

Rigid Heddle Loom Equipment: as Panacea for Cottage Industrial Development

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Abstract

Rigid heddle loom is an effective weaving machine and a catalyst for textiles' cottage industrial development. Rigid heddle loom is a functional equipment use to weave light work, such as placemats, muffler, dish towels, throw-pillow, hand towel, shoes, bags and it has a comparable high rate of weft insertion. While cottage industry, provide on the job technical training through education, to art practitioners/youths toward acquisition of practical and applied skills, and basic scientific knowledge for economic empowerment. The determination to create meaningful impact in the lives of Nigerian youths, the Federal Government of Nigeria is set to implement practical programs that will promote entrepreneurship and human resource development toward national sustainable development. The objective is to promote rigid heddle loom equipment, an indigenous technology that has been neglected, but of immense importance toward skill acquisition and youth empowerment to lime light. Also, this policy will strengthen cottage industries capacities for research toward skill acquisition in designing, construction and production of woven fabrics among youths in order to create employment opportunities and prevent youth restiveness. The experimental research method will be adopted and the entire effort is toward technological advancement needed for youth economic empowerment.

Keywords: *Cottage industry, Heddle, Rigid, Weft, Warp, Loom, Shuttles, Heald, Self-sustenance*

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Background to the Study

The Rigid heddle loom equipment is an equivalent of a two-shaft loom used for weaving light work such as: scarves, wall hangings, shawls, placemats, muffler, dish towels, shoes, bags and other suitable fabric for clothing. The knowledge gained from rigid heddle loom is transferable to mobile two shaft loom and the floor loom. The use of white oat wood, pine wood and cedar wood provides a very strong, lightweight, and serviceable frame. Also, the loom is comfortable, compatible, sturdy and constructed for high performance and it can serve as a catalyst for cottage industry development and entrepreneurial skill amongst youths in Nigeria. Especially, as the national per capital poverty rate remained very high at 60% of the population, with no visible evidence in poverty reduction.

McDonald (2011) defines weaving as the making of fabric by interlacing fibers at cross angles to each other. Also, weaving is one of the earliest methods of making out of plant or animal fibers (Encarta Encyclopedia, 1). John (2013) defines a loom as a machine for producing cloth by interlacing warp and weft at right angle and Corbman (1989) further buttressed that a loom is a device for holding a set threads or yarns in sequence, parallel, and under tension (the warp) so that other yarns may be interlaced with them at right angles (weft) to create a cloth.

Therefore, a loom is an implement, a machine for weaving'. These definitions place the rigid heddle loom as a functional utility tool in the design and textile cottage industry. However, (Investor Words, 2013) defines cottage industry as an industry where the creation of products and services is home-based than factory based. Ojo (2013) explain that cottage industry is to provide on the job technical training and experience toward skill acquisition and economic empowerment

Ogunsiakan (2002), states that skill acquisition help human be self-reliant, resourceful and appreciate the dignity of labour. The aim of cottage industry, therefore, includes preparation for employment and self-reliance in any occupation for which specialized education is given to meet societal needs. Hence, Nigeria federal government in the National Policy on Education (1981) stressed the importance of self-reliance as a veritable objective fundamental to national development. The knowledge acquires from rigid heddle loom design and construction could stimulate the enormous talents, skill and gift of nature endowed in youths toward self-sustenance and national development.

Globally, weaving has been practiced for thousands of years and it still remains a source of economic growth in many countries and developments in woven apparels and household textiles has been beneficial to different countries and their culture area. Rigid heddle loom is versatile weaving equipment used in many industrialized and developing countries for many centuries. However, in Nigeria, there is no in-depth knowledge of its design and construction even for cottage industries as seen in the industrialized countries such as: America, England, Mexico, China, India, Germany and Japan and Ghana. Without the existence of cottage industries, the economic empowerment of any nation cannot advance and the negative effects are youth restiveness and mass unemployment.

Palmer (2014) advocate that '*human should break the metaphorical glass that limits them both economically, socially, personally and professionally in the society*'. Also, United Nations Industrial Development Organization (UNIDO) states that: '*Empowerment*' is the process of increasing capacity of individuals or groups to make choices and to transform those choices into desired actions and outcomes'.

