# Community Development and Empowerment of Women in Rural India Through a Recycle Textile Cooperative

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The candidate confirms that the work submitted is her own and that appropriate credit has been given where reference has been made to work of others.

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# Abstract

In the village of Vellanchery, Tamil Nadu state, India, the main source of income is through the weaving of traditional silk saris. This activity is completed by the males of the families. This is a domestic process carried out on handlooms using a warp of approximately twenty-one metres; from which, three six metre sari lengths are produced. This leaves close to three metres of remnant silk yarns on the warp beam. Past efforts to make use of these remnant yarns have been aimed at the production of fashion accessories, including items such as: bangles and necklaces, which crucially are of low value and only sold in the local market. As such, the production of these items from remnant yarns provide minimal economic empowerment of the women in the village, which is very much needed.

The thesis investigates the development of a process of recycling hand spun knitting yarn using 30% of these silk remnants collected from handlooms blended with 70% scoured lamb's wool. Alluring and unique yarn colours, that are non-repeatable, and have excellent handle and knit-ability can be produced. Notably, non-repeatable yarn colours make this product unsuitable for the mainstream fashion market, however bespoke designs are extremely desirable for craft hand knitters. The idea is to use hand spinning, which is a therapeutic craft, whereby the wheels employed could be housed in one building to enable women to form a cooperative system.

The aim of the project is to create a framework for a sustainable cooperative model combining the socio-economic and political aspects for setting up a women's cooperative, including the technology for production and a marketing strategy.

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# List of Abbreviations

AATCC - American Association of Textile Chemists and Colourist

ASTM - American society for Testing and Materials

AT- Appropriate Technology

CAPART- Council for the advancement of People's Action and Rural Technology

CSR - Corporate Social Responsibility

CSI - Corporate Social Irresponsibility

CUP - Children Uplift Programme

GDP - Gross Domestic Product

GRO - Grass Root Organisation

ICA - International Cooperative Alliance

ISO - International Organisation for Standardisation

IT- Intermediate Technology

LCA - Life Cycle Analysis

MSME - Ministry for Micro Small and Medium Enterprise

NABARD - National Bank for Agriculture and Rural Development

NGO - Non Governmental Organisations

NFHS - National Family Health Survey

NID- National Institute of Design

NIFT - National Institute of Fashion Technology

NMEW - The National Mission for Empowerment of Women

PAR - Participatory Action Research

PRA - Participatory Rural Appraisal

SAI - Social Accountability International

SD - Standard Deviation

SDC - Society of Dyers and Colourist

SHG - Self Help Groups

SME - Small and Medium Enterprise

UN - United Nations

USDA - United States Department of Agriculture Rural Business and Cooperative Development Service

WFTO - World Fair Trade Organisation

WB - World Bank

RMM - Relative Molecular mass

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# Chapter 1
# Introduction

This chapter presents the background, the problem under investigation and a general summary of the structure of the thesis. In order to address the matter under investigation an overview of the socio-economic situation of the rural women in Vellanchery village in Tamil Nadu state (South India) has been presented. This has motivated the researcher to develop a recycled yarn using the silk remnants collected from the handlooms in the village. Its production and use is presented as a means of empowering women through cooperatives. Design, as an organisational thinking process incorporating the technology of production and management, is used to develop a conceptual framework for this sustainable worker cooperative.

## 1.1 Research context

The publication of The Brundtland Commission in 1987 popularised the concept of sustainable development. This is defined as development that meets the needs of the present without compromising the ability of the future generations to meet their own needs. The 1992 The Rio Declaration of Environment and Development represented a major shift from focusing purely on environmental balance to issues related with wider social and economic aspects. Sustainability which is often thought of primarily in terms of the environment, is actually comprised of three overlapping mutually dependent goals: economy, environment and social equity. According to McKenzie (2004) among the three elements, social sustainability is least developed and it is often positioned low in relation to environmental and economic sustainability. Beckley (2000); Berks and Folke (1998) and Elkington (1998) explain that environmentally (or ecologically) focused renditions of sustainability posit social sustainability directly in relation to the environment – focusing mainly on society's threat to natural resources. On the other side, economic rendition of sustainability places society within the construct of economics. However, studies related with social sustainability in relation to economics and environment, fail to investigate the factors that

sustain a community of people (McKenzie, 2004). In order to identify the contributions related with social sustainability, it must be understood as a phenomenon distinct from the ecological and economic sustainability.

Harris and Goodwin (2001) define a socially sustainable system as a fair and adequate provision of social services including: health and education, gender equality, political accountability and participation. It is argued by Dillard *et al.* (2009) that the social process required to achieve economic and environmental sustainability is missing in Harris and Goodwin's definition. In order to implement economic and environmental policies, human engagement is an essential factor. McKenzie (2004, p.12) explains social sustainability as a "life-enhancing situation within communities, and a process within the communities that can achieve that condition". The indicators of the condition are:

- Equality in access to key services like education, health, transport, housing etc.
- Equality between generations, where the activities of current generations should not affect the wellbeing of future generations
- A system of cultural relations where cultural values are protected
- Society's participation in areas of political activity, particularly at the local level
- A system for transmitting awareness of social sustainability and community responsibility from one generation to next
- Mechanisms for political support to meet needs that cannot be met by community actions (McKenzie, 2004).

Magis and Shinn (2009) bring together the concept of wellbeing and social sustainability as a topic related to Human-Centred Development, sustainability and community well-being. The Human-Centred Development process includes basic human needs such as nutrition and shelter, strategies which expand the social, economic, cultural and political choices that lead to equity, sustainability, productivity and empowerment (Haq, 1999 and Sen, 1999). Stiglitz (2002) argues that Human-Centred Development promotes pro-poor strategies that help in poverty reduction, facilitating

sustainable growth. In the past few years there has been growing recognition of the need to address basic human needs and adopt a participatory approach to achieve development goals. Many governmental and non-governmental organisations have demonstrated interest in improving the well-being of the people and empowering them to achieve improvement in their lives (Mehra, 1997). This research addresses the cooperative as an organisational framework that can provide employment for rural women that promotes equality and empowerment.

## 1.2 Linking social sustainability and women's empowerment

Despite the development programmes in India after independence in 1947, there remains significant gender gap across many aspects. United Nations research indicates that in order to reduce gender inequality globally, there should be an expansion of opportunities for women and an increase in their ability to exercise choice (United Nations Development Programme, 1995). The United Nations Conference On Environment and Development (1992) agenda 21, 'Global Action for Women Towards Sustainable and Equitable Development' discusses several conventions for elimination of all forms of discrimination against women to ensure women have access to land and other critical resources, such as education and employment. Successful implementation of women's empowerment programmes depend on the active involvement of the women in decision-making and in the implementation of sustainable development activities.

During the first half of the twentieth century, Gandhi promoted spinning of Khadi (hand spun and hand woven cloth) for rural self-employment and self-reliance in India. Thus making Khadi an integral part of the swadeshi movement. The swadeshi movement was concerned with a revival in the production and use of domestic produce. In his book "An Autobiography or The Story of My Experiments With Truth" Gandhi describes the experience of hand spinning as: "the wheel began merrily to hum in my room, and I may say without exaggeration that its hum had no small share in restoring me to health. I am prepared to admit that its effect was more psychological than

physical ” (Gandhi, 1929, p.441). The non-violence freedom struggle in India revolved around the use of khadi, eliminating a reliance upon imported cloth from England, symbolising key political ideas and emerging independence of India. In this thesis the researcher aims to link the ethical thoughts of social sustainability through a method of production of recycled yarn. This would be achieved using a hand spinning technique which is itself, a therapeutic craft. The spinning wheels can be housed in a building where the women can assemble and work under fair conditions. As such, the thesis weaves together a technology appropriate for the production of the yarn alongside a sustainable marketing strategy. The yarn developed for the study is referred throughout the thesis as ‘recycled hand knitting yarn’ even though 70% is scoured virgin lamb’s wool. This is combined with 30% recycled silk remnants collected from the hand weaving of silk saris.

## 1.3 Originality of research Idea

The researcher’s educational background and work experience in Tamil Nadu has given her exposure to a major handloom sector specialising in sari weaving. Being an alumnus of the National Institute of Fashion Technology under the Central Textile Ministry in India, has helped her to access the handloom sector in the village where the research takes place. It was noticed by the researcher in her visits that the silk remnants from the handloom were used by small organisations for the production of accessories like bangles and necklaces to match the saris woven in the loom. Her experience as a knitwear designer has encouraged her to collect some of the silk remnants and mix it with lamb’s wool to develop knitting yarns with unique colour and texture. As the study progressed she was able to develop a production method which is: environmentally friendly, easy to adapt and socially beneficial for the community. Marketing of the recycled yarn is the other issue addressed in the thesis. Furthermore, to achieve quality that can compete with the market available hand knitting yarns she has conducted objective and subjective tests which are discussed later in the thesis. These are outlined in a following section describing methods used.

Accordingly, two different contexts are chosen for the study: firstly, the role of an eco-friendly and therapeutic method of recycled yarn production under a cooperative setup is explored. Vellanchery village is chosen to investigate whether a worker cooperative system could help to empower currently unpaid women in the handloom sector. This group is approached, because the researcher is familiar with the village and has language capability to conduct research in Tamil.

Secondly, the UK is chosen as the context for analysing the quality of the yarn. Based on the primary research conducted with potential customers who are mainly hand knitters, the aesthetic and functional aspects of the yarn are reviewed. A marketing strategy to promote the recycled yarn as an export product was also developed.

## 1.4 Research aim and objectives

The aim of the research is to create a framework for a sustainable cooperative model combining the socio-economic and political aspects for setting up a women's cooperative. This would also include the technology for production and a marketing strategy.

In order to achieve the aim the following objectives are set:

- To critically review literature in relation to: empowerment of women and community development, sustainable methods of production and marketing strategy
- To investigate the possibility of producing recycled yarn in a workers' cooperative setup involving the currently unpaid labour in the handloom sector (women) in the village
- To develop an appropriate technique of production and marketing strategy for the recycled yarn
- To test the consumer response to a group of yarns and hand knitted fabrics
- To formulate a framework which would facilitate the organisation of this cooperative.

## 1.5 Thesis structure review

The thesis is organised into nine chapters including this introduction. Chapter 2 outlines the methodology and methods used to attain the aim and objectives discussed in chapter 1. It explains why participatory action research (PAR) is considered as the most appropriate methodology, including specific data collection and analysis methods.

In chapter 3 the researcher reviews literature that relates to women's empowerment through income generating institutions (such as workers' cooperatives leading to community development), and discusses the initial field study in the village. Specific literature on interventions by the government and the non-governmental organisations are critically reviewed to promote training and assistance for beneficiaries. The economic empowerment of women through cooperatives is analysed and connected with the political, economic and social aspects of the community. Chapter 4 examines the choice of technology for the production of the recycled yarn. A technology appropriate for the village background is selected and adapted by the researcher to develop the yarn. The appropriate technology is analysed in the context of: philosophy behind the choice, sustainability, and environmental aspects related to the production of the yarn. Chapter 5 examines techniques related to the analysis of the physical properties of the recycled yarn. Chapter 6 discusses a sustainable marketing strategy for the yarn along with the primary market research and development of a brand name and packaging for the yarn. The outcome is a sustainable marketing strategy incorporating the ideas of customer oriented marketing and relationship marketing – with the '4P' paradigm.

Chapter 7 and 8 are data analysis chapters. Each presents the results and examination of subjective and objective tests. Chapter 7 outlines the cross triangulation of findings that has helped the researcher to relate the objective findings with the subjective analysis regarding the physical properties of the recycled yarn. Chapter 8 is the discussion chapter in which the sustainable cooperative framework developed as an outcome

of the project is tested with sustainable design experts. Here the researcher discusses the implications of the findings of the experts to identify the limitations of the framework.

Finally, chapter 9 bring together the previous chapters which comprise the thesis. This is achieved through outlining how the aim and objectives were met and concludes by determining the contributions that this study has made as well as recommendations for future work. Finally, the limitations of the study are also discussed at the end of this chapter.

# Chapter 2
# Research Methodology

This chapter discusses the methodology and methods used to achieve the objectives and the aim of the project. The research objectives explained in the introduction chapter call for different types of research methods for data collection. The research objectives influenced the selection qualitative, quantitative or mixed methods (Robson, 2011). The choice of methods for research depends on the field of study and the research paradigm. A paradigm traces the outline of: what questions to ask, what can be researched, what an appropriate methodology is, what constitutes data and what kind of tests enable beliefs to be counted as knowledge (McIntyre, 2003). Accordingly the researcher formulated a paradigm to investigate whether the silk remnants collected from the handloom could be recycled into a hand knitting yarn that would have a market niche. Sustainability involved in the production process adds value to the recycled material. The paradigm further discusses women's empowerment issues resulting from their engagement in the production process as well as the marketing and sale of the recycled yarn. To gather data and information for the study, both qualitative and quantitative research methods were applied. In this chapter the researcher critically analyses and discusses the importance of combining the above two types of research methods to support the validity of the study and the methodology appropriate to shape the research outcome.

## 2.1 Purpose of research

Real world research focuses on four possible purposes (Table 2.1) commonly put forward by Robson (2002) to explore, to describe, to explain and to emancipate.

**Table 2.1 Classification of the purposes of enquiry (Robson, 2002, p. 59)**

| | |
|---|---|
| Exploratory | – To find out what is happening, particularly in little-understood situations<br>– To seek new insights<br>– To ask questions<br>– To assess phenomena in a new light<br>– To generate ideas and hypotheses for future research |
| Descriptive | – To portray an accurate profile of persons, events or situations<br>– Requires extensive previous knowledge of the situation to be researched or described, to know appropriate aspects for gathering information |
| Explanatory | – Seeks an explanation of a situation or problem, traditionally but not necessarily in the form of causal relationships<br>– To explain patterns relating to the phenomenon being researched<br>– To identify relationships between aspects of the phenomenon |
| Emancipatory | – To create opportunities and the will to engage in social action |

In real world research there is always a central purpose to the project but the study may be concerned with more than one research purpose and sometimes the purpose can change as the study proceeds. For this research the researcher intended to use an action perspective where the concern is not only to explore, describe or explain; but also facilitate changes or improvements to influence the policies or practices; and suggest that an additional purpose is important in real world research (Robson, 2011). The

aim of the emancipatory or empowerment purpose is to help members of an oppressed group to take control of their lives through direct action where the study leads to change or indirectly influences policy (Brown and Strega, 2005).

This research is about understanding an existing situation in a South Indian village, and the development of a strategy to produce (and market) recycled hand knitting yarn, involving unpaid labour (women) in the handloom industry. The project outcome is to structure a sustainable small-scale worker cooperative framework that provides an employment opportunity for the women in the village. To generate data the researcher had to engage in the process along with the participants. Initially it had to be determined whether the women in the village were willing to be involved in the production of the recycled yarn, and the next stage was to develop a sustainable product and evaluate the market value of the yarn with potential customers. The quality analysis of the yarn is an important factor to determine the market value.

## 2.2 Identifying suitable methodology

Silverman (2013) argues that methods are techniques which have a specific meaning relating to the methodology in which they are used. Grix (2004) defines methods as the vehicle or process used to gather data. The choice of methods reflects the research strategy as the methodology forms according to which methods are used, and how each method is used (Manson, 2002). A research can consist of flexible or fixed research strategies. If either of these basic design strategies are not sufficient to answer the research objectives, then the researcher can combine substantial elements of fixed and flexible design as a multi-strategy design (Robson, 2011; Blaxter *et al.,* 2010).

Grix (2004) describes project methodology as a discussion of how a particular piece of research should be undertaken, and how it is better understood through a critical study of research methods and their use. Therefore, methodology is not only a proposed design strategy in order to

answer the research objectives and hypothesis, but also: a detailed account of all the methods used to collect the required data and information related to the project, and sequence of implementation. In this project the application of any one research design is insufficient to achieve the desired outcome as it involves both quantitative and qualitative data collection techniques/methods (examining physical properties and participant's subjective response to the yarn and knitted samples). However, it is essential to derive an appropriate methodology where the researcher can provide an opportunity to co-develop a process with the beneficiaries (rather than for the beneficiaries). As such an action research method with active involvement of the participants would help to achieve the project outcome (McIntyre, 2008).

Three widely used flexible design strategies are: case study, ethnographic study and grounded theory. Case studies are about developing an intensive knowledge about a single case, or small number of cases (Robson, 2011; Denscombe, 2008). McKenzie *et al.* (1997) differentiates case study from action research: where a case study examines a phenomena in its natural setting while the researcher is an independent outsider, in action research the researcher might be a participant in implementing a system and simultaneously evaluating a particular approach. Hult and Lennung (1980) explain action research as a methodology to assist in practical problem-solving and enhance the competence of respective actors who perform collaboratively in an immediate situation. Also using data feedback collected in a cyclical process increases understanding of a given social situation. This is primarily applicable to understand the changing process in social systems undertaken under a mutually acceptable ethical framework. A working definition given by Reason and Bradbury (2001, p. 1) is that "action research is a participatory democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory world view".

Many conventional research studies are followed by inappropriate recommendations that frequently fail to take into account local priorities,

process and perspectives. The use of ethnographic assessment tends to involve people merely as informants, as the researcher becomes actively involved in the study. In the case of participatory research, the people are effective participants who focus on their priorities and perspectives (Hennink *et al.*, 2011; Cornwell and Jewkes, 1995; Chambers, 1992). As the study was conducted in a real world setting, there is a need for the researcher to participate with participants to engage in a collaborative process aimed at improving and understanding their world in order to change the system. To summarise, action research leads the participants through identifying a course of action without necessarily engaging in the actions.

In this project the researcher worked with participants using a combination of methods for data collection and analysis. It is necessary to identify a suitable methodology in order to validate the research findings. Participatory action research (PAR) was the methodology adopted for the study because of the active involvement of participants at each stage of the investigation that helped the study to be reflexive, flexible and iterative.

### 2.2.1 Participatory action research (PAR)

The underlying principles specific to PAR are:

- Collective commitment to investigate an issue or problem
- A desire to engage in self and collective reflection to gain clarity about the issue under investigation
- A joint decision to engage in individual and collective action that leads to a useful solution benefitting the people involved
- The building of an alliance between researcher and participants in the: planning, implementation and dissemination of the research process (McIntyre, 2008).

