Pavilion. Coarsey weaving filters sunlight to illuminate the space [2]

C. 'Nano Cure Tent' by Imperial Motion

Nylon ripstop is an example of durable fabric, using a special reinforcing technique by 'Imperial Motion,' a clothing production that is focused on innovating textile. They develop their textiles with resealing and water-resistant qualities. The company uses their fabric to create a lightweight portable tent [8]. Figs. 13 and 14 show parts of this tent and elaborate its convenience to the user.

Fig. 13 The reinforced fibers of ripstop create reinforcement and support puncture [8]

Fig. 14 Holes and punctures can be repaired when combined with the special double-sided coating and heat from fingers [8]

IV. Conclusion

"Design comes out of industry and of the paradigmatic idea of modern project in order to state diffusely its presence in every social and aesthetic event and performance." [7]

Bedouin shelters adjust to weather conditions and seasonal changes, 'AlRahala' Bedouin tent is a shelter example of one group of people. Their tents are successful and light-weight dwellings made of sustainable materials [3]. The tent structure of 'AlRahala' Bedouin tribes relies on the textile as a main component of its architecture. Animal skin and hair are used as a solution to protect them all the year during their movement. The thermal capabilities of the fabric used in the tents of 'AlRahala' tribes are a lead for designers to develop innovative fabrics. This could be established by understanding original properties of material and manipulating weaving techniques to provide the material with further qualities.

Nomads until today use their traditional techniques to weave their tents. Their methods lay out a rich source of information for designers to experiment with these techniques and contribute to modern textile designs. The elaboration on the plain weaving method used by the tribes and the examples provided in the paper are indicated to initiate finding other possibilities and production means of textile innovation for a modern society that is constantly changing its needs.

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