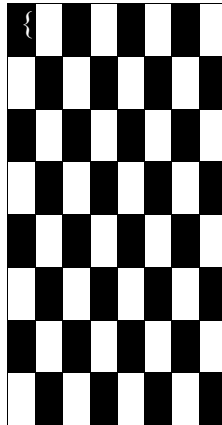
Globally, nations strive for self-reliant, human capital development and self-sufficiency in all ramifications of life. Hence, the Federal Government of Nigeria in the policy on education (1981) stressed the significance of self-reliance as a veritable tool for nation sustainable development. In Nigeria, cottage industries are found in Akwete town in, Ijebu Ode in Ogun State, Nupe in Benue State, Akoko-Edo people in Edo State. These industries have blossomed dramatically among the people, especially these days when many occasions demanding traditional attires are on the increase (Okpu, 2011).

It is a truism that a cottage industry has set a paradigm to utilize new and more effective machinery and technology to organize youths under a centralized building for the purpose of imparting knowledge, increase productivity and create employment opportunities. Notably, scholars like Pictin (1988), Gipson (2013), Amos (2013), AIderman (2004), Whyman (2005), Constantine and Larsen (2081) and Keep E. (2011) were early contributors to the theories and practice of woven textile as a mean of human capital development. However, much interest has not been directed to rigid heddle loom and no country can develop technologically without paying recourse to art as a veritable tool. Therefore, this paper addresses rigid heddle loom construction processes as veritable equipment for training youths in cottage industry.

The Rigid Heddle Loom Concept

The concept of rigid heddle loom in this paper is weaving equipment used for the production of infinite weaving possibilities. The loom is inexpensive to construct, simple, transportable, compatible and portable unlike the treadle loom that must be woven in the studio. Rigid heddle loom is versatile as it an equivalent of a two-shaft loom and it combines all the features of tapestry loom. The versatility comes from the fact that a single heddle serves both as a reed for warp threading and as an exchange shaft, manipulated manually to create a shed for transporting the weft threads from selvedge to selvedge (selvedge is the self-edge). However, floor looms that consist of adjustable purport or blocks are more versatile, stable and comfortable while weaving. Also, ratchet brakes that hold the warp threads under tension will encourage weaving efficiency. This process is used to weave plain weave, plain weave variations such as basket weave, calico and finger manipulated weaves such as Leno with openings.

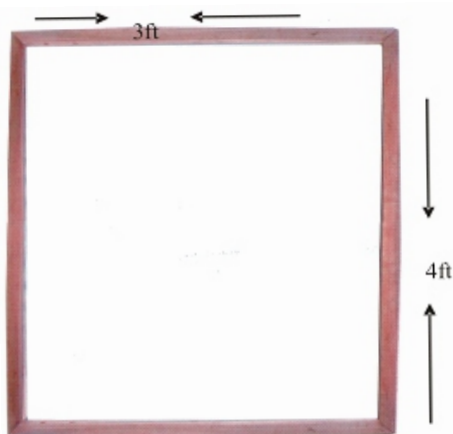
Plain Weave Structure: Is the simplest and most important of the three basic weaves. Rigid Heddle weave structure comprises of “**plain weave structure**” in which a single weft crosses a single warp as balanced cloth interlacement – where the ends per inch (e.p.i.), equals the pick per inch (p.p.i.) used in about 80% of all woven fabric. The weave is executed by passing each weft yarn successively over and under each warp yarn, from selvedge to selvedge, alternating each row.