According to Whyte *et al.*, (1989) the involvement of participants in the research process is likely to stimulate the researcher to think in new ways about old and new theoretical problems, and thus generate new ideas. In the context of PAR, the practitioners draw a variety of quantitative, qualitative and creative methods to engage participation in the construction of

knowledge. Examples include: surveys, interviews, focus groups and mapping. Considering the diversity of materials used, there is also a variety of analytical methods utilised by researchers to analyse the research data. In the PAR process the initial research objectives lead to the emergence of new questions and new avenues of inquiry, all of which informed the research process rather than it flowing in a certain formulated way (McIntyre, 2008).

The aims of PAR are achieved through a cyclical process including: exploration, knowledge construction and implementation at different stages through the research process. The participants reflect their views through active engagement in critical dialogue and collective reflection helping them to recognise that they have a stake in the overall project. Thus PAR becomes a logical argumentation, changing the researcher, the participants and the situation in which they act (McTaggart, 1997). Accordingly there are no fixed formulas for designing, practicing and implementing PAR projects, nor is there an overriding theoretical framework that underpins the PAR process. PAR is a philosophy rather than a methodology that assists practitioners in developing authentic and effective strategies for: collaborating with people in improving their lives, effecting social change and reconstructing the meaning and value of knowledge. Participants engage in collaborative, action based projects that reflect their knowledge and mobilise their desire (McIntyre, 2008).

### 2.2.2 PAR process

PAR is a recursive process (fig 2.1) that involves a spiral of adaptable steps that include the following

- Questioning a particular issue
- Reflecting upon and investigating an issue
- Developing an action plan
- Implementing and refining the plan

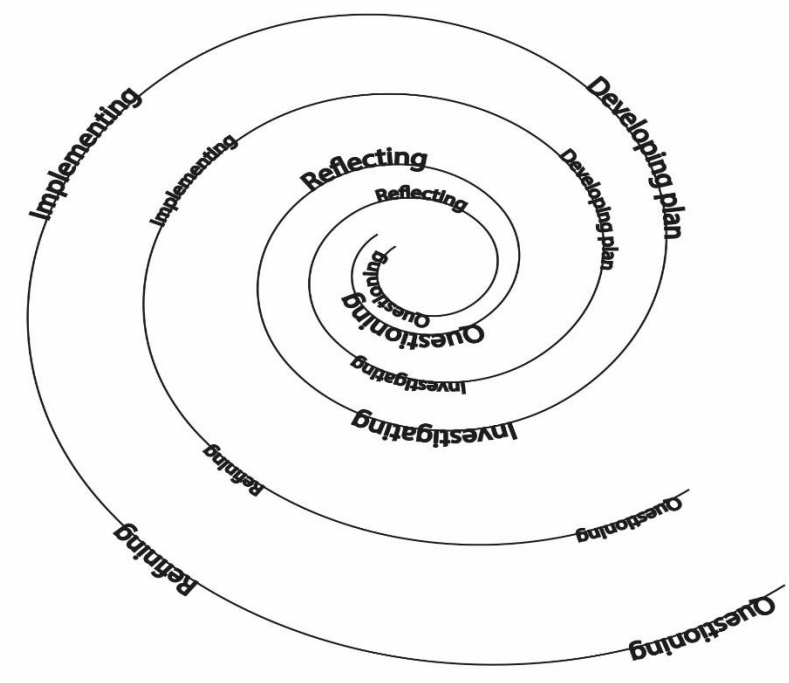



**Fig 2.1 The recursive process of PAR (McIntyre 2008, p. 7)**

To summarise, the researcher has followed the spiral steps of PAR in four steps in order to:

- Question the issue of recycling the silk remnants collected from handlooms to produce a value added recycled hand knitting yarn that could help empower women in the weavers' community in Vellanchery village through their involvement in the production process
- Reflect and investigate the issue involving the participants in order to achieve clarity
- Develop an action plan by combining both quantitative and qualitative data generating methods
- Finally review the outcome with the real life situation and develop a contextual framework that could be adopted in the real world.

A field study was conducted by the researcher in order to get an understanding about the community, their cultural background and the willingness of the women to be a part of the project. The initial study and observations helped the researcher determine the validity of analysing the market value of the recycled hand knitting yarn. The literature review and

observations assisted the researcher to frame the research objectives and the research methods adopted can support and critically examine the primary data. To construct the research process a combination of methods were applied, including: interviews, focus groups, surveys, the objective and subjective testing of yarns and a wearer test.

## 2.3 Types of research - qualitative and quantitative

To investigate a topic many researchers use either quantitative or qualitative methods. Quantitative research specifies numerical assignment to the phenomena under study, and qualitative research produces narrative or textual descriptions of the phenomena under study (Vanderstoep and Johnston, 2009). Qualitative research methods are explained as an approach that allows the examination of people's experiences in detail, using a specific set of research methods such as: in-depth interviews, focus group discussions, observations, content analysis, visual methods and life histories or biographies. Qualitative research is not only concerns the application of qualitative methods but also allows the researcher to identify the issues from the perspective of the participants and understand the meaning and interpretations that they give to behaviour, events or objects (Hennink *et al.*, 2011).

Quantitative research involves relatively large scales of data presented or perceived as the gathering of facts. Qualitative research on the other hand is concerned with collecting and analysing information mainly in nonnumerical forms. The choice of these two strategies depends on the researcher whether to use them separately or mix these strategies within their research project (Blaxter *et al.*, 2010 and Hennink *et al.*, 2011).

### 2.3.1 Key difference between qualitative and quantitative research

The table 2.2 presents different research methods and their relationship to types of research.

**Table 2.2 Difference between qualitative and quantitative research (Hennink *et al.*, 2011)**

| | Qualitative research | Quantitative research |
|---|---|---|
| Objective | To achieve a detailed understanding of underlying reasons, beliefs and motivations | To quantify data and extrapolate results to a broader population |
| Purpose | To understand why? How? And What are the processes? What were the influences or contexts? | To measure, count and quantify a problem. How much? How often? What proportion? Relationships in data? |
| Data | Data are words (called textual data) | Data are numbers or numerical data |
| Study population | Small numbers of participants or interviewees, selected purposively (non- randomly) | Large sample size of representative cases |
| Data collection methods | In-depth interviews, observations and group discussions | Population surveys, opinion polls, exit interviews are objective values of product quality parameters |
| Analysis | Analysis is interpretive | Analysis is statistical but it should be followed by interpreted meaning |
| Outcome | To develop an initial understanding, to identify and explain behaviour, beliefs or actions | To identify prevalence, averages and patterns in data. To generalise to a broader population |

## 2.4 Data collection methods

The data collection methods used for this project are observation, focus groups, one-to-one interviews, survey methods, subjective and objective yarn and fabric tests. Within the research at the primary stage, observation and questionnaires were used to collect data.

### 2.4.1 Observation

The aim of observation is to generate knowledge about specific issues, which can be used by the researcher in a variety of ways. It may be employed at the primary stages of the research project to explore an area which can be studied further by utilising other methods, or it can be used at the final stage of the project to check data collected in interviews or surveys (Sapsford and Jupp, 1996; Robson, 2011). According to Sapsford and Jupp (1996) there are two types of observation: structured observation and participant observation. Structured observation methods require systematic observation of behaviour, but without directly questioning the people who are observed. Participant observation involves asking questions that arise naturally in the course of observation rather than carried into the observation by the researcher.

Participant observation includes approaches, such as a field study, that appear to refer to where the study takes place rather than what kind of study it is. Here the researcher is more likely to have a set number of interviews and more inclined to have discussions or informal interviews with participants. At the initial stage of the research the researcher followed participant observation where she was committed to approach observation with a relatively open mind, in order to minimise the influence of the observer's preconceptions and to avoid imposing existing preconceived categories. Here the focus of the research is to change during the course of data collection as the idea is developed and particular issues became important (Sapsford and Jupp, 1996).

### 2.4.2 Survey

Surveys are self-report measuring instruments composed of two types of elements, stimuli / questions and questions and responses/ answers. The modes of administration can be oral or written where oral surveys are generally interviews and written surveys are questionnaires. The physical elements for these may either be structured or unstructured. Structured are known as closed or multiple choice responses where the respondent must choose among the alternatives supplied by the researcher. Unstructured responses are open or free responses in which the respondents may say or write anything. Combinations of structured and unstructured responses are possible in a questionnaire (Herzog, 1996; Sapsford and Jupp, 1996). For quantitative data collection the researcher used both structured and unstructured survey methods.

### 2.4.3 Focus groups

A focus group explores attitudes and expressions, feelings and ideas about a topic and encourages discussion with the participants (Flick, 2007). Robson (2002) describes it as group interview conducted on a specific topic. It can be an open ended group discussion guided by the researcher extending for an hour or more. Two focus groups were conducted by the researcher to collect qualitative data related with the aesthetic and functional features of the recycled yarn along with a group of market sourced hand knitting yarn.

### 2.4.4 Semantic differentiation test

A semantic differentiation test was used to collect quantitative data related with the hand feel of the yarns and fabric. Semantic differentiation is a technique that can provide quantitative values for the perceived attributes people use to describe the quality of the products, materials or visuals. It is a form of scaling instrument with polar pairs of adjectives clearly defining the extremes of particular attributes being measured (Jacobsen *et al.*, 1992).

### 2.4.5 Interview

Interviews are conducted to question or discuss the issues related with the research samples (Blaxter *et al.,* 2010). Based on the degree of structuring, interviews are divided into three categories: structured interviews, semi-structured interviews and unstructured interviews. A structured interview uses a set of pre- defined questions asked in the same order for all respondents. A semi-structured interview is a combination of closed ended and open ended questions; but in the course of the interview the interviewer could adjust the sequence of the questions and add questions in the context of the participant's response if necessary (Fontana and Frey, 2005). According to Denscombe (2008) semi-structured interviews allow the participants to develop their own ideas in response to the issues raised in the interview. In the case of unstructured interviews neither the questions nor the answer categories are pre-determined. Instead, they rely on the social interaction between the researcher and informant (Minichiello *et al*., 1990). Table 2.3 presents the qualitative and quantitative methods used to collect data for the project.

**Table 2.3 List of mixed methods used for collecting data**

| | Type of research | Data collection method | Outcome | Discussed in chapter no: |
|---|---|---|---|---|
| **Observation** | Qualitative | **Field study** at Vellanchery village | -To evaluate the efficiency of existing handloom worker cooperative for silk weavers and to review the strengths and weaknesses in administration and marketing techniques<br>-To investigate whether the women in the community were willing to participate in the production process of the recycled hand spun yarn | 3 |
| **Unstructured interview** | Qualitative | **One to one discussions** with the managing directors of Texere yarns in Bradford, UK and Gossypium, Lewes High Street, UK | -To obtain information about the quantity, quality and a pricing strategy for the recycled hand spun yarn | 3 |

| | | | | |
|---|---|---|---|---|
| **Survey** | Quantitative | Survey at knitting and stitching show at Harrogate 2012 | -To collect feedback related to the prototype of the recycled yarn and hand knitted garment from the people who visited the exhibition using a draft questionnaire | 6 |
| **Objective testing** | Quantitative | -Twist constant<br>-Fabric pilling test<br>-Shrinkage after washing | -To analyse the physical properties of the recycled hand spun yarn | 7 |
| **Focus group** | Qualitative | Two focus groups were conducted one at Cromford mill, UK and Texere yarns, Bradford UK | -To analyse the features of a range of market available hand knitting yarn along with the recycled yarn | 7 |
| **Semantic differentiation test** | Quantitative | A semantic grid was derived from the focus group participants with bipolar attributes relating to the tactile qualities of a range of six hand knitting yarn | -To compare the handle preference of a population of hand knitting yarns and fabric | 7 |

| | | | | |
|---|---|---|---|---|
| **Objective test** | Quantitative | Arrange the yarns according to overall appearance and colour preference | -To compare the participants preference of a population of hand knitting yarns | 7 |
| **Wearer test** | Qualitative | Participants to wear hand-knitted sweater made out of the recycled yarn for eight months | -To analyse the physical properties of the yarn in the garment stage including: abrasion, repeated laundering and the application of forces in dry and wet stage arising from everyday use and service. Also recording the wearer's comfort during this time | 7 |
| **Packaging for recycled yarn** | Quantitative | Online survey on Ravelry.com | -To identify the packaging preference of the hand knitters | 6 |
| **Label and brand name for the recycled yarn** | Qualitative | Online discussion with Ravelry.com users | -To analyse customer feedback related to the proposed band name and labelling | 6 |
| **Observation** | Qualitative | Knitting and stitching show at Harrogate 2014 | -To examine the pricing, quality, content and display of hand spun yarn exhibited in stalls | 8 |

| | | | | |
|---|---|---|---|---|
| **Evaluating the contextual framework for worker cooperative** | Qualitative | Interview with experts in sustainable design | -To review the worker cooperative framework developed by the researcher along with the production technique and marketing strategy for the recycled yarn | 8 |

## 2.5 Phases of data collection and evaluation

The data collection presented in table 2.3 are conducted in three phases:

### 2.5.1 Phase 1

In (table 2.4) the aim of phase 1 was to collect and analyse data to support the research paradigm and develop a framework for the project. The primary data collection techniques (field study, unstructured interviews and survey) were used to collect data from weaver's cooperative managers and women in the village. The findings were discussed in chapter 3. Unstructured interviews with UK retailers and the survey conducted in Knit and Stitch exhibition were explained in chapter 6.

### 2.5.2 Phase 2

The aim of phase 2 was to compare the subjective and objective data collected about the recycled yarn using different techniques including: focus groups, semantic differentiation test, wearer test and objective tests (twist constant, fabric pilling test, shrinkage after washing). The findings of these activities were triangulated to analyse the quality requirements of the yarn. According to Flick (2007) triangulation is about comparing different sources of data collected against each other to develop a theory. Robson (2011) describes triangulation as corroboration between quantitative and qualitative data in order to enhance the validity of findings.

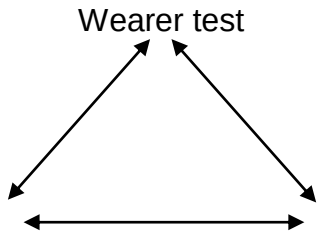
The researcher used data triangulation combining the qualitative and quantitative methods, to test the physical properties of the recycled yarn, and identify the yarn properties that are acceptable to the hand knitters. The adjectives indicating the tactile properties of a range of six hand-knitting yarns with similar physical properties were selected from the focus group transcript. These adjectives were used to evaluate the handle of hand-knitted yarns and fabric on a bipolar scale. The results from the semantic differentiation test were compared with the scientific test results which were again compared with the subjective wearer test. The results of the tests are discussed in chapter 7.

### 2.5.3 Phase 3

The aim of phase 3 was to evaluate the conceptual framework developed by the researcher for the production of recycled hand knitting yarn with personnel with considerable experience in sustainable design.

The final framework was developed through analysing the literature review related to the worker cooperative and empowerment of women, also including a marketing strategy for the recycled yarn and the technical choice for the production of the yarn. The theoretical underpinning guided the researcher to compare the existing knowledge with the principles and values of the cooperatives and the reasons for their success and failure. The potential framework was finally tested with the sustainable design experts and the limitations were discussed in the conclusion chapter. UK craft exhibitions were visited to observe the quality, display and pricing of the hand spun yarns.

**Table 2.4 Phases of data collection and evaluation**

| **Phase 1**<br>**Data collection and understanding** | | | **Phase 2**<br>**Data triangulation** | **Phase 3**<br>**Evaluation** | |
|---|---|---|---|---|---|
| **Cooperative managers and workers** | **Hand knitting yarn retailers** | **Customer survey** |  | **Knitting and stitching show 2014** | **Sustainable design and marketing experts** |
| Field study at the village | Unstructured interview | Conducted in knitting and stitching show in Harrogate 2012 | Objective evaluation results<br>Subjective evaluation results | Identify existing competitors for the recycled yarn, quality, content, pricing and display of hand spun yarns | Evaluate worker cooperative framework developed by discussion with sustainable design experts |

## 2.6 Qualitative data analysis

Robson (2011) discusses three approaches to qualitative analysis which are quasi-statistical approach, thematic approach and grounded theory approach. The quasi-statistical approach rely largely on the conversion of qualitative data into quantitative format and using thematic coding to group data together in themes that serves as a basis for further analysis and interpretation. According to Corbin and Strauss (2008) and Robson (2011) the aim of grounded theory is to generate theory from data collected and it is useful for sorting and analysing data through open coding and axial coding.

PAR researchers like McIntyre (2008) and Whyte *et al.,* (1989) used grounded theory approaches for data analysis. Robson (2011) discusses the use of coding that depends on the type of data you wish to collect, which in turn depends on the research objectives the study seeks to answer. Corbin and Strauss (2008) state that coding involves interaction with data using techniques like: asking questions about the data and comparing data. By doing so the researcher is able to derive concepts to stand for its data, then develop the concepts in terms of their properties and dimensions. The key difference between grounded theory and a thematic approach is that the former is based on developing a theory that explains the findings with the data and the latter is used to summarise the data, but not necessarily with an aim to develop a theory (Potter and Wetherell, 1987).

The researcher adapted a coding or categorising system to analyse the focus groups. However, a combination of thematic coding approach (to encapsulate the data collected through the focus groups) and matrix diagram method (that identified corresponding elements involved in a problem situation or event (Mizuno, 1988)) was used to analyse the qualitative data to guide and support the theory (see table 2.5).

**Table 2.5 Combination of thematic coding method and matrix diagram**

| Thematic coding approach | Method used for the focus group data analysis |
|---|---|
| **Data Collection**<br>A source of textual data may be used but any kind of semi-structured interviews, observations, focus groups and field studies can be used for collecting data | **Data collection**<br>The interviews and focus groups were video and audio recorded |
| **Transcribe data**<br>It is necessary to produce full transcriptions of the one-to-one and focus group in order to analyse them | **Transcribe data**<br>The interviews were transcribed to analyse the data |
| **Develop categories**<br>Break down the transcript to manageable pieces according to facts, incidence or phenomena and assemble them in categories | **Develop categories**<br>The transcript was broken down to key phrases and facts |
| **Naming categories**<br>Assign a name for categories in higher order with enough breath to include all incidence or phenomena under them | **Categorising facts**<br>Similar key phrase were given specific colours and the similar colours are assembled to categories |
| **Saturate categories**<br>Incidences are gathered as one proceeds through the transcripts until no new examples of the particular category emerge | **Matrix Diagram**<br>The data is presented in a matrix diagram where the information is easy to visualise and comprehend under each assigned category |

| | |
|---|---|
| **Main categories**<br><br>These categories then serve as the basis for further data analysis and interpretation | **Categorising matrix axis**<br><br>Assign names for each axis in the matrix according to the categories emerged from the data |
| **Summarise the category**<br><br>Summarise the category, supplemented by matrices, network maps, flow charts and diagrams | **Data positioning**<br><br>Position the data according to their relationship with the assigned categories |
| **Establishing core categories**<br><br>A core category is identified and related to all the other subsidiary categories by the means of the coding paradigm | **Establishing core categories**<br><br>Different attributes that relate with the physical properties of the recycled hand knitting yarn were identified under the core categories |
| **Filling in gaps**<br><br>Finally, any missing detail is filled in by the further collection of relevant data | **Filling in gaps**<br><br>The missing details under the core categories were filled by further objective and subjective data collection methods |

## 2.7 Quantitative data analysis

The aim of quantitative research is to understand and explain the difference in the dependent variable under investigation (Davis and Hughes, 2014). According to Walliman (2011) the concept or variable which is the cause is referred to as an independent variable and the variable that is affected is referred to as a dependent variable. Mostly quantitative experiments are planned in such a way to observe the effects of change in independent variables. Most of the quantitative data is analysed on statistical grounds and the data are displayed graphically (Davis and Hughes, 2014; Robson, 2011). Here the quantitative data collection methods are dependent on the

design of the study. The procedure adapted to analyse the data for this project are discussed in the following sections.

## 2.8 Mixed methods

Mixed methods as a research paradigm emerged during the 1990s. The defining characteristics of mixed methods cited by Denscombe (2008) are:

- Use of qualitative and quantitative methods in the same research project
- A research design that clearly specifies the priority and sequencing given to qualitative and quantitative methods of data collection and analysis
- An account of the manner in which qualitative and quantitative aspects of the research relate to each other, and;
- Pragmatism as the philosophical underpinning for the research.

### 2.8.1 Benefits of a mixed method

According to Bryman (2006) some of the benefits of a mixed method that encouraged the researcher to apply it in this study are:

- Collaboration of qualitative and quantitative data would enhance the validity of the research findings
- Combining the two approaches produces a more complete and comprehensive picture of the topic of research
- Combining two approaches can help to neutralise the limitations of each approach
- In a real world situation combining both approaches helps to deal with the complex phenomena and a range of perspectives required to understand them
- Qualitative data can illustrate quantitative findings which will help to strengthen the phenomena under research
- A qualitative study may be undertaken to refine the research objectives used in the quantitative phase of a study

- A qualitative phase of study may generate items like questionnaires or tests to be used in the quantitative phase of a study.

In order to validate the primary research data, the researcher followed a combination of qualitative and quantitative methods. When the research methods are characterised by collection and analysis of qualitative data followed by collection and analysis of quantitative data, this is categorised under sequential exploratory design. Here the quantitative data helped to explain and interpret the findings of qualitative study. The two methods are finally integrated at the data interpretation phase of the study (Robson, 2011).

### 2.8.2 Complexities of multi-strategy design

Bryman (2004) discusses the following drawbacks for applying mixed methods in research projects:

- Skills of many researchers are either based in qualitative or quantitative research. Commonly this takes the form of qualitative researchers expressing unease about the involvement in more advanced forms of quantitative data analysis
- Qualitative and quantitative forms sometimes have different time implications as often quantitative research can be completed more quickly than a qualitative component
- Multi-research strategies are not beneficial when the rationale for combining qualitative and quantitative research is not fully demonstrated. In such cases it is difficult to judge the benefit of employing both approaches
- Research studies indicate that only a small proportion of studies fully integrate the qualitative and quantitative components when the research is written up.

This project demands both qualitative and quantitative methods for data collection and equal priority is given to both of them as they played an important role in addressing the research problem. The levels of interaction between the qualitative and quantitative methods are kept independent or interactive. An independent level of interaction occurs between the two types

of research, when the study is independent and combines it while drawing conclusions at the end. A level of interaction occurs when there is a direct interaction between the two strands of study and this can occur at different points of the research in different ways (Greene, 2007). In order to attain the objectives of the project with regard to yarn quality, a triangulation design model is developed to compare quantitative and quantitative data at the phase 2 of the study in order to interact, explain and interpret the findings.

## 2.9 Ethical considerations for PAR

The ethical dimension of PAR is of high importance if participants and research practitioners are working together for change. The practitioner has to review a number of ethical issues with the participants like informed consent, documentation of data, ownership of data, confidentiality, privacy, trustworthiness and responsibility. The researcher should pay attention to reduce barriers with the participants by ensuring the language used in the project is understood by them. The ethical considerations of the project could be negotiated and modified to serve the participants in order to protect their confidentiality, privacy and identity. The practitioners have to take every precaution to protect the confidentiality, privacy and identity of the participants. Furthermore, the researcher should not disseminate any research data without the explicit consent of those involved (McIntyre, 2008; Whyte *et.al.,* 1989 and McKenzie *et al.*, 1997).

While conducting the primary research for the study, the author followed the confidentiality and privacy procedures to protect the anonymity of the participants. The researcher followed the procedure of filling consent forms before collecting data and defined the purpose of the research and the right of the participant to withdraw from the research before, during or after the enquiry.

## 2.10 Summary

A participatory action methodology based on a cyclical process of analysing, testing and refining the data collected through a combination of qualitative

and quantitative methods was followed for this project. The qualitative data collected through focus groups and interviews was analysed using a coding or categorising system and then summarised in a matrix diagram. The key phrases from the qualitative data collected from focus groups have helped the researcher to develop and interpret the quantitative methods and the outcome was later evaluated and tested with the experts.

# Chapter 3
# Community development and the empowerment of women through cooperatives

In this chapter the literature draws attention towards empowering women in the rural areas of developing countries by creating employment opportunities through small scale worker cooperatives. It examines: why the role of women remains limited within the community development processes and the issues related with women's empowerment in the context of Vellanchery village in South India.

The chapter also reviews different policies administered by the international agencies like the United Nations, the World Bank and the Indian government for the empowerment of rural women in India. Also, it analyses the gaps between income generating policies of the government and the international agencies targeting women and their implementation without proper beneficiary involvement in developing countries. It is found that the success and failure of these policies depend largely on how they are designed to meet the needs of the women in rural India. There a number of factors required to facilitate these policies to increase the price of women's labour through income generation schemes. These factors include: training, credit and technical assistance (upgrading the quality of women's labour), increasing demand for women's labour through labour intensive production methods, and domestic and export oriented manufacturing (Buvinic, 1989). The literature is sourced from online websites of the United Nations, World Bank, International Cooperative Alliance, National Mission for Empowerment of Women, books, journals and other articles.

## 3.1 Economic growth

According to Brohman (1996) the growth of a country is treated mainly as a function of investment linked with an increase in capital-output ratio and desired growth rates. Economic growth is arguably related to other

development objectives such as: employment creation, reduction in poverty and inequality among the people, and the provision of basic needs. The process of economic growth is thought to follow different series of stages, which should spread the benefits to all of the people. The objectives of economic growth should help in alleviating poverty and inequality among the people (Brohman, 1996). Much of a developing country's growth is accompanied by increased inequality in income distribution and growing labour unemployment (Griffin, 1989). As a result, economic growth has failed to filter down to rural areas. This fact leads many economic analysts to conclude that the nature, rather than the pace, of growth is crucial for development (Ul Haq, 1976). Accordingly a new development approach should be oriented towards the satisfaction of basic human needs and desires at local community levels. In a developing country like India, surplus labour that cannot be absorbed by the organised sector, due to the lack of proper education and training, has led to mass unemployment. In order to solve the problem of rural unemployment, a network of small-scale industries in villages does bring a regional sufficiency of food, clothing and shelter (Ul Haq, 1976). Pandey (1991) discusses in his book, the Gandhian thought of social justice that emphasises production by the masses and not mass production. Gandhi insisted that production methods like hand grinding, spinning and husking provides employment to millions of villagers who live in idleness. According to Gandhi, voluntary limitation of wants and simplicity corresponds to truth; multiplicity of wants, had in short, polluted the eco system and has increased the tension of mutual relationships of humans which lead to the growth of numerous physical and mental illnesses and physical distortions (Pandey, 1991,p.232).

During the early 1970s, many bilateral and international agencies advanced development programmes that considered: distributional equality and poverty alleviation, provision of basic needs and adaptation of appropriate technologies. Emphasis is given to the projects which basically targeted the poor, especially in the rural areas of developing countries (Brohman, 1996). Intermediate technologies are appropriate for development programmes as these are more productive than traditional means of production and are:

immensely cheaper, simple to use and understandable compared to modern sophisticated machines used in the industries (Schumacher, 1973). The aim of economic development with these targeted projects is to provide employment focused towards fairer distribution of income and resources. This, in turn, encourages local participation and the promotion of small-scale projects employing socially and environmentally appropriate technology which targets the needs of a rural community. Targeting the poor and adapting programmes to suit local conditions and the needs of a rural community can potentially offer positive change to these poorer rural populations (Stohr and Taylor, 1981).

The employment programme proposed in this project is a production method of hand-knitting yarns using remnants of sari silk yarns collected from the handlooms. The raw materials for producing the hand knitting yarns are the leftover sari silk yarns and lamb's wool. The silk remnant, an essential component of the product, was sourced from Arignar Anna Silk Handloom cooperative in Vellanchery village, Kancheepuram Thaluk.

The main occupation of the male population in the village is handloom weaving and the handlooms are installed in their houses by the cooperative depending on the number of male members who can weave. The ladies and the children in the house help them in silk reeling, setting up the looms and other household work. The work undertaken by the women is unpaid. This project focuses on involving women of the households in the production of the recycled hand knitting yarn. The women in the village are familiar with the characteristics of the silk yarn collected from the loom that gives unique colour and texture to the recycled yarn. The aspect of developing a product with market value makes the programme interesting and engaging for the women to be involved. The recycled hand-knitting yarn is produced using appropriate technology which is simple and easy to understand. Women in the village are trained in silk reeling using a hand charka (or reeling wheel) which is similar to a hand spinning wheel. However, these women have to be trained voluntarily to use the carding machine and hand spinning wheel. The project targets the poor surplus labour available in the village (women)

that cannot be absorbed by the organised weaving sector because of the cultural and social reasons. Providing employment opportunities for the women in the village would help in building their confidence and improving their standard of living.

## 3.2 Participatory development and women's empowerment

Alternative development is concerned with alternative practices of development like participatory and people centred development and redefining the different goals according to the needs of the community (Pieterse, 2002). In order to achieve development, rural people can group together through sustainable organisations that provide them with continuous employment and income. Micro and small enterprises are recognised as a major source of employment for many developing countries. In most countries the majority of these small industries are owned and operated by women. The small enterprises tend to be concentrated relatively in a narrow range of activities like craft products, food processing etc. (Mead and Liedholm, 1998).

Women's empowerment can be a controversial subject for the developing countries because of the lack of interpretation of the concept, and what it might achieve to improve the living conditions of the women. Empowerment is an increase in power (Ibrahim and Alkire, 2007) and women's empowerment is measured through: the contribution to the household income, access to resources, ownership of assets, participation in household decision making, perception of gender awareness, education, freedom of movement, elimination of domination and violence, political and legal awareness, equality in marriage, freedom to choose motherhood or not, demand for contraception, right to safe abortion... (Parveen and Leonhauser, 2004; Ibrahim and Alkire, 2007; Beteta, 2006; Sen, 1999). From the above it could be concluded that women empowerment is women gaining control of their life. It is noted that the contribution of income to the household has an indirect influence on other factors like personal, economic, familial and political empowerment. The socio-cultural expectations of the women in

Indian villages are far more limited compared to the west. Some personal and social capabilities developed as a result of providing employment to rural women are: economic empowerment, improved standard of living, self-confidence, sense of achievement, increased social interaction, increased participation in political activities, improvement in leadership qualities, improvement in solving problems and decision making in the family and community (Satiabhama, 2010).

In 2006, the World Bank came up with the slogan 'Gender equality is smart economics'. Investment in women's empowerment aims to increase a country's Gross Domestic Product (GDP) by ignoring the fundamental gender inequalities. These inequalities are associated with the unpaid work of household maintenance and subsistence of society on which the market economy depends (World Bank, 2009). In order to achieve gender equality, there should be full and equal participation of women in development programmes. This can lead to their interest in both social justice and development with broader aims (Burkey, 1993). In a wider perspective, the aim of participatory development is to increase the involvement of socially, economically and politically marginalised people in the decision making of their own life (Pandey and Okazaki, 2004).

Many women especially in developing countries are not always able to use their full potential to the same extent as men. Empowering women means strengthening their opportunities to develop themselves and to participate in the developmental activities. It is closely linked to: mutual respect, equality of opportunities, equality in day-to-day life and overcoming of the prejudices and firmly established discrimination mechanisms within society (Federal Ministry of Economic Cooperation and Development, 2007).

As argued by Dixon (1978) the lack of money in poor households is an important factor regarding rural development. In addition, the lack of control over money contributes to the low status of women and increases their motivation for frequent child bearing. In a developing country more children in the family means extra helping hands for the family in: farming, weaving or any other small scale work. Promoting women's empowerment has yielded

important benefits to women, which is reflected in four key areas: increased life expectancy; increased girls' enrolment in primary school; decline in birth rate and women's increased access to contraception (Mehra, 1997).

It is observed that the income earning capacity of women has always resulted in investment for schooling of their children, food and medical care. According to Mehra (1997), some studies about women empowerment show that women's earnings contribute more to family welfare than men's earnings – because their income goes towards food and children's education. Thus, the principal target group for many participatory development programmes is the women. The income earning activities of women can improve their position in household and wider society (Mayoux, 2008).

### 3.2.1 Women empowerment leading to male possessiveness

The immediate needs of women (such as income earning, ability to protect their own health and that of their children) could rarely be achieved without addressing aspects of gender subordination such as: unequal division of labour, restrictions on female mobility, domestic violence and women's lack of autonomy. These inequalities may affect the way in which their needs are addressed and the long term sustainability of any intervention (Mayoux, 2008). In developing countries men have often opposed women's involvement in any type of activity which is against their interest either at household or community level (Carney, 1992). Whereas men are able to call on the support of women and children in their family to help in their activities which is unpaid labour. Women's participation in this way can lead to significant increase in their workload which includes household work and decrease their time available for leisure and other activities.

In the above context, the question arises does women's empowerment lead to male jealousy? Visaria (2008) in her article mentions six specific situations for violence against women in rural and urban India:

- Whether the husband becomes jealous or angry if their wife talks to other men

- Whether their husband accuses them of being unfaithful
- Whether the husband may not permit them to meet their female friends
- Whether the husband limits the wife's contact with their natal family
- Whether the husband insists on knowing where they were all the time
- Whether their husband did not trust them with money.

Visaria's study is mainly based in Tamil Nadu state in India. The National Family Health Survey (NFHS) points out that 40% of women in Tamil Nadu experience lifetime physical and sexual violence. Her findings show that regardless of socio-economic background a significant amount of women accept the fact that men have the right to discipline them, especially when they fail to fulfil gender specific duties such as: taking care of household work and children and cooking food in a timely way that pleases their husband.

The project idea is based in a village in Tamil Nadu; the researcher has to consider the patriarchal society as a factor while involving women in the production activity of recycled yarn. In this project, the researcher refers to a worker cooperative organisation as an instrument to provide employment for women. One of the principles of cooperatives is open and voluntary membership. Here the author proposes an initial training for both male and female members in the family about the benefits that come along with the extra income through employment for women. Moreover, women getting out of their household work and engaging in a simple production system which is also therapeutic would help them to improve their mental health and wellbeing (MacIntosh, 2011). Involvement in hand spinning and hand knitting activities has many therapeutic advantages which are scientifically proven (UK Hand Knitting Association). Voluntary association of a male member in each family through voting right in the selection of the director board members and important decision making of the cooperative can inspire an indirect participation of spouse or close kin.

### 3.2.2 Role of participants in the project development

Projects from international donor agencies suggest that actual involvement of women in the initial stages of the projects and project plans are greater than before (Himmelstrand and Bickham, 1985). However, this was written in 1985 and lack of participation by beneficiaries in setting up projects is prevalent in India.

It is argued that the participation of women at the grassroots level of the project would increase their commitment and interest towards the work. The researcher's attempt was to involve the targeted women right from the beginning stage of the project. The author did a field study in the village in 2012 February, where the women were approached in order to collect feedback about their opinion of the recycling silk waste yarn to hand knitting yarn. As the main objective of the project was about empowering women in the weaver's community through providing an employment opportunity for the production of the recycled hand knitting yarn, it was important to engage the target client right from the beginning stage. Hand knitters and hand spinners in UK were interviewed to test the market value of the recycled knitting yarn in order to investigate the credibility of the project. Here the researcher was building an alliance between research and practice in the planning of the research process. The researcher's attempt was to shape a collective action that would lead to a useful solution which was discussed in the research methodology chapter.

In the field visit to Vellanchery village the researcher noticed that women were responsible for providing most of the family's needs and a large amount of their time was spend on unpaid work in the process of: weaving saris, household work like cleaning, childcare and cooking. The researcher enquired about their willingness to be a part of the project to produce the recycled yarns that could provide them with employment and income. Women were interested in the project idea, but in an Indian patriarchal society it is the elderly and the men in the family who finally decide whether the women should go out of their house to work or not. In such a situation

the family need awareness about the benefits of both men and women working and how that improves their living condition. Also, through employment, women could be liberated from many social and cultural constraints and working outside of their home could help them to: interact with people, share ideas with co-workers, be involved in discussions, build leadership qualities and participate in political activities. When women become a part of political activity they have the choice to elect a representative who could help in directing the central government and state government empowerment policies and activities for their benefit. According to Mayoux (2008) the definition of empowerment in the context of women and development, should include the expansion of choices for women and an increase in women's ability to exercise choice.

### 3.2.3 Gaps in the development programmes for women's empowerment

The National Mission for Empowerment of Women (NMEW) was launched by the Government of India in 2010 with an aim to develop the socio-economic position of women. The objective of this mission is to ensure that the benefits of the schemes and programmes of the central government and the state government reach the beneficiaries. The NMEW website directs different schemes and programmes to create employment opportunities for women in: agriculture, animal husbandry and the handloom sector; and include credit facilities and training programmes. The researcher worked in Chennai, South India as a lecturer during the period of 2010-2012 in a design institute that organises voluntary training programmes for rural women in a nearby village who were engaged in embroidery and other handicrafts. The aim of the training conducted by textile designers and academics was to help women through technical assistance and design development. The researcher was one of the facilitators for this programme and neither the organisers nor the participants were aware of NMEW or their schemes. This is an example of the gap between the government policies and actual practice in most developing countries. NMEW is under the ministry of child and women's development, the Government of India. NMEW sums up the economic development programs for women that can

be fairly implemented through the Self Help Groups (SHGs) and the Non-Governmental Organisations (NGOs). In order to achieve the objectives of NMEW, these organisations have to strengthen their delivery system and provide better service to poor women (www. nmew.gov.in).