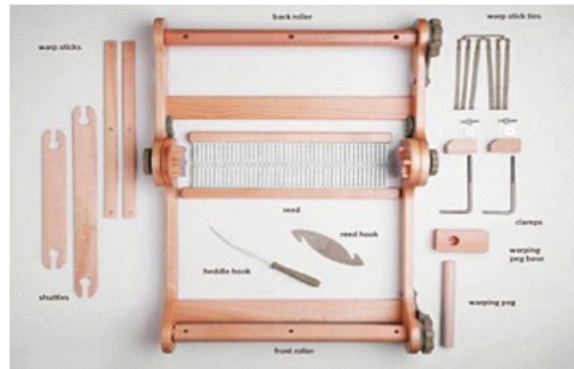
Alderman Sharon (2004)

*Fig. 1: Mastering Weave Structures
Comprehensive Draft for Plain Weave Love land*

Rigid Heddle Loom



*Fig. 2: Locally Constructed Frame
Port Harcourt, Nigeria*



Margaret Ajiginni (2017, May 10)

*Fig. 3: Complete Rigid Heddle Loom with Accessories
Schacht Spindle Company America*

Beaming the Loom

Beaming the loom is the process of passing the warp threads through the heddle slot. The rigid heddle loom is a frame that holds the rigid heddle positioned at the center and the warp for weaving. The heddle is made of wood or plastic that has narrow bars with holes alternating with narrow spaces, called slots. The warp threads are alternately arranged in the slots and in the holes. The rigid heddle (that serves as reed) is a tool responsible for the lifting and the lowering of warp yarns and allowing the insertion of weft yarns from selvedge to selvedge.

The heddle comes with a set number of slots and holes for the warping procedure. The threads from the roller stick are tied to the warp beam and are threaded permanently through dents per inch, 23 heddle eye or slot to the cloth beam. Typically, most rigid heddle reeds are between 5

and 12 dents per inch so, 5 dpi and 5 dent heddle are the same. After the warp threads are permanently wound on the loom, the ends are tied to the cloth beam at the front of the loom. This process is known as beaming the loom.

The beaming process proceeds slowly to ensure that warp threads are evenly wound on the loom. The beamed warp threads are checked for even tension and threading errors. For an effective weaving, the warp must have either an even tension or the selvedge slightly tightens than the center since extreme warp tension is not required. The warp threads must be held slightly under tension from the warp beam to the cloth beam for an effective weaving process and the cross lease sticks at the warp beam are retained: otherwise they will prevent the shaft from moving up and down during weaving.



Liz Gipson (2015, January 10)

Fig. 4: Beaming the Rigid Heddle Loom

Cricket loom: Schacht Spindle Company.

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Weaving the Cloth

Once the loom is dressed and the weft yarns are prepared, the practitioner is ready to start weaving. The weaver sits facing the front of the loom. The heald is raised creating an opening in the warp called a shed and the shuttle pass through the opening, laying the weft thread across the bottom layer of warp threads. Next, the heald is then pushed down to create new shed to pass the weft threads. Each time the weft thread is passed from selvedge to selvedge through the warp shed, the rigid heddle is used to beat down the weft thread onto the fell of the fabric thereby interlacing both threads at an angle. This operation is continuous until the warp threads are completely woven.



*Jane Patrick (2017, January)
Weaving on Rigid Heddle Loom
Schacht Spindle Company
Fig. 5*



*Liz Gipson (2015, January 10)
Weaving procedure: Heddle up (left); heddle (down)
Cricket loom: Schacht Spindle Company.
Knitty.com ISSUES15
Fig. 6a and Fig. 6b*

Hardware and Accessories of Rigid Heddle Loom

The major hardware and materials needed for the loom construction are listed below.

Hardware includes: Nails (standard nails), hammer, handsaw, chisel, T-square, sandpaper, screws, screwdriver, and drill. The loom consists of: heald, shed, warp, weft, cloth roller, DPI-dents per inch, heddle support block, ratchet brakes, and warp roller and a separation stick, threading hook, and shuttles as accessories. The accessories dimensions are listed below:

1. Top horizontal frame bar and bottom horizontal frame bar with dimensions of 1.5cm x 1.5cm x 40cm each.
2. Left vertical frame corner post and right vertical frame corner post with dimension of 1.5cm x 1.5cm x 5cm each.