## 3.3 Role of NGOs in development activities

NGOs are voluntary organisations viewed as a link between the government and the people in the process of planning and development. Mercer (2002) gives three reasons to favour NGOs in strengthening civil society and democratic development.

- NGOs are autonomous bodies who are civic actors that enhance democracy by expanding the number and range of the people's voice in addressing the government and its policies
- NGOs work with SHG organisations comprised of poor and marginalised groups in the wider public arena, campaigning on their behalf and seek to influence public policy. Fisher (1998, p.126) argues that "this type of bottom up democracy has been successful in many instances that it might eventually lead to 'top down' political change"
- State policies are said to be checked by NGOs by challenging the state's autonomy at both the national and local scales. This results in the demand for change and developing an alternative set of perspectives and policies. As an example Clarke (1998) points out that the NGOs in India and Philippines are considered to have filled the institutional vacuum caused by weakness of political parties and trade unions.

Reviewing the above reasoning, it can be concluded that NGOs act as independent bodies encouraging common people to add pressure to reduce the scope of the autonomous government action and excessive authoritarian systems of bureaucrats. According to Sen (1999) in reality, both the government and NGOs represent a diverse and confused relationship which

is marked both by administration and by suspicion and hostility. This is caused mainly by the conflicting ideas in planning and implementation of development programmes between the government bureaucrats and NGOs. In India, NGOs operation is largely in the field of the religious and the social reforms. In 1986 the Council for the Advancement of People's Action and Rural Technology (CAPART) was formed to improve areas of: employment, income generation, creation of community assets and fulfilment of basic needs (e.g. housing and drinking water). As NGOs activities are recognised by the Indian government they became more involved in rural development programmes. Most of the rural development and women empowerment programmes undertaken by the NGOs are guided by government (Latha and Prabhakar, 2011). Devi (2014) prefers NGOs to be involved in the developmental activities of the poor as it is not managed only by the government. Both NGOs and government are distinctive in nature but the common objective is to strengthen participation in the development activities.

In order to achieve this objective, the Government of India has to liberalise the regulation for grants and aids supplied to NGOs and monitor and supervise the use of grants. Educated young professionals and universities had to be encouraged to collaborate with NGOs to provide training and necessary advice for different programmes. For this research, involvement of academics and students in design colleges (like the National Institute of Fashion Technology (NIFT) and the National Institute of Design (NID) which are under the management of the Textile Ministry; the Central Government of India) could provide the necessary assistance and training in terms of design, quality control and marketing techniques for the proposed cooperative employers.

### 3.3.1 International agency support for women's empowerment in India

The World Bank project report on "Rural Women's Development and Empowerment in India" on a credit amount of US $2.5 million, states this project was approved by the board in 1997, but the effectiveness was not declared until 1999 – owing to the lack of the Cabinet clearance from the

Government of India. The overall objective of this project was “to strengthen the process that promotes the economic development of women and to create an environment for social change” (The Rural Women Development and Empowerment WB implementation completion report p. 2, 2006). The programme was aimed to expand the production activities through the Self Help Group (is a group of ten to twenty members of women who voluntarily work together for socio-economic upliftment, Paramanandam and Packirisamy, 2013) programmes started through the National Bank for Agriculture and Rural Development (NABARD). According to NABARD 72% of SHGs are formed by the government or NGOs, 20% by credit institutions and 8% by the NGOs who act as both facilitators and financial intermediaries.

The Rural Women Development and Empowerment report (2006) concludes that the project outcome was satisfactory but the major limitations pointed out were: weak management and lack of coordination with lead training agencies, problems in recruiting staff at state level, frequent turnover of staff and delay in filling key posts throughout the project duration. Also, the slow bureaucratic procedures and financial management performance were other drawbacks of the project. From this discussion the major cause of gaps for the implementation of the developmental programs can be described as weaknesses of the administration at both the state and the central government levels involving: poor planning of policies, corruption, inadequate resources in the form of trained personnel, lack of experience and socio cultural factors in a patriarchal society where women are considered subordinate to the man.

### 3.3.2 Corruption hindering development

Since the 1960s, government servants have acted as mediators and are part of the important interface between governors and the governed. Thus administration involved continuous negotiations between government officials and the citizens, and on the other hand between the government servants, and the lobbying groups which often program these services for their own benefit (Gould *et al.*, 2013). There is always partiality towards

strong supporters of the ruling political parties and they are usually favoured by both the state and the central government. These supporters sometimes act as lobbying agents between the common citizens and the government.

## 3.4 Role of participants in participatory development

Commitment of the participant provides the baseline for participatory community development. Kanter (1972) describes commitment to the community as the reciprocal relationship of what is given to the group and what is received from it – in which both are seen by the person as expressing his/her, true nature and as supporting them self. Thus individuals are willing to undertake a cooperative activity, so far as the participants perceive that it has provided what they need materially or/and spiritually (Levi and Litwin, 1986).The basic needs of a human being in a community are physical needs for food, clothing, warmth and safety. The social needs are belonging and affection, and the individual needs for knowledge and self-expression. The wants of human beings are shaped by their culture and personality (Kotler and Armstrong, 2004). In the context of India, in order to eradicate poverty, the Gandhian scheme of planning gives importance only to two basic goals: food and shelter (Pandey, 1991). These two goals help to achieve the basic wants and needs of a community. In Buddhist economics the essence of civilisation is not in multiplication of wants, and a community's aim has to be maximum wellbeing of the people with minimum consumption (Schumacher, 1973). Thus a simple way of living with limited wants encourages a modest way of production and consumption. By restricting mass production by large scale industries and encouraging production through small-scale industries using environmentally friendly technology has not only provided employment for the surplus labour in the village but also lead to the Gandhian thought of civilisation where man lives in perfect harmony with his peers and nature.

However, participant characteristics like: homogeneity, size of the participating group, a real or perceived threat of well-being, commitment to the idea of the cooperative participation, willingness of the participant to put

the community goal ahead of the individual preference and finally competence and knowledge about the working of participatory mechanisms are associated with the success of participatory outcomes (Levi and Litwin, 1986). The other secondary benefits of community participation are: ensuring responsible governance, value for individual freedom and fostering greater community belongingness (Levi and Litwin, 1986). It seems that the alternative of involving the community is by combining the sustainable activities with cultural integrity (Hoff, 2000). Thus development can be achieved through retaining the community's cultural identity as a part of the goods they produce to generate income.

### 3.4.1 Participatory development process and community development

Participatory development has functioned efficiently when community coordinate policies and decisions at local level – and government programmes are implemented through locally coordinated efforts. If governmental programmes and policies are not coordinated at the initial level, local coordinating action do not make participation a meaningful undertaking. If priority is set with regard to resource allocation, service delivery and policy implementation at the community level, it improves the prospects of linkage between community members and sponsors of the development, who are international agencies and the government. Optimal linkage does happen when the sponsoring authorities allocate participants of community development a sufficient degree of decision-making power. Minimal power in the hands of the community does make the linkage with authorities difficult and may result in pseudo-participation. Maximum linkage could be achieved through appropriate sharing of power between the participants of development efforts and authorities who regulate and sponsor such programmes. This linkage is a complex undertaking and depends upon careful analysis and planning of the programme (Levi and Litwin, 1986). Most of the developmental programmes are effective only when the government organisations, NGOs and SHGs work in close collaboration with each other. In the case of providing employment opportunities for women, it is necessary that there should be equal participation of beneficiary right from

the planning process. This has influence in developing the project according to the needs of the community and has ensured their full and active contribution for the implementation of the programme. At the initial stage of this project, the researcher investigated whether the project idea was interesting for women in the weaving community. The positive responses and their willingness to be involved in the production process of the recycled yarn encouraged the researcher to further investigate the means of setting up a production method and framework for a sustainable worker cooperative that can provide employment and income.

### 3.4.2 Participatory development and cooperatives

In the early 1990's participatory development moved towards improving the distribution of benefits for development effectively to low income groups and reemphasise development as a process concerning people. It has been long argued that rural populations in particular could not participate in the development activities, since they lack an organisational basis for participation. In terms of development, such organisations are introduced to the rural areas (e.g. the cooperatives or farmers association) or else they emerged and structured themselves because of grassroots participation (Oakley, 1995). The development process is essentially a learning process, one person cannot develop another. He cannot learn from another but can help another learn for himself. Therefore, a government cannot develop a country; it can only help the country develop itself (Ackoff, 1984). The community members or the participants have to focus on issues of mobilisation, organising and participation in activities designed to enhance people's participation in decision making and programmes to improve their material wellbeing.

The most common form of rural producer organisation are the cooperatives which play a significant role in rural development (Battilani and Schroter, 2012). Cooperatives are enterprises, which are suitable for sustaining economic growth in emerging economies. The United Nations declared the year 2012 as the "International year of cooperatives" intending to raise the public awareness about the valuable contribution made by the cooperative

enterprise towards reducing poverty, social integration and employment generation (UN, 2012).

## 3.5 Community development

Sanders (1966) defines community development as a transition of a low situation to a higher level of local participation in: decision-making, involvement in development activities and utilisation of local resources. This transition has led to self-organisation, which can help to form institutions through: self-help, self-management and self-reliance obtained within the community. When a group of people with common interest come together to undertake the joint risk, responsibility and management of an enterprise with economic character to provide one or more services. The group has to function under a system of equality in decision-making along with other associated members. This includes rotation in the managerial responsibility and sharing of benefits from the surplus generated according to their participation in the activity. This kind of organisation provides a classic model of a cooperative and is based on two fundamental elements.

- Activator and activated who belong to the same target population and
- Identification of member and user, whereby the member has to be the entrepreneur and beneficiary of the services and production factions supplied by the cooperative (Sanders, 1966).

If the cooperative organisation is to be self-sustained and viable there should be a balance between the social and economic components (fig 3.1). The community has helped the cooperative with legal, technical and economic assistance and participating in the problem solving procedure. The cooperative on the other hand serves the general interest of the community by: hiring local people, creating local income, generating jobs, preserving the community's ecology; contributing to education and participation, expanding its activities to serve community interest and financial contribution to collective needs (Levi and Litwin, 1986). Community development is a process of empowering the people in a community. These help people to recognise their potential and organise themselves in groups to achieve their

needs and improve their quality of life. When the public agencies, the NGOs and the communities work together, it helps to improve the quality of living of the community.

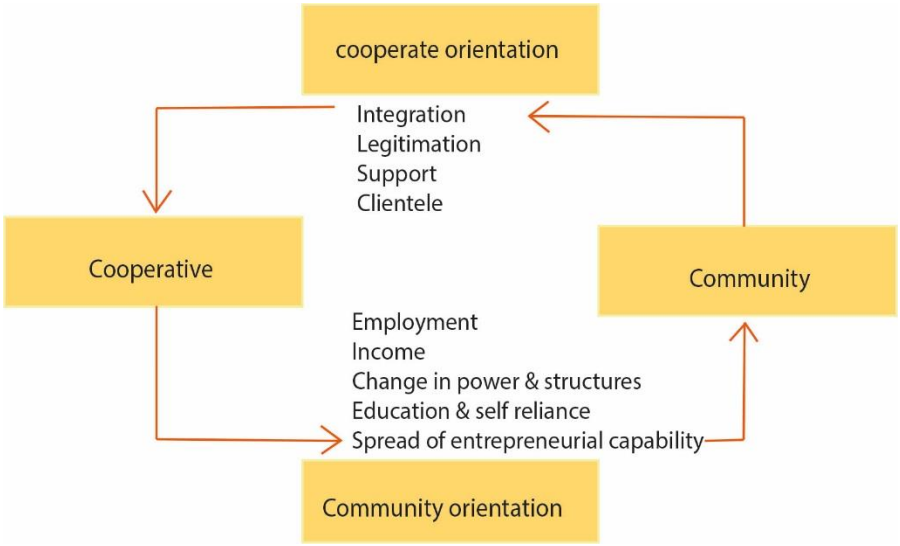



**Fig 3.1 Mutual contributions in the dynamics of community cooperative interaction (Levi and Litwin, 1986, p.6)**

### 3.5.1 Women's role in community development

According to UN, 2012, "empowering rural women is crucial for ending hunger and poverty. By denying women rights and opportunities, we deny their children and societies a better future". Opportunities for women to work outside the home and earn an independent income can make a positive impact on enhancing the social standing of the women in both the society and household. The income contribution by women to the family plays an important role in the division of benefits between men and women. The lives affected are mainly children, as evidence shows that the women's empowerment within the family has led to a significant reduction in child mortality. Also, education and employment for women can influence the nature of public discussion related to social subjects like child care, birth rates and environmental priorities (Sen, 1999). However, it is clear that the role of women in the community development is a key element in reducing gender inequality, fair distribution of income, and thus economic growth of a country.

### 3.5.2 Measures to improve community development

Voluntary organisations for the development of natural and human resources seek to uplift the rural poor through the self-managed groups in the rural areas. Voluntary organisations involved in rural development programs for local communities seek to organise a community in a cooperative. These organisations campaign to sell cooperative shares to households and they hold general meetings of shareholders to form a managing committee. This is later followed by the framing of a constitution, registration of a cooperative community and submission to the development authority for development grants (Levi and Litwin, 1986). NGOs are organisations that are officially established and run by employed staff who are professionals and experts. They are well supported by domestic or international funding agencies and are relatively large and well organised. Grass Root Agencies (GRO)/ SHGs are smaller, member based and operating without paid staff and they are often reliant upon the donor agencies or NGO support. Combining vocational education with the cooperative organisation has encouraged and promoted self-managing initiatives (Mercer, 2002). In developing countries lack of skills has prevented the growth of initiative and enterprise, and tends to impede the self-managing initiatives. This situation can be countered by combining self-management with vocational education. Such a combination would promote the development of skills necessary for the formation of a cooperative enterprise. In this project the skills to be developed are understanding of the principles and values of cooperatives, the production and marketing techniques through training from the voluntary organisations.

## 3.6 Social enterprise

“Social enterprise is defined as a business that conducts trade in the market in order to fulfil its social aims” (Martin and Thompson 2010, p.6). The purpose of a social enterprise is to reinvest its surplus for the benefit of the community it serves. There are different categories of social enterprise: community enterprise, cooperatives, development trust, charities, social business, mutuals, fair trade organisations and social firms (Martin and Thompson 2010; Ridley-Duff and Bull 2011). Pearce (2003) argues that

social enterprise is depicted as a subsector lying between charity and voluntary organisations and the private sector. Cooperatives in particular are described to border between the two.

### 3.6.1 Types of social organisation

Prabhu (1999) categorises social organisations in three types:

- Charitable organisations which are individual oriented and based around a moral code. Their approach arises from religious and philanthropic beliefs
- Social action organisations are campaigning organisations who take up issues related with politics and social injustice and attempt to improve society
- Developmental organisations initiate economic activities in the society by introducing technological and organisational innovation for the benefit of deprived or vulnerable communities e.g. cooperatives and mutual societies.

This project has selected cooperatives as an organisation for the production of the recycled yarn because of its principle and values that makes it user owned and user controlled business which is discussed in 3.7.1.

## 3.7 Cooperatives

Cooperative enterprises have had a significant role in economic and community development. The earliest cooperative associations were created in Europe and Northern America during the 17$^{th}$ and 18$^{th}$ centuries. The Rochdale society of 19$^{th}$ century England launched the concept of the modern cooperative movement. The organisers of the Rochdale society set the guiding principles that helped to foster modern day cooperative business development. Presently cooperatives are found in almost all countries around the world (Battilani and Schroter, 2012).

According to Ivan Emelianoff, cooperative scholar, the diversity of cooperatives is kaleidoscopic and their variability is infinite (Emelianoff, 1948). As the topic is very diverse, there is no universally accepted definition

for the cooperatives. The definition, according to the International Cooperative Alliance (International Cooperation Alliance (ICA), 2012) is: “cooperation is an autonomous association of people united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise”. Another definition by the United States Department of Agriculture, Rural Business and Cooperative Development Service (USDA, 1995) is that: “cooperatives are businesses owned and controlled by the people who use them. The cooperatives are different from other businesses because they are owned and operated for the benefit of the members rather than earning profits for the investors”.

Common to the above definitions, it could be argued that the cooperatives are user-owned and user-controlled businesses. The financial benefits from cooperatives are distributed proportionally to members. The essential element of the cooperatives is that, the membership is voluntary and members are not forced to join. If members are compelled to act against their wishes then they are not cooperating. People join the cooperative voluntarily and can quit any time (Zeuli and Cropp, 2004).

The message of ICA 90$^{th}$ International Cooperative day states that the cooperatives play a key part in the 21$^{st}$ century economy. Cooperatives have the greatest number of participatory governances. Because of the member engagement in the running of the firms, this reflects the values of the community (ICA, 2012).

### 3.7.1 Principles and values of cooperative

Cooperatives are based on the values of self-help, self-responsibility, democracy, equality, equity, and solidarity. According to the tradition of cooperatives the cooperative members believe in the ethical values of honesty, openness, social responsibility, and caring for others (Battilani and Schroter, 2012).

The seven cooperative principles set by ICA are guidelines by which cooperatives put their values into practice. They are voluntary and open membership, democratic member control, member economic participation,

autonomy and independence, education training and information, cooperation among cooperatives and concern for community (ICA 2012).

**Consideration of the principles of cooperatives**: The rules of the cooperative are bound by the social, economic and political environment of the time it is formed. As the environment changes, the application of the rules may produce unanticipated consequences and could decrease cooperation (ICA, 2012). However, the vagueness of the principles can optimize the essence of cooperation to fit their community and environments. In the case study section 3.6.5, Manos cooperative run by the women in rural Uruguay receives voluntary assistance from the community which has helped in the overall growth of the cooperative. Involvement of non-members can contribute to the benefit to the working process of the cooperative. In this project the framework of the cooperative for employing and empowering women is developed in order to benefit the society without causing harm to the cultural ethnicity or ecology of the community. Thus cooperatives need their members to accept responsibility for the social good in exchange for personal benefits.

#### 3.7.1.1 Open and voluntary membership

- When the membership is household based, women are often ignored. This would lead to general inequality and few women getting elected to the board of directors and other positions in the cooperative. In this case allocating two voting rights to the household members can solve the problem. The couple should be encouraged to attend the meetings together and have equal participation in the affairs of the cooperative
- The non-member employees of the cooperative would face a problem, as they do not have requisite rights in the cooperative. This issue has a major impact on the political and social dynamics of the community
- The surplus obtained from the non-members business earning come from the border community and should be put into undivided reserves to benefit the community in future (Battilani and Schroter, 2012)

The worker cooperative framework proposed in this project is managed and run by women. Considering the patriarchal society in the village, the final decision at home is made by the male members in the family. In order to convince them the project proposes voluntary involvement of men in the final voting process of decision making that can inspire the community as a whole to contribute in the smooth running of the cooperative. This is linked to the mutual contributions in the dynamics of community cooperative interaction explained in fig: 3.1. This project suggests the involvement of the voluntary organisations as the non-members who can provide training in production, administration, distribution and the marketing process.

#### 3.7.1.2 Democratic control

The main problem of this principle is how it is practiced by the cooperatives. The factors that constrain the democracy are:

- The wide meaning of democracy and the lack of understanding of its dynamics
- The growing size of cooperatives and the development of subsidiaries
- The interface between the board of members and the management
- As the working of the cooperative becomes complex, it will increase the need to rely on experts, which could create negative impact on the democratic processes
- People who disagree with the decision made by the members of the cooperative could form new coalitions to change the decision (ICA 2012).

The possible solution recommended by (Levi and Litwin, 1986) is that the members need to be involved in the directional planning aspects of the cooperative. Also the principles have to include the involvement of all stakeholders in the future plans of organisation.

In other words, before registering the cooperative, the terms and conditions should state that the members have to be given training and proper understanding of the principles and values of democratic decision making. The above stated problems are manageable when the workers are given

training in: production techniques, accounting and marketing. All the members should be encouraged to take turns in all forms of work, which can avoid expertise in a particular narrow area (ICA 2012).

#### 3.7.1.3 Capital sharing

For capital-intensive projects, the problem is to generate capital and how to sustain its value during inflation times. In an economically stable time members are content and willing to leave their savings with the cooperative for a limited rate of return. In times of inflation they are not prepared to invest their savings for little return, as they will decrease in value. However, outside funds bring outside influence that is not problematic if the interests are the same. If they are not, however, difficulties can occur.

The possible solution to this is to restate the principles for different types of cooperative with different capital needs. In this case, the cooperative should be flexible enough not to hamper capital formation, so as to enhance the economic vitality of communities and make them more self-reliant (ICA 2012).

#### 3.7.1.4 Cooperative education

Cooperative education enables people to learn about the business world and operate in a democratic system. Cooperative education should enhance the social and economic vitality of the communities and, through practice, it should enhance the political efficiency of the community. The problem with cooperative education is that it can lead to different interpretations. Although this has long-term importance, in the short term it can be frequently postponed due to economic constraints. Education develops people skills helping beneficiaries become analytical critical thinkers. This can potentially increase criticism of the performance of the leaders and managers. The possible solution is to restate the principles to show the fundamental vision of the movement rather than it remains as an abstract statement (ICA 2012).

#### 3.7.1.5 Cooperation between cooperatives

This principle refers to the nature of the cooperatives to cooperate, as in practice a lot of questions may arise. In this case the interest of the

members and the managers can differ. The managers may prefer to be independent rather than interdependent with other cooperatives. While the members have much to gain if the organisations they own and finance work together. The inter-cooperative decision-making needs to be between the autonomous equals rather than on a hierarchical basis. In this case the management often has trouble and may distort relations by applying a hierarchy to the decision making process of the cooperatives. The logic of self-help does not apply when existing cooperatives cooperate to do services for others, rather than with others. The possible solution is to make the members understand that the cooperative is a means to apply the essence of contractual cooperation into an organisation. Secondly, it is not who initiates the cooperative, but what process is used to have members sense ownership of the organisation. In order to achieve this, the core group of members must experience the essence of cooperation and feel a bond to the organisation (ICA, 2012).

### 3.7.2 Types of cooperatives

There are five types of cooperatives:

**Consumer-owned cooperatives:** Consumer cooperatives are owned by people who seek to purchase goods and services of the cooperative. These include: credit cooperatives, health care cooperatives, housing cooperatives and food cooperatives. The most common form of cooperative allows consumers to achieve better prices and quality compared to profit businesses.

**Producer-owned cooperatives:** Producers of farm commodities or crafts band together to form a producer-cooperative, to process or market their products.

**Worker-owned cooperatives:** Employees own and democratically govern worker owned cooperatives. They operate in different industries including childcare, food service, technology, consumer retail services etc. This is the model that would be adopted for the future development of this project.

**Purchasing or shared services cooperatives:** Small and independent

businesses, municipalities and other like organisations band together under this cooperative to enhance their purchasing power.

**Hybrid cooperatives:** Some innovators from multi-stakeholder hybrids form the cooperatives, which seek to balance the conflicting needs –for example between consumers' desire for affordable products and producers need for higher price for their goods (ICA, 2012).

### 3.7.3 Worker cooperative

There is no one definition for worker-owned cooperatives. The most common definition is the idea of a business wholly or substantially owned and controlled by those who work in it and run for mutual benefit. The workers in the cooperative retain majority control of the enterprise; control is exercised democratically on the basis of: one person, one vote. The membership is open as far as possible to all the workers and there are limits on the returns to the capital invested in the enterprise (Conforth *et al.*, 1988). In other words, a worker cooperative or labour managed firm is a firm owned and managed by its employees. The bulk of capital is individually or collectively owned by the employees. All members are eligible to apply for membership and each member has one vote (Battilani and Schroter, 2012). Although as stated earlier, in the context of a male-dominated society in rural India it may be necessary to give two votes to the household to encourage the involvement of the men in the organisational set up alongside the women. A worker cooperative is an efficient cooperative system which provides job security for all members as it is owned and the decisions are taken unanimously.

The characteristic of the cooperative is heavily based on the way in which it is formed and the objectives of their membership. Paton (1978) distinguished five types of worker cooperative:

- Endowed cooperatives are firms given away by their original owners to the employees. The motivation behind it is Christian socialist ideas pertaining to keeping the firm running in the absence of an heir

- Worker buyout cooperatives are firms where the workers are interested in buying out the original owners
- Defensive cooperatives are cooperatives formed by employees in order to preserve jobs against the closure of business
- Alternative cooperatives are formed by members who are usually middleclass, well-educated and share a strong commitment to democratic ideas
- Job creation cooperatives are cooperatives formed in order to create new jobs for the unemployed. These cooperatives face the same problems of a new business venture, e.g. obtaining capital, acquiring experts, training the workers and developing a market for the product. Moreover, the evolvement of a system of democratic control in which members tends to have very little autonomous control. Job creation is the type of worker cooperative proposed for the project.

#### 3.7.3.1 Efficiency of a worker cooperative compared to conventional firm

The performance of a conventional firm is measured by its financial success. However, in a workers cooperative the pay is endogenous and not analytically distinct from profits (Pencavel, 2001). The members of a worker cooperative may choose to increase their income in a given year and cut the pay in subsequent years according to the profit gained. With regard to a conventional firm, the employer has an upper hand in the bargain for the wages. This is because, in the event of bargaining breaking down, the employment relationship is discontinued; here the loss to the employer is relatively small. The cost to an employer for replacing a worker assumes a small fraction of his total cost; whereas the entire livelihood of the worker can be at stake. This greater vulnerability of the worker to termination of the employment relationship has given the employer an advantage in bargaining. This is true in the context of developing countries like India where the labour is cheap and easily available. However, unemployment can happen due to lack of working capital or closure due to bad business conditions. Under such circumstances there are cases where the

unemployed workers group together to form cooperatives and retain their jobs even if the returns are marginal when the economy is stagnant. Mead and Liedholm (1998) conclude their article stating that the first two years are very crucial in the life of new and very small enterprises. A significant amount of them show signs of growth through expansion of the enterprise by the end of second year and this would make it fairly easy to identify the potential for survival.

### 3.7.3.2 Success of a worker cooperative

The collective nature of employees in a worker cooperative encourages team work. Also participation of employees in both decision making and economic returns can arguably increase the organisational efficiency and productivity by providing incentives to make the decisions consistent with the firm's profitability (Battilani and Schroter, 2012). Doucouliagos (1995) argues that co-determination laws are negatively associated with productivity. But in a labour managed firm; profit sharing, worker ownership and worker participation in decision making are positively associated with productivity.

In a worker cooperative the members collectively own the capital. When the members leave the firm they cannot receive a share of the present value of the future profits generated by their investment which their work helped to finance. The solution favoured by economists for this issue is to have a market for the membership rights. Thus, shares are tradable and if the market is reasonably efficient, members could receive a share of their present value that accounts for future returns when they leave the cooperative (Dow, 2003).

As a result of the evidence reviewed by Dow (2003), he proposes that labour managed firms probably survive better than the conventional firms. Worker cooperatives adjust pay of their members rather than employment to changing market conditions. The members decide the allocation of profit, so that they can increase the pay later when market conditions improve and do the reverse when market conditions worsen (Battilani and Schroter, 2012).

### 3.7.3.3 Failures of worker cooperative

Conforth (1983) points out that it is difficult to measure the success and failure of a conventional workers cooperative because of the mixture of commercial and social objectives and an unusual pattern of ownership and control. Potter (1891) points out three major reasons for the failure factor of the workers cooperative. They are: want of capital, lack of custom (commercial expertise) and lack of administrative discipline. Considering the fact this written 1891, the above discussed are some of the main issues identified by the researcher in the first stage of field study at Arignar Anna Silk Handloom Cooperative at Vellanchery village discussed in (3.7.4).

## 3.7.4 Arignar Anna Silk Handloom Cooperative in Vellanchery village

At the initial stage of the study the researcher visited the Arignar Silk cooperative from where the silk remnants were collected for the project. Observation method was used to review the administrational setup and running of the cooperative. A participant observation technique was carried out that involved discussion and informal interviews with: managers, government officials and the weavers' family. The researcher visited the Anna Silk Handloom cooperative office in the village to informally interview the managers; and weaver's houses to collect photographs and discuss the project idea with the ladies in the household. The Joint Director of Handlooms and Textiles, the Government of Tamil Nadu was informally interviewed about the structure of the existing handloom cooperatives and the aid provided by the central and the state government to sustain the handloom sector.

**Table 3.1 Organisational set up of Tamil Nadu state handloom and textiles supported by government**

| Organisational set up | |
|---|---|
| Head of administrative department of Secretariat | Secretary to the government (Chennai) |

| | |
|---|---|
| Director of Handlooms and Textiles | Head of the Department (Chennai) |
| Joint Director Handlooms and Textiles | Head office (Chennai) |
| Joint Director Handlooms and Textiles | District level (special officer for each district) |

### 3.7.4.1 Cooperative management system

The Arignar Anna Silk Handloom cooperatives are controlled by the board of directors appointed by state government. The cooperatives are registered under laws laid down in the Cooperative Society Act by the Government of India, so it can be controlled by the government. Day-to-day functions are regulated by bylaws framed by the founding members of the society. The board of members controls the authority of the society as-per the rules and society act and the state government acts as the administrator of the cooperative.

According to the Joint Director of handlooms and textiles (head office), the board of directors elected by the members takes time to stabilise, mainly because “they know only to weave”. The weavers do not know about the working of the cooperative and how the profits are shared. Also cooperatives are politicised. It is not the actual weaving members of the society who come to power. The political parties want their people on the board of directors and to control the cooperative. So it is not the real members who come in the elected board, but it is the politically influenced people who are not active in the cooperative society who come to power.

### 3.7.4.2 Government support for the cooperative

The central government supports 80% of the funding for handloom cooperatives with 20% funded by state government. Funds are used as working capital, marginal expenditure and to eliminate losses. Delayed spending dues are also settled using these funds. The government owns retail stores around Tamil Nadu state where the handloom saris are retailed. The government provides subsidies and rebates for hand woven saris to

clear the loss that can occur due to a fall in sales. Also the government organises exhibitions around India where the saris are exhibited and sold. The Weaver's Service Centre run by the government provides training and design assistance. The profits of the cooperative are shared with the members as bonuses and dividends. Other welfare schemes include savings and security schemes, Tamil Nadu cooperative offer handloom weaver's family pension schemes, old age pension schemes, health insurance and housing schemes.

#### 3.7.4.3 Employment and empowerment of workers

The private sector is the main competitor for government authorised cooperatives, mainly due to: large price differences in the silk saris, the variety of silk products and the number of retail outlets around India and overseas. The cooperative society use 100% silk and superior quality zari which is 40% silver or 40% gold coated for weaving. The average price for 1kg silk yarn is around two thousand rupees (£20), and the starting price for saris in the government retail outlet is five thousand rupees (£50). The silk remnants for the recycled yarn were collected from the Arignar Handloom Cooperative to ensure the quality of silk yarns. The private sector uses silk combined with polyester and inferior quality zari which brings down the total cost of the sari around one thousand five hundred rupees (£15). The private sector has more intricate designs, colours and promotion to bring attention in the market place.

The cooperative sells the hand woven saris through the Arignar Silk Cooperative stores in Tamil Nadu, Coopetex stores around India and through the government organised exhibitions. The government tries to provide continuous employment for weavers but, the stock of saris accumulates and they have to wait till existing stock is cleared, which leads to short term unemployment. In discussions with the weavers and the cooperative managers it was revealed that most members of the society work for the private sector as they provide continuous employment due to demand for the product. The main drawback is that the private sector fixes wages as they wish and also provide advance money for the weavers which

might not be equivalent to government cooperative payments. Wages fixed by government authorised cooperatives are higher than the private sector but the government sector does not provide the weavers with loans or advanced payments.

#### 3.7.4.4 The unpaid labour (women) participation in the project

Due to the cultural factors, kancheepuram sari weaving is a male dominated sector where women do not engage in weaving. They help the weavers in setting up the handloom and reeling silk. The weaving men in the village are mostly engaged throughout the year weaving for the cooperative for fair wages or working for the private sector during short term unemployment from the government cooperate sector. The researcher proposes to involve the unpaid labour (women) in the handloom sector to be involved in the production process of recycled yarn (fig 3.2).

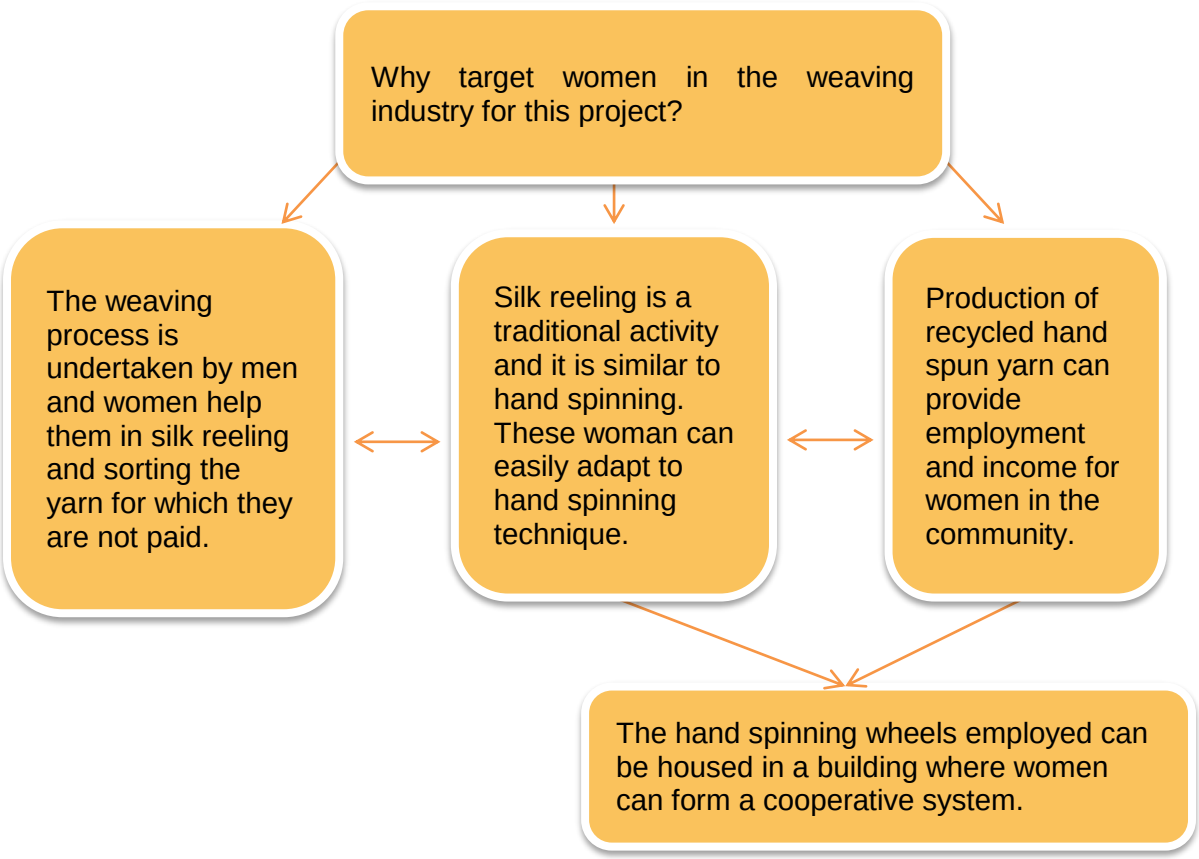



**Fig 3.2 Reasons to target unpaid labour (women) in the weaving industry for the production of the recycled yarn**

During field work the researcher showed samples of the recycled hand knitting yarn and a hand knitted sweater made with the yarn. A simple presentation of the production method of yarn was given to the cooperative officials in their office and the weaver families visited were shown photographs of the production method and yarn samples. After the presentation, one of the director board members pointed out that they are starting a training centre for the weavers and the casual labour or idle labourers targeted in this project could be given training in this centre.

The women in the weaver's family found the hand spinning technique interesting as they are trained in silk reeling. They were fascinated by the project idea and were willing to work for 4 to 5 hours a day, if the production

set up can happen in a space within their community area. The main question arose from the weavers and the officials were about the market for the recycled yarn. Hand knitting yarns do not have demand in India mainly due to warm weather conditions. The women were not reluctant to work with a foreign material 'lamb's wool' but they had questions about the marketability for the product, continuous employment and income.