3. Heald consist of 23 wooden strips with slots and holes in their centers through which warp threads are inserted and with dimensions (0.5cm x1cm x8cm) mounted on the frame with ½ inch nails.
4. 2 stick shuttles with dimensions 0.5cm x3/4cm x33cm each
5. 2 sticks with dimensions, 3/4cm x 3/4cm x33cm used to insert into the shed before actual weaving with threads commences.
6. 2 shed sticks with dimensions, 1cm x1cm x50cm. This is used to effect and maintain crossing of the warp threads.
7. 1 threading hook that passes the warp through the heddle slot.
8. DPI –dents per inch. It indicates the number of slots and holes in the rigid heddle reed
9. Ratchet brakes – it is a mechanism that keeps the positioned onto the loom, or advanced the warp yarn while weaving, It also provides tension from the warp beam to the cloth beam.
10. Heddle Support Block – holds the rigid heddle in an up and down position.

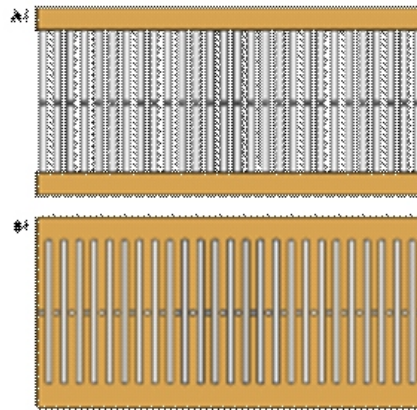
In this loom, the two equal-length horizontal bars are attached to the two vertical frame corner posts to form a frame at right angles. The manually manipulated rigid heddle loom consists of wooden strips known as rigid heddle (0.5cm x 1cm x 8cm) in dimension, mounted on a frame (15cm x40cm) in dimension. Each wood strip has a hole in the center and a space in between. The wooden strips are attached to two vertical and two horizontal wooden posts which make up the rigid heddle frame Fig. 7a, 7b and 7c.



*Liz Gipson (2015)
Ashford loom Rigid Heddles
Schacht Spindle Company
America
Fig. 7a*



Margaret Ajiginni (2015)
Locally constructed Rigid Heddle
Studio Practice
Port Harcourt, Nigeria
Fig. 7b



Liz Gipson (2015)
Ashford Loom Rigid Heddles
Schacht Spindle Company
America
Fig. 7c

Versatility and Efficiency of Rigid Heddle Loom

Rigid heddle looms are generally smaller and more affordable than two-shaft and floor looms. The loom consists of the rigid-heddle arranged in a frame designed to position it; the equipment is versatile, efficient, quick and easy to warp and weave; an effective tool to start with a small investment. As a single heddle serves both as a reed for warp yarns and as an exchange shaft as such; if the rigid-heddle is lifted, the whole yarns are raised above the slots and if the whole yarns are lowered below the slots, yarns are lowered. By raising and lowering the rigid-heddle, plain weave variations are woven (Van der Hoogt, 2015).

Also, the pick-up stick technique is used to create endless designs that exhibit: flamboyant hues, balance and harmony, design knowledge to imbue character, creativity, and artistic richness used for interior, exterior and substitute fabrics to blend contemporary fashion.

The equipment appeals to beginning and experienced art practitioners; who value its thriftiness and versatility as it explores techniques beyond the basics and capable of creating exquisite design possibilities. From classic plaids, openwork, flamboyant hues, rich textures for creating complex weave structures using color-and-weave technique, pick-up sticks, embellishment, and more surprisingly complex weave structures. The option for a second rigid heddle gives extra versatility as the loom can be manipulated to create tapestries, wall hangings, and wider woven household textiles.

Efficiency: Rigid heddle looms may prioritize compactness, portability and simplicity. The locally constructed and the imported sturdier looms are stronger, especially with well-designed support blocks; that holds heddles, make weaving more efficient. Most imported intermediate and advanced rigid heddle looms like: Ashford, Beka, Harrsville, Schacht, Kromski come with advanced design features with multiple heddles, clamps, ratchet brakes and aid in warping the loom. These looms create more complex weave structures and create room for exploration and experimentation.