From the primary research the main objectives to be considered before setting up a worker cooperative for the production of the recycled yarn are summed up as:

- The cooperative members should be given training in the production methods of the recycled yarn, marketing and management skills
- Development of a sustainable quality control system is required for the product
- A substantial market demand for the product to sustain the cooperative.

Worker cooperatives are based on the principles of equal benefits for the members. In order to obtain these benefits the members have to be trained in managing the organisation which should include a meaningful element of individual ownership rather than common ownership. As the market for the product is an important factor to sustain the cooperative the members should be aware of the market conditions and ensure a good quality product.

### 3.7.5 Case studies: organisational analysis of worker cooperative for the empowerment of women

For the purpose of developing a sustainable worker cooperative framework for the project, the following case studies are reviewed. The objective is to analyse how the cooperatives in the case studies survived in the international market scenario:

Case study 1: Lijatt Papad was started in 1959 by seven women with a working capital of Rs 80 borrowed from a social worker, who later became their guide. Eventually Lijatt expanded to cooperative system and in 2011 the organisation has grown employing more than 42,000 women with seventy two branches across seventeen states in India with an annual

turnover of Rs 350 billion (Dutta and Gailey, 2012) . The product produced is pappadam, a snack in India exported worldwide. The organisation follows four principles: collective ownership, cooperation, self-reliance and profit sharing. All the decisions in the organisation are based on consensus that benefits all the members and they have the flexibility to choose their own work. The organisation did not take any donation or charity. It has grown because of the commitment of the members, group decision making and equal profit sharing (Dutta and Gailey, 2012).

Case study 2: Manos Del Uruguay is a non-profit social organisation found in 1968 by a group of five friends with a goal to find income source for the crafts women in their province. The group outlined a project under the cooperative principles and the founders were subsequently the managers of the cooperatives who belonged to high social strata. The families of the founders stood as guarantors for bank loans and social contributions as the initial capital for the cooperative. In 1968, two-hundred and eighty-one craftswomen were brought together in 12 groups in different zones of the country. By the end of one year the number of members grew to seven-hundred and fifty in forty-nine groups. The objective of the organisation is to generate work for rural women allowing them to stay in their town and help them earn their living. Because of the significant connections of the managers, the cooperative is able to receive a good amount of voluntary assistance. This is used to train women in hand spinning of yarn, manufacturing and technical aspects, administration, commercial area and funding for setting up and running of the cooperative – which helped to keep the fixed cost very low. In order to find an export market, the Manos Del Uruguay formed export committees through international companies who had connections abroad. The committee members carried the hand spun yarn and knitted garments when they travelled and exhibited them abroad. Gradually they were able to find export markets in Europe, US and Japan. In 2009 Manos became a member of World Fair Trade Organisation (WFTO) that has a quality trademark guaranteeing the rights of vulnerable workers and producers, transparency and respect, fair international trade which help in sustainable economic development (www.manos.com.uy).

Case study 3: Basha Enterprise Ltd is a social enterprise started in 2011 with fourteen members in Bangladesh that provided employment for women who are survivors of the sex trafficking trade. The women are trained and paid to make unique kantha (patchwork embroidery originally from Bengal) bed spreads, cushion covers, throws, blankets, scarves and jewellery made with metal and fabric. The raw material used is discarded saris. Basha is partner with non-profit organisations Children Uplift Programme (CUP) and Pobitra who are involved in rehabilitating mothers and children in the street. Basha adhere to the global fairtrade principles and they promote ethical trade within Bangladesh and global partners. Basha exports its product to other Asian countries such as: Australia, Europe and US (www.bashaboutique.com).

The above case studies are examples of the worker cooperatives started to provide employment opportunities for women. The cooperatives are initiated with a small group of members which later grew to large scale production. These cooperatives are always supported by voluntary organisations who helped provide credit facilities, training and marketing opportunities. In some cases, members are able to create their initial capital from loans and savings but they always need external support in the form of training in commerce and administration. Along with the local market, the export market is a helping factor for the growth of these cooperatives as it provides better profit for sustaining the cooperative.

The disadvantages noticed in the case studies are: in the present scenario these cooperatives are large scale producers producing wide range of products that are sold in both domestic and export markets. The products are sold at a higher price which definitely helps to increase the profit margin of the cooperative but can also lead to the degeneration of the cooperatives.

The worker cooperative proposed by the researcher is designed not only to provide income opportunity for the women in the village but also for their overall well-being. It recommends a small-scale production unit using appropriate technology (discussed in chapter 4) that produces less quantity of the recycled hand spun knitting yarn with unique colour combinations and

a tactile property. The yarns have uneven twists and neps which are common characteristics that happen while spinning. The focus of the project is to create an atmosphere where women can be involved in a therapeutic method of producing a recycled product which has market value. According to Walker (2000) using human labour and natural materials could create variegated rough finishes which allow the marks of use to be absorbed without spoiling the appearance of the product. Production of such materials using less technology and employing local labour is economically viable and can be an alternative to the mass produced, largely unsustainable products.

### 3.7.6 Key areas to consider to set up a sustainable cooperative system

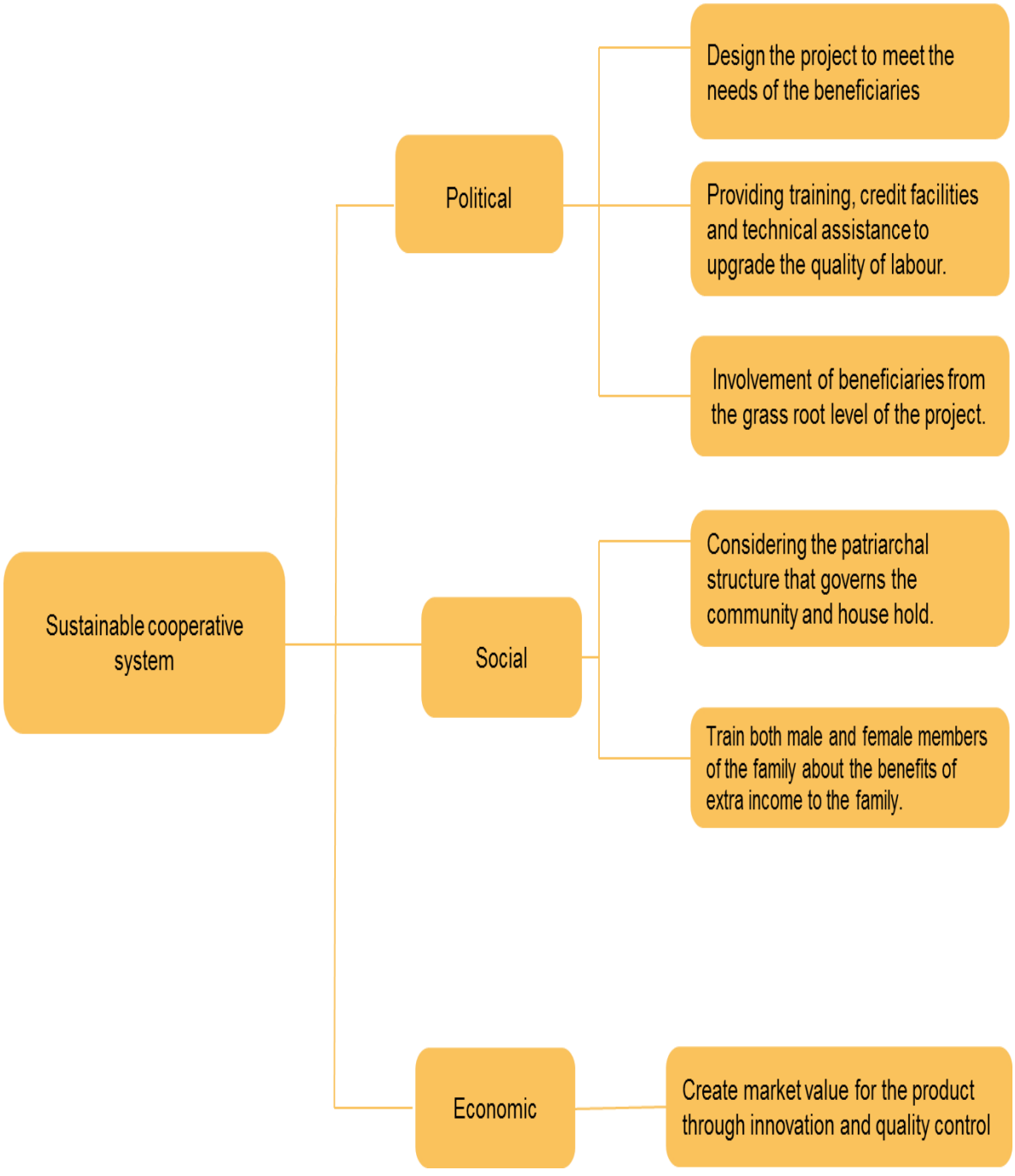



**Fig 3.3 Prominent characteristics to set up a sustainable cooperative system**

**3.7.6.1 Political:** The success or failure of the empowerment policies of government and international agencies depend largely on how they are designed to meet the needs of women in rural areas. This includes: training, credit and technical assistance to upgrade the quality of women's labour, increasing the demand for women's labour through labour intensive production methods, and domestic and export oriented manufacturing. It is highlighted in the literature review that the participation of women at the grassroots level of the project would increase their commitment and interest towards work.

**3.7.6.2 Social:** The immediate needs of women such as income earning, ability to protect their own health and that of their children cannot be achieved without addressing: aspects of gender subordination such as unequal division of labour, restrictions on female mobility, domestic violence and women's lack of freedom. This is mainly due to the patriarchal structure that governs the community and household. In this case, the researcher recommends initial training for both men and women in the family about the benefits that come along with the extra income through employment for the women.

**3.7.6.3 Economic:** to attain market value for the recycled yarn produced in a worker cooperative system it is necessary to introduce quality control and innovation of the product. The literature draws special attention that such considerations and changes require help and guidance from the voluntary organisations and government.

## 3.7.7 Degeneration of cooperatives

Meister (1984) suggests that democratic association has four distinct phases:

- The first phase is characterised by high idealism and commitment, which enables the organisation to get off the ground
- The second phase is a period of transition; if the enterprise survives, economic consolidation takes place and conventional principles of organisation are increasingly adopted

- In the third phase, the cooperatives lose their radical ideas, and market values are accepted. Here the democracy of an organisation becomes restricted to the representative board. This, in turn, leads to a gap between workers and management as the business is developed and the production is rationalised
- In the final stage, cooperative members and the representatives lose all effective power. As it is assumed that the managers take control because of their superior expertise and ability to control information.

Meister (1984) called this 'organisational degeneration'. Degeneration is an internal characteristic of worker cooperation. The members can overcome these problems by a strong ideological commitment and following the principles of cooperatives.

## 3.8 Corporate Social Responsibility for small-scale industries

There is no single accepted definition for Cooperate Social Responsibility (CSR). The problem is that there is an abundance of definitions often biased towards specific interests which prevent the development and implementation of the concept (Marrewijk, 2003). Howard Bowen is thought to be the father of the CSR movement. In his article (Bowen, 1953, p.6) defines social responsibility of business at that time as: "the obligations of the businessmen to pursue those policies, to make those decisions or follow those lines of action which are desirable in terms of the objectives and values of society". Similarly Carroll (1979) addressed the responsibilities of companies to the society and outlines four types of social responsibilities of business: the economic, legal, ethical and philanthropic. The European Commission (2010) defines Corporate Social Responsibility (CSR) as ''a concept whereby companies integrate the social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis.'' In general, Corporate Sustainability and Corporate Social Responsibility refer to business activity demonstrating the inclusion of the social and environmental concerns in their business

operations and in interaction with stakeholders (Marrewijk, 2003). The above definition raises the question whether CSR is different for large, medium and small scale business.

In many cases in small and medium enterprise (SME) managers are responsible for many business tasks and their awareness of the issues beyond day-to-day running of business can be low (Spence, 1999; Tilley, 2000). However, SMEs are very adaptive to changing market opportunities; the flexible character of SMEs are able to take advantage of new niche markets for products and services that incorporate the social and environmental benefit in their value (Jenkins, 2006). SME's play an important part in investing social capital which helps to overcome common problems in society, but they tend not to reflect on their social practice as they are frequently motivated by personal moral convictions not business matters (Habisch *et al.*, 2004). The CSR agenda for SMEs can provide scope for competitive advantage more than being a business threat and cost burden (Tilley, 2003). However, the motivation behind SMEs to engage in CSR has to be different from the large companies. SMEs are likely to hold their attention to issues such as employee motivation, retention and community involvement. Another way of describing this is that small firms desire to protect a personal ethic which simply helps them to survive (Jenkins, 2006).

According to Graafland *et al.***,** (2003) the most popular instrument used by SMEs for organising CSR is to let one member of the management team or board is answerable to the ethical questions and they are less inclined to use formal instruments of CSR such as codes of conduct to foster the ethical behaviour within the organisation.

According to Grayson and Hodges (2004), the same basic principles of CSR apply for all types of business. They describe individual Corporate Social Opportunity "as commercially viable activities which also advance environmental and social sustainability. These tend to be based on one or more of the following: innovation in developing new or improved products and services; serving the underserved or creating new markets; or

organising new business differently in a new business model: for example, in how it conceives and develops the new products and services or how they are financed marketed and distributed" (Grayson and Hodges, 2004, p.11). To be sustainable in the long term, companies need to link business opportunity to sustainable development. In order to achieve this, companies need to move beyond Corporate Social Responsibility to embrace Corporate Social Opportunity (Grayson and Hodges, 2004). In order to run a sustainable worker cooperative it is necessary to follow the social responsibilities of the business. It enables to maintain a fair worker-customer relationship, where the customer is well informed about the social and environmental aspects related to the product.

## 3.9 Summary

This chapter reviewed key concepts related to participation of people in the community development process. Although most of the literature are based on community development, it lacks discussion on the involvement of women in the development process. The involvement of international agencies in women empowerment mainly through credit facilities and training is growing noticeably. In order to achieve economic growth it is necessary to adopt a development strategy that places high priority on labour intensive methods of production and a pattern of international trade that reflects the relative availability of the resources and skills. Most of the writers like Sen (1999), Schumacher (1973) and McRobbie (1981) have mentioned the involvement of excess labour available in developing countries for small-scale production using labour intensive techniques or unseeing appropriate technology discussed in chapter 4. When production is combined with creativity it preserves and promotes human identity and dignity which is presently subdued to the point of elimination by the use of large-scale technology. People participation in the productive work have given them greater dignity and helps them to sustain a framework of freedom that can bring a blending of production with ethical values which can lay a foundation for a peaceful and spiritually rich society (Pandey, 1991). Also, this project emphasised sustainability as Walker (2000) states

that local production and local employment contribute to environmental benefits by evolving a locally based industrial ecology and social equality which is an essential element of the inner teachings.

The above literature reflects that a small scale worker cooperative can offer a example of when it's effective to start a project where the workers are the stakeholders and decision makers. Involving the governmental organisations, the NGO's and other voluntary organisations can provide the necessary training in: production methods, management and credit facilities. Women's empowerment is currently one of the main development programs of the Indian government and international agencies. Providing employment opportunities for women in their own village can reduce the migration of young women to urban areas looking for employment opportunities. This may further reduce crime against women who are forced to work under unfamiliar circumstances in urban areas of developing countries like India, Bangladesh and Philippines – which is largely discussed by the media and international agencies (UN women 2013).

# Chapter 4
# Technology choice for the production of recycled yarn

This chapter is discussed in two sections. The first section explores the literature related to appropriate technology and its application in small-scale industries. The objective is to analyse the different interpretations of the appropriate technology and why it is appropriate for the production of recycled yarn. The technology selection for the recycled yarn production has to support the social values and the aim of this project in more than the economic efficiency and profit motives practiced in a free market economy. The second section of the chapter covers technology choice and its function for the production of the recycled yarn.

## 4.1 Gandhian and Buddhist economy

Buddha and Gandhi praised the quality of goodness and benefit more than wealth. The objectives of both their teachings are about building a civilisation that does not depend on exploitation of fellow men. Their codes of action or standard values are based on social, moral and spiritual considerations (Payutto,1992; Gandhi, 1952). Nachane (2007) says that there is no definite scheme of economic thought evolved from Gandhi and that he did not make any distinction between economics and ethics. According to Gandhi, true economics never has a substantial effect against the highest ethical standards just as all true ethics, at the same time, have to be good economics. True economics stands for social justice and promotes the good of all equally, including the weakest and is indispensable for a decent life (Harijan, 1934). As a matter of fact Gandhi set up two criteria for the appropriateness of technology: first it should not be labour displacing, and second it should increase the general wellbeing of the people (Nachane, 2007).

In the Buddhist point of view “economic activity should be a means to a good and noble life. Production, consumption and other economic activities are not ends in themselves; they are means and ends by which they must lead to the development of well-being within the individual, within the society and within the environment” (Payutto, 1992, p.20). As the research is based in a village where the technological system practiced is hand weaving which is a textile craft – the production technique of recycled yarn has to mirror what is happening within the prevailing social characteristics in society. This research is considerably influenced by the Gandhian and Buddhist economics mainly because of emphasis upon attributes like: general well-being of the stakeholders, use of simple technology, and activity that is cost effective and not labour displacing. Weber (1999) suggests that due to excessive increase in human interference with nature; economic, technological and ideological policies must change. The ideological change may define an appreciation for the quality of life rather than standard of living.

## 4.2 The relationship between culture and technology

In order to make the technology used successful within a particular locality, it has to be firmly related to the: technical, economic and social conditions in existence (Francis and Mansell, 1988). Culture is viewed as forming a context or a background for the development of technologies. Hazeltine *et al.* (1998) define culture as groups, customs and standards of taste. However, culture is not considered solely as a series of responses or adjustments to technology; rather, it is seen as an essential mediator and adversary to: the non-cultural, the mechanical, and artificial realm of technology. A cultural critique of technology is one in which the non-cultural elements are evaluated, judged and forced into new directions as it fits the individual society or culture (Baark and Jamison, 1986).

Traditional handloom weaving is the technique practiced by the weavers who are men in the village where the study is based. The targeted labourers for the production of the recycled knitting yarn are women in the household

who help men in the weaving process. These women are not highly skilled and their work is unpaid. Considering aspects such as gender subordination, unskilled labour, involvement in the silk reeling and setting the loom along with the household work; it was essential that the choice of technology for the production of knitting yarn must be simple and therapeutic and reflect their existing skill in silk reeling using a spinning wheel (fig 4.1).

**Fig 4.1 Silk reeling**

## 4.3 What is appropriate technology (AT)

Schumacher (1973) developed the idea of intermediate technology, which is more productive than indigenous technology – but low in price compared to sophisticated technology used in the modern industry. Intermediate technology is considered useful when work places are created where people live, reducing migration to urban areas. These work places can be created in large numbers without huge capital, and production methods can be simple – mainly using local materials. The term intermediate technology is criticised for implying a technological fix for development problems separate from the political and the social factors involved (Hollick, 1982). However, the term “appropriate technology” (or AT) is suggested as a substitute which includes the social and the cultural dimensions of innovation (Pellegrini, 1979).

According to Long (1980) in the selection of technology that accounts for regional social values plays an important role. For example, the appropriateness of technologies should not be decided purely on economic and factor endowment grounds. Long (1980) states that AT is a technology that is appropriate to the particular situation faced by a given group of people, where consideration is given to value priorities along with the economic circumstances and the available resources. The U.S. Congress's Office of Technology (1981) characterised AT as being: energy efficient, small scale, environmentally sound, labour intensive and can be controlled by the local community. Dunn (1978) discusses AT as rural based and as a method which attempts to recognise the potential of a particular community and help it develop gradually. This development progressively builds the skills of the community based on local resources. Hazeltine *et al.* (1998) state the reason why AT relates well to the cultures because it adapts to the local needs and is controlled by those using it. The characteristics of AT like low cash requirements, being repairable and controlled by users matches the situation of women in the developing countries. If cultural factors are not taken into consideration while introducing a new technology, then it is likely that the aim of the new technologies may not be met – perhaps because of unexpected contingencies or resistance by those involved. Appropriate technology tends to put participants in control so that it can be adapted to local conditions, it does not require major changes in people's lives, and it is a promising way to improve living conditions without cultural damage. Pellegrini (1979, p. 2) suggests that a technology should be considered appropriate "when its introduction into a community creates a self-reinforcing process internal to the same community, which supports the growth of the local activities and the development of the indigenous capabilities as decided by the community itself". To sum up, appropriate technology can be defined as an approach to create employment through optimising the use of existing skills and resources and raising the productive capacity of the community. Considering the interpretations relating to appropriate technology in the literature the researcher came to a conclusion to adopt a technique for production of the recycled yarn that is: simple, cost effective

and socially appropriate for the community and this is explained later in this chapter.

### 4.3.1 How is appropriate technology related to sustainability?

The challenge for the researcher is to understand the mechanisms underlying technology adoption; considering which technology is to be used, where and by whom. Schumacher (1973) discusses the modern technology's involvement in three situations. The first of these is that the human nature can revolt against inhuman technological, organisational and political patterns that are inappropriate. Second is the living environment that supports human life, which gives signs of partial breakdown; and the third is exhaustion of non-renewable resources due to permanent and limitless expansion of technology. In this case, a technology with human involvement can help to solve the above problems.

Modern technology can reduce productive time; on the other hand social time used for producing things employing hands and brain and using simple natural tools can help produce real quality goods. This "real work" has therapeutic value where women and elders can make themselves useful in an opportunity to work creatively in their own time and at their own pace.

Bhatt (1980) describes the Gandhian development path suited for the Indian sub-continent as a social order based predominantly on the chakra (wheel); which includes everything that promotes the wellbeing of the villagers including: the production of electricity, iron works and machine-making existing side-by-side with village crafts. The dependence on the chakra can be reversed due to industrialisation planned to destroy the villages and village crafts. In this effort Gandhi found organisations known as 'The All India Spinners Association' and 'The All Village Industrial Association' (Dunn, 1978).

Considering these facts, the study proposes to employ hand spinning as a therapeutic craft, housed in a building where unpaid women in the handloom sector can produce recycled yarn. According to Schumacher (1973) people who work in this way do not know the difference between work and leisure;

unless they sleep, eat or occasionally choose to do nothing but they are agreeably, productively engaged.

### 4.3.2 Why appropriate technology is suitable for small scale application?

The benefits of small-scale industrial development using appropriate technology outlined by Francis and Mansell (1988) Schumacher (1973) and Mc Robbie (1981) are summarised as follows:

- Employment can be created in the place where the unemployed live and that can restrict migration of unemployed people to urban areas
- Through reducing the needs for imports, and creating an export market, savings from wages and profits generated can be used for investment in further capital development
- There is a greater opportunity to use renewable resources (solar, wind, hydro, wood and biogas)
- Small-scale industries using AT can reduce pollution and ecological imbalances prevalent in most concentrated large scale industry. Furthermore, ecological problems can be remedied at much less cost
- Growth of the industry can occur in small steps, as required by demand and made possible through new capital which includes changes in the products through innovation.

### 4.3.3 Concerns about the use of appropriate technology

In India small-scale manufacturing systems have impacted hand crafts and use of recycled materials. The identified drawbacks in the handloom weaving industry by the researcher in her primary research conducted in the village were: lack of intensive market research and product modification to meet the customer requirements (discussed in chapter 3).

Dunn (1978) outlines three reasons why small scale entrepreneurs encounter difficulties in building up their business:

- Lack of management skills including organisation, financial control, planning and marketing. There are few numbers of people working under a small-scale industry who normally serve their immediate local

area and very often the work is commissioned on a one off basis. The workers are restricted to a few traditional practices, tools and locally available traditional materials. In order to expand the business it is necessary to expand the market. However, to attain market value it is necessary to introduce quality control in the product. Such considerations and changes require guidance from outside the firm

- The second is the shortage of capital. Setting up or expanding a business requires capital. In most developing countries there are banking arrangements to set up credit facilities for small scale industry. Workers have to properly assemble project details and present their ideas in terms that are understandable to lenders. Corruption in the system is a major setback. To overcome this workers can consider assistance from voluntary and non-governmental organisations
- Technical problems or lack of expertise can be overcome through the use of proper training facilities.

Hazeltine *et al.* (1998) discuss AT in a broader sense where the major concern is whether AT can produce provide sufficient goods and services. For developing countries AT can lead to national development in the sense of trained work force. However, the problem exists whether people may accept an AT approach rather than high technology. Hazeltine *et al.* (1998) highlight the fact that some leaders are understandably suspicious of AT as being a way to discourage the developing countries from industrialising and becoming competitors. The answer to this issue is that there is no other way to industrialise other than using the resources that are readily available. India has untrained labour; in order to channel it in the right direction a simple technology that is easy to adapt with simple training facilities will lead to economic development of the community.

Another problem faced by the appropriate technology approach is that it is specific to locality; thus transferring expertise from one locality/country to another is a difficult process. In this eventuality, changes must be made in technology choice depending on the requirements and skills of the

community. Hazeltine *et al.* (1998) points out that AT is small-scale and done by many independently; thus making it difficult for the government officials to understand what is happening and take action when needed. With reference to India, central and state government has specialised departments such as: 'The National Mission for Empowerment of Women' (NMEW) and 'The Ministry for Micro Small and Medium Enterprise' (MSME). These departments aim to handle the socio-economic development of rural areas.

Considering the above factors the technology chosen for the production of the recycled yarn is a method that is socially acceptable and familiar to the beneficiaries. Women in the handloom sector are voluntarily involved in silk reeling using a spinning wheel. They are trained to control and adjust the speed of the reeling wheel which is similar to the basic principles of hand spinning wheel. The key factors identified to develop an AT bearing in mind the socio cultural-aspects of the community is presented in fig 4.2

## 4.4 Appropriate technology framework identified for the production of recycled yarn

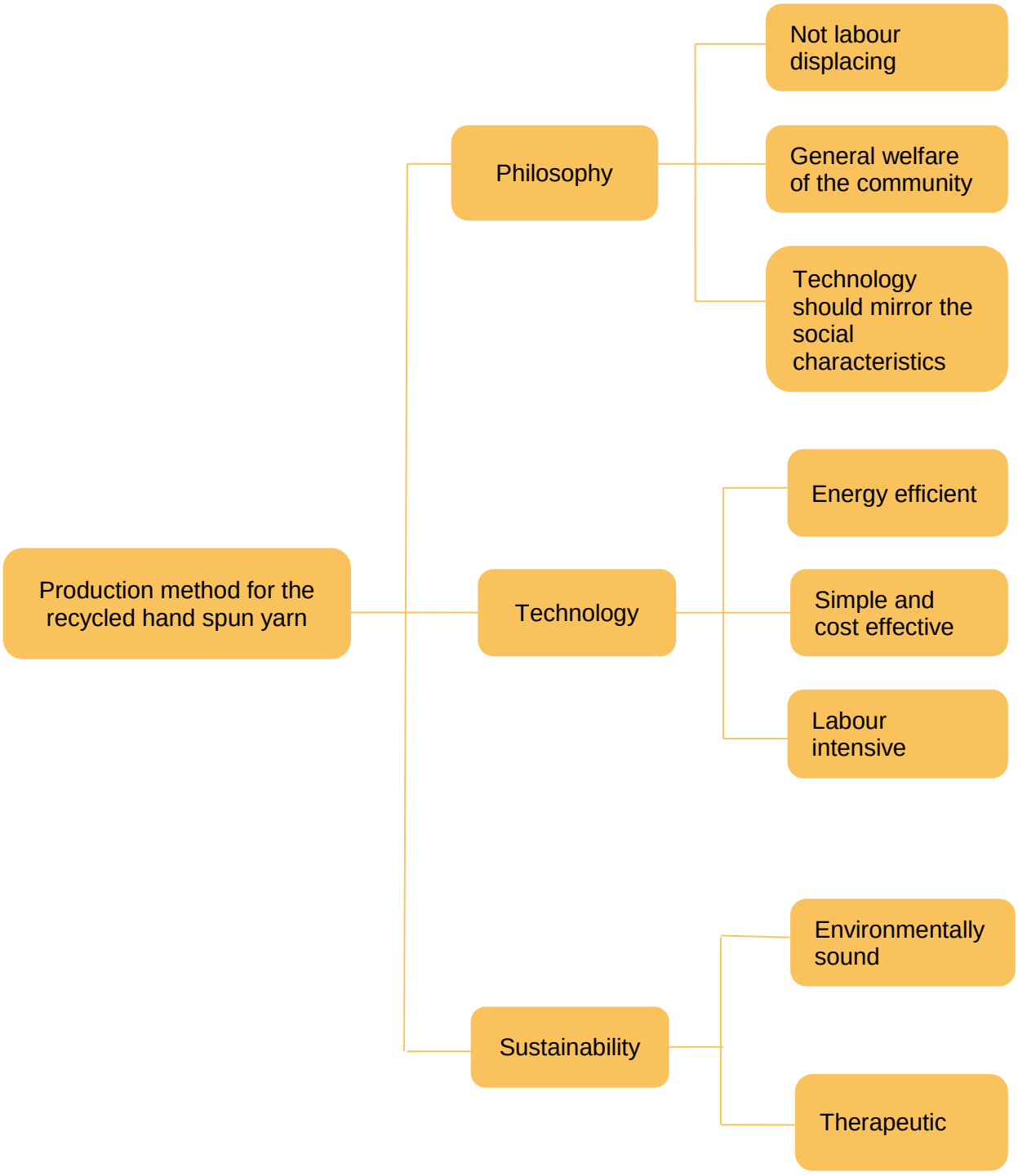



**Fig 4.2 Characteristics considered for the choice of technology to produce recycled yarn**

### 4.4.1 Philosophy

The focus of this project is to involve female unpaid labour in the handloom sector in the production of the recycled yarn within their community. Providing an employment opportunity, encourages these women to become involved in a cooperative system where they can gather to work and share their thoughts and socialise with others.

### 4.4.2 Technology

The project proposes appropriate technology that is simple to use and easy to understand. The choice of AT is best suitable for this project as it take into consideration the social and the cultural dimensions of the community. Also it is energy-efficient, cost-effective and labour-intensive.

### 4.4.3 Sustainability

The researcher has considered the environmental impact at each stage of the product development. The social credentials behind the context of setting up a worker cooperative provide an holistic approach towards the sustainable aspects of this project.

## 4.5 Stages of recycled yarn development

The recycled yarn goes through different stages of development which is explained in fig 4.3.

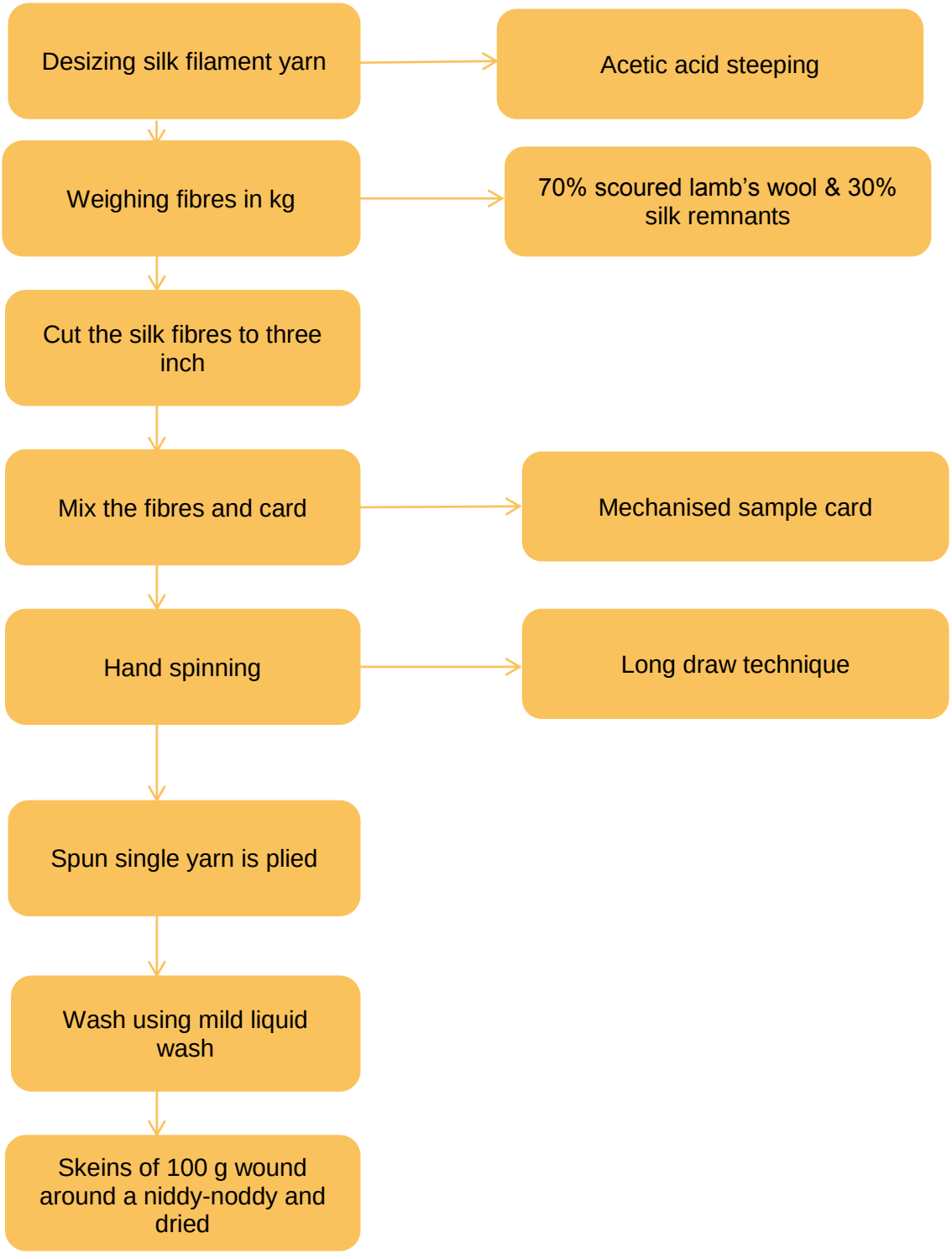



**Fig 4.3 Stages of product development**

The first stage of yarn development was to weigh the silk remnants in proportion to scoured lamb's wool. Two options were considered to finalise the silk content in the recycled yarn: 50% and 30% of silk remnants. The swathes hand-knitted using the above ratio of silk remnants (fig 4.4) did not show much difference in the form of colour and texture. Thus the researcher decided to keep the silk content as 30% and scoured lamb's wool 70%.

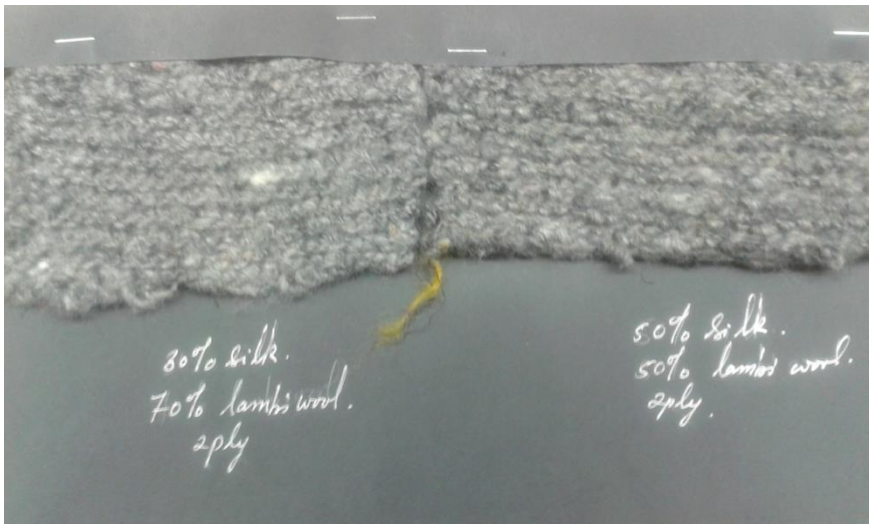



**Fig 4.4 Hand-knitted swatches in 30% and 50% silk remnants**

### 4.5.1 Preparing silk yarn for hand spinning

Silk is a natural protein fibre with a soothing lustre and elegance. India produces four varieties of silk, namely: mulberry, eri, tussar and muga. Mulberry silk is used for weaving Kancheepuram sari. The procedure for making a Kancheepuram sari starts with preparing the silk threads. The unique features of this sari is its strength, which is achieved by the twisted silk yarns running in both warp and weft direction (Bhasin, 2011).

Silk yarns are dyed in a variety of colours, dipped in rice water and dried in sun before they are set in the handloom for waving. The twisted yarns used for weaving these saris are strong enough to last for 30 to 40 years (Bhasin, 2011). The silk remnants left after weaving the sari are collected from the handloom and processed to develop the recycled yarn.