Advocacy

Presently, Nigerian Poverty Profile, Report (2011) reveals that the Nigerian youth's population is about 90 million, representing 54.51% of the country's population, out of this; 64 million are unemployed while 1.6 million are under employed. Also, the economic diversification and progressive growth have not translated into significant decline in poverty reduction. Therefore, rigid heddle loom is a viable equipment to promote cottage industry and self-reliant amongst youths. Adeyemi (2015) said the need to revamp practice through creative techniques, education (formal and informal), advocacy and hands-on skills is necessary. The impartation of weaving technique through rigid heddle loom will increase youth's indices to promote economic advancement and cottage industry where the creation of products and services is home-based. The products are customized, unique and distinctive since the woven fabrics are not mass produced.

Conclusion

This paper was able to establish that the exploring rigid heddle loom for weaving fabric is apt as it focuses on developing youths potential to attain its full productive capacity towards achieving economic empowerment through the organized cottage industry. The struggle for the upliftment and empowerment of Nigerian's youths is a continuous process. Every effort made by Federal Government Agencies, multinational companies towards dignifying Nigerian is a new Birth.

Rigid heddle loom is easily constructed, serviced, versatile, and operated, a perfect blend of functionality and simplicity. It is inexpensive to construct, comfortable, compatible, transportable, portable and constructed for high performance. It is an equipment to create meaningful impact in the lives of Nigerian youths. Its ability to promote entrepreneurship and human resource development toward national sustainable development cannot be overemphasized.

The impartation of technical skill through cottage industry remains the process of increasing capacity of youth's indices to facilitate self-sustenance and economic empowerment. Without the existence of cottage industries, the economic empowerment of any nation cannot advance and the negative effects are youth restiveness, aggression, agitations and mass unemployment. These social vices are inimical to self-developing potential and as such cannot promote national sustainable development.

Hence, the Federal Government of Nigeria in the policy on education (1981) and National Economy in Nigeria stressed the significance to develop oneself as a veritable tool for nation sustainable development. Consequently, the use of rigid heddle looms will boost the establishment of medium scale industries; promote weaving efficiency and technological advancement (skill, knowledge, productivity and innovativeness) needed for youth economic empowerment. This is considered a legacy of prosperity.

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Rigid Heddle Loom Woven Fabrics



Margaret Ajiginni (2015, May 23)
Title: Baby Tie Design
Medium: Woven Fabric
Port Harcourt, Nigeria
Fig. 8



Margaret Ajiginni (2015, July 2)
Title: Ring of Hope Design
Medium: Woven Fabric
Port Harcourt, Nigeria
Fig. 9



Margaret Ajiginni (2017, July 26)
Title: The Mangrove Design
Medium: Woven fabric
Port Harcourt, Nigeria
Fig. 10



Margaret Ajiginni (2015, February 24)
Title: Salvation Design
Medium: Woven Fabric
Port Harcourt, Nigeria
Fig.11



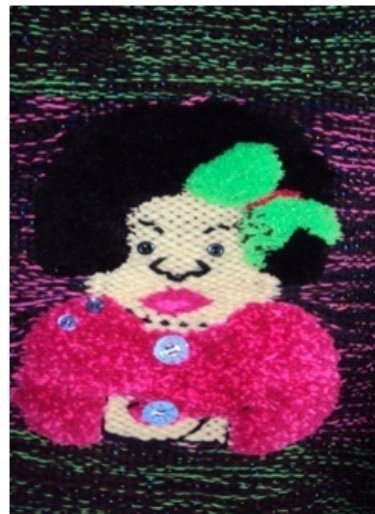
Adaora P. David (2017, August 15)
Title: Waa Doo Design
Medium: Woven Fabric
Port Harcourt, Nigeria
Fig. 12



Sotonye Precious (2017, August 24)
Title: The Niger Delta Design
Medium: Woven Fabric
Port Harcourt, Nigeria
Fig. 13



Pet Iwurie (2016, October 11)
Title: Unity of Purpose Design
Medium: Woven Fabric
Fig. 14



Adaora P. David (2016, April 14)
Title: Mother Africa Design
Medium: Woven Fabric
Fig. 15