#### 4.5.1.1 Yarn twist

Yarn twisting is an essential process in the production of both staple and filament yarn. The yarn twist has two-fold effects; the twist increases the cohesion between the fibres by increasing the lateral pressure in the yarn, thus giving strength to the yarn. Secondly, twist affects the softness of the yarn and fabric (Lorenz, 1987). In the case of Kancheepuram saris the silk yarns are sized in rice starch.

In order to desize the silk remnants collected from the handloom before carding, the following desizing experiments were conducted:

#### 4.5.1.2 Desizing experiments

1. **Hydrolytic desizing**

   Rod steeping

   This is the oldest and simplest desizing method to remove the starch size. The grey fabric is saturated with water (90-100% pick up) by a padding mangle, and allowed to dwell in the rope form for 24h. at 40-45°c. The starch size is degraded by natural microorganisms in the water and can be easily removed by hot water washing. It is a normal practice to treat the batch with some of the process liquor from the previous batch processed, so that the appropriate microorganisms start to degrade the starch present in the yarn. The time and temperature which are usually inversely related, are the only process factors controlled in this method. This procedure does not involve chemical usage, also it is the cheapest method of desizing. The disadvantages are: it can be time consuming and requires large floor space. Defects like: uneven removal size and damage to the fabric are common. For the above reasons rod steeping is uncommon. (Au and Holme, 1999).

Desizing of silk remnants before carding help the silk fibres open and improve the mixing of silk fibres with lamb's wool while carding. Machine carding method is adopted in order to improve the handle and reduce the hairiness on the surface of the hand-spun yarn. The researcher

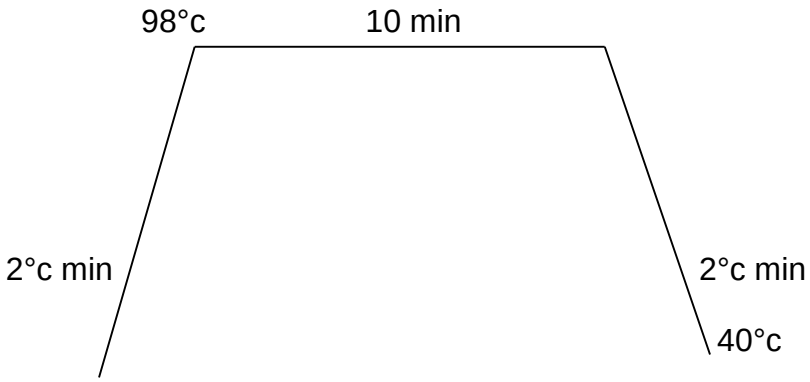
experimented with rod steeping, alkali steeping and acid steeping methods to desize the yarns. The result for alkali desizing was not satisfactory. as it was noticed in the experiment that the original dyes in the silk remnants were bleached out and had lost the required smooth handle, texture and strength.

**Experiment 1**

Rod steeping method done in Roaches Pyrotec Dyeing machine

Yarn weight - 25g before desizing

L/R= 1:30




The liquor was boiled to 98°c at a rate of 2°c per min. Once it reaches 98°c it was kept for 10 min and then gradually cooled at 2°c per min till it reaches 40°c. The weight of the yarn reduced to 22g and a large amount of colour bleeding from the silk remnants was noticed.

2. **Experiment 2**

   Acid desizing using sulphuric acid

   Weight of yarn before desizing 9 g and L/R =1:200

   0.2% of $H_2SO_4$ at room temperature and dwell time 7 h.

   The desized yarns were dried at room temperature.

The dyed silk yarn had less colour bleeding during the desizing process and the opening of silk fibres in the carding process was comparatively better than the rod-steeped yarn. The results showed that acid steeping is more

efficient and it can obtain a more uniform desized fibre. The weight of the yarn had dropped to 6.5g after desizing.

**Experiment 3**

Acid desizing using acetic acid
Weight of the yarn before desizing 150g

The yarn was conditioned for 24h. before desizing to improve the physical properties.
L/R =1:200

0.2% of acetic acid at room temperature and dwell time 7h.

The desized yarns were dried at room temperature and conditioned for 24h. before carding

The dye bleeding was minimal.

The experiments undertaken involved treatment of dyed silk fibres with diluted sulphuric acid and diluted acetic acid. The difference of desized yarn weight was similar in the case of sulphuric acid and acetic acid desizing. 0.2% acetic acid was chosen for desizing silk fibres as acetic acid is a moderately weak acid and the effluent was rinsed in cold water.

### 4.5.1.3 Results of desizing experiments

**Table 4.1 Comparison of desizing results**

| | **Chemical** | **Dwell time** | **Temperature (°c)** | **Yarn weight difference** |
|---|---|---|---|---|
| Rod steeping | Distilled water | 10min | 98 | 0.88% |
| Acid steeping | $H_2SO_4$ | 7-12h | 25 | 0.72% |
| Acid steeping | $CH_3COOH$ | 7-12h | 25 | 0.71% |

From the table 4.1 acetic acid steeping was finalised for desizing silk yarn in a liquor ratio 1:200 (1g of fibre mixed in 200g of water) with 0.2% of acetic acid in grams is added. The desized yarn was then dried at the room temperature and conditioned for 24h. before carding. The portion of acetic acid used for desizing was minimal and more eco-friendly compared to the rod steeping and sulphuric acid steeping methods.

### 4.5.2 Waste water treatment

The best way to reduce the environmental impact during the production of yarn is through reducing the amount of chemical content released for treatment. Furthermore, the conventional waste treatment causes a transfer of waste from one phase to another (Hendrickx and Boardman, 1995). Many industrial wastewaters carry acidic waste streams. Wastewater discharge permits generally require that acidic waste be neutralized to the range of pH level 6.0-9.0 (Liu and Lipták, 1997).

It was noticed in the experiments that acid steeping was more effective compared to rod steeping. In the rod steeping experiment, water was boiled to 98°c which led to the colour bleeding of the yarn. Acid steeping was considered a more effective method of desizing with minimal colour bleeding. It was also noticed while carding that the acid desized yarn, untwists and opens well compared to rod-steeped yarns. The researcher realised that the acetic acid steeping is more effective as the amount of acid used for desizing silk yarn is 0.2%, which is very negligible. The acid desized effluent wads rinsed while disposal.

### 4.5.3 Blending and mixing of fibre

The basic objective of fibre blending is to assemble and combine together the correct proportion of the components so that the relative amounts of each kind fed into the succeeding process remain constant throughout the whole batch of material. While mixing takes place in the carding process, an acceptable uniform mixture should be ensured (Brearley, 1965).

#### 4.5.3.1 Carding

This involves subjecting the fibres to the action of a large number of pins in an attempt to separate each fibre from its neighbours in order to form a fluffy but coherent mass (Brearley, 1965).

Accordingly “carding is defined as an action of reducing tufts of entangled fibres into a filmy web of individual fibres by working the tufts between closely spaced surfaces with opposing sharp points” (Lawrence, 2003, p.101).

General carding objectives

- To separate each fibre from the others in each original tuft of feed material with minimum of fibre breakage
- To remove impurities and fibre entanglements
- To mix together different colours and qualities of fibres to provide a uniform distribution
- To form a bulky sliver of overlapping, partially aligned fibres (Oxtoby, 1987).

The industrial woollen carding machine consists of a number of units each consisting of a series of rollers. The number of such units on the machine depends on the type of material to be carded. In a two-section machine the card is divided into scribbler and carder and in a three-section machine scribbler, intermediate and carder. Increased sections in the carding machine provide better mixing of the fibres by means of intermediate feeds. For carding purpose in this project, a one part or unit sample carding machine was used. The three kinds of carding action used in a woollen card are:

1. Point-of-tooth to point-of-tooth

   In a carding machine the rollers operate with their teeth point-to-point which helps to open the fibres. The fibres are held briefly by either roller and combed through by teeth of the other, resulting the fibres being detangled and straightened. This method ensures a gentle opening of the material with minimum fibre breakage.

2. Point-of-tooth to back-of-tooth

   In this action the teeth of the stripper roller approach and pass the back of the worker teeth. A similar action takes place between the fast surface speed of the swift and slower moving stripper. This demonstrates a stripping action.

3. Back-of-tooth to back-of-tooth

   The fibres which are embedded into the teeth of swift by several worker-swift actions, are raised and brushed. This action can be used for fibres stripping for the web formation (Lawrence, 2003 and Brearley, 1965). The carding action is diagrammatically represented in fig 4.5.

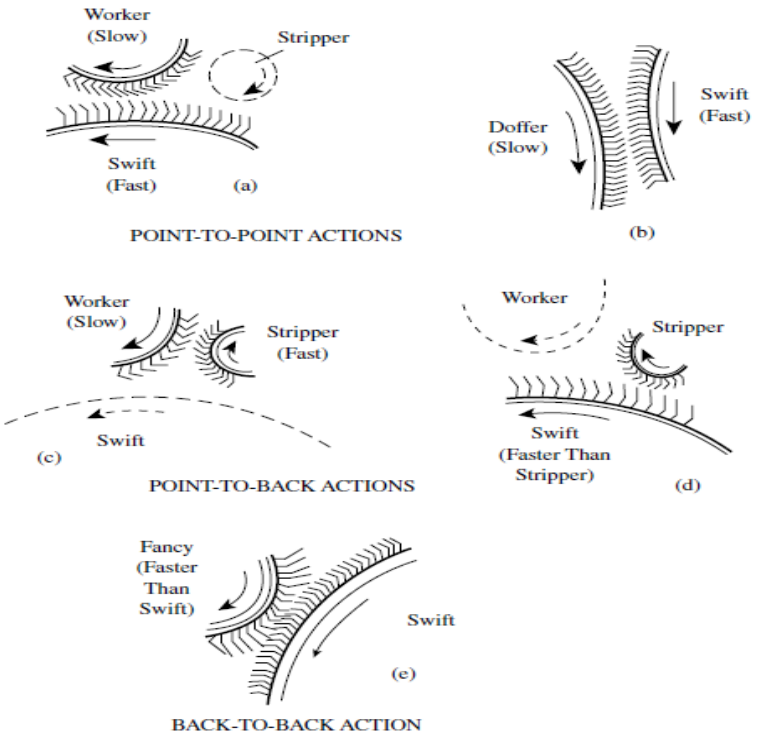



**Fig 4.5 Actions of different rollers in a woollen card (Brearley, 1965, p.61)**

**Fig 4.6 Carding method used for mixing silk remnants and scoured lamb's wool**

#### 4.5.3.2 Carding method used to mix the fibres

The silk yarn remnants were cut in 3-inch length after desizing. Staple silk yarns were carded twice in the carding machine (fig 4.6). The scoured lamb's wool was carded separately and mixed with carded silk at a later stage. The separately carded silk fibres and lamb's wool were combined and fed in the carding machine. In order to mix the fibres during carding, the web from the scribbler was collected into thick sliver and cross-fed into the carder twice. This method of cross-feeding the material from scribbler to carder gives an additional blending to the fibres and assists in evening the density across the width of the web from the scribbler to produce a regular sliver. This is the same method as intermediate feed, but done manually as the carding machine used by the researcher did not have an intermediate feed. The carded fibres were spun in a hand spinning wheel.

#### 4.5.3.3 Machine carding

The silk remnants collected from the handloom were weighed and conditioned. After desizing, the yarn was dried and conditioned for 24h. at 25°c room temperature to improve the physical properties. The remnants are then cut to 3 inches and carded to open (fig 4.7, fig 4.8).

**Fig 4.7 Silk yarns before carding**

**Fig 4.8 Silk yarns after carding**

The silk remnants and lamb's wool were carded separately and then mixed and carded twice to achieve a consistent spinning fibre (fig 4.9 mixed carded fibres).

**Fig 4.9 Carded fibres ready for hand spinning**

#### 4.5.3.4 Hand spinning and plying

Carded fibres were spun in a hand spinning wheel using the long draw technique. Here the spinner holds and drafts the fibre using one hand. As the spinning wheel treadle, spinner holds the rolag in the left hand and slowly guides it to the orifice allowing the fibres to draft out. After extending to a comfortable position, the fibre was allowed to add adequate amount of twist to set in (fig 4.10). The left hand was moved forward and the yarn was

guided with the right hand to the orifice to let the yarn wind on to the bobbin (Chadwick, 1980).

**Fig 4.10 Hand spinning of recycled yarn**

The singles were spun in ‘Z’ twist and plied in ‘S’ twist. This was done using a lazy kate. Two filled bobbins of hand-spun singles were removed from the spinning wheel and put on the spool rack. The two single yarns were guided to the bobbin through the orifice and then the wheel was turned in an anti-clockwise direction to give ‘S’ twist to the plied yarn (fig 4.11).

**Fig 4.11 Yarn plying**

The plied yarn was taken from the bobbin and wound on a niddy-noddy (fig 4.12).

**Fig 4.12 Recycled yarn wound in a niddy- noddy**

#### 4.5.3.5 Washing the plied yarn

The yarns were washed in sensitive detergent used for washing baby clothes in hot water at 40 to 43 °c and allowed to cool. This process helped bleed the excess dye content in the silk. Hand spun yarn was then rinsed in cold water to remove the detergent. The rinsed yarn was put in the spin cycle of the washing machine with no added water to remove the moisture, and hung to dry in skeins in the shade with no direct sunlight (fig 4.13 and fig 4.14).

**Fig 4.13 Drying of recycled yarn**

**Fig 4.14 Recycled hand spun yarn**

#### 4.5.3.6 Hand knitting needle sizes

| Metric (mm) needle size | Yarn used |
|---|---|
| 3.25 | Knits as 4 ply |
| 3.75 | |
| 4 | Double knitting |
| 4.5 | |
| 5 | Aran |
| 5.5 | |
| 6 | |
| 6.5 | Chunky |

**Table 4.2 Hand knitting needle sizes (UK Hand Knitting Association)**

Table 4.2 shows different needle sizes used for knitting various types of yarns to create a good solid fabric. Larger number needles are used for looser knitted fabric and for a tighter look smaller number needles are used. However, to maintain the tension while hand knitting is the most important part of a pattern and to achieve this, the knitter has to change the needle size according to the type of the yarn.

The needle size for hand knitting the recycled yarn can differ according to the fineness of yarn spun. Mostly the hand spun yarn after plying was between aran and chunky yarn category. The recycled yarn developed was initially hand knitted using two different metric size (mm) needles 4mm and 6mm (fig 4.15).

**Fig 4.13 Swatch knitted using 6 mm needle**

### 4.5.4 Identified defects in the initial product development

- The singles yarn tangled while plying; the spinner have to break the yarn and knot it, which caused bulkiness and discontinuity in yarn
- Inconsistency in twist while plying the yarn
- While plying two singles in different width, the thinner yarn twists higher around the bulker one.

The initially produced hand spun recycled yarn and knitted swatches were examined with two retailers in UK in order to collect feedback related to the quality and marketability of the yarn. The first approached was Texere yarns, Bradford who retails hand knitting yarn and the second interview was with the managing director of Gossypium, organic and fair-trade clothing shop on

Lewes High Street UK. The unstructured interviews with the retailers were discussed in chapter 6.

## 4.6 Summary

In this chapter the researcher critically examines the choice of AT as the method of production for the recycled knitting yarn. To keep open the possibility of introducing AT as a production method, it is important to have a comparable definition of the technologies that suit the process, so that the outcome can be effectively analysed across the study. The project acknowledges the fundamental limitations of hand spun yarn which is related with the restriction in the colour and quantity produced. This depends on the availability of silk remnants from the handloom that is unpredictable in terms of colour and quantity. The literature reviewed highlights the fact that a small-scale unit with simple production techniques is the most adaptable method to follow for this project because they are capable to produce small quantities maintaining the quality. Also considering the aspect of empowering women (unpaid labour) in the village, the choice of technology should relate to the technique which is familiar to the beneficiaries and acceptable to the community.

# Chapter 5
# Technical evaluation of recycled hand spun yarn

Chapter 4 presents a discussion concerning the use of AT for the production process of the yarn, and when its use is most suitable. The use of traditional crafting techniques (e.g. hand carding) was considered for this project, as this method is historically significant. However, such a method would not fully achieve the stated objectives. Hand carding is an extremely slow process and would not have enabled the quantities of yarn required for a reasonable profit model to be produced. In contrast, hand-spinning allows for relatively quick production accompanied by a therapeutic effect, which would be important for the well-being of the women in the cooperative system. This technique also produces the desired qualities in the yarn (texture and handle).

In the early stages of the project, the researcher learned to hand spin and produced all initial prototypes. As the researcher learned the parameters and quality requirements, she realised that the time spent on production would not actually be valuable for PhD study. The fibre content of the recycled hand spun yarn produced for this study was kept as 30% silk remnants and 70% lamb's wool. To evaluate the quality required for the hand spun yarn the following technical aspects related to fibres and yarn properties are reviewed.

## 5.1 Textile fibres

Yarns are built up by twisting together thin and flexible strong strands called fibres. The properties of fabric depend largely on the properties of the fibres from which they are made. The length of the fibre is a very important property; it can be infinitely long but should not be shorter than 6-12 mm, or it may not hold together while spinning. The fineness of the material eventually depends on the width of the fibre (Cook, 2001). Fibres have been defined by the Textile Institute as units of matter characterised by flexibility, fineness, and high ratio of length to thickness (Morton and Hearle, 1993).

### 5.1.1 Natural fibres

There are different sorts of natural fibres collected and examined as potential raw materials for cloth. These natural fibres vary according to their basic properties like: fineness, flexibility, resilience and shape; as a result, the variety of fabrics they produce are correspondingly diverse. The most suitable natural fibres which become the basis of textile industries are cotton, wool, flax, jute and silk (Corbman, 1983).

Vegetal fibres are fibres which have been produced by plants. These include: cotton, jute and flax. Animal fibres are fibres based on proteins (a complex substance derived from animal matter). These include: wool and silk. Mineral fibres are of limited importance in the textile trade. These include: asbestos and more recently basalt. In order to measure the fineness and length of fibres there are different numerical methods that can be used. However, in the case of natural fibres, no two batches of fibres are alike. Because of this, the length and fineness of natural fibres cannot be quoted by numerical precision as in the case of synthetic fibre (Cook, 2001 and Corbman, 1983).

### 5.1.2 Wool fibre characteristics

Wool is composed of protein known as Keratin. It is a coarse fibre and is crimpy and has scales on the surface. The finer, softer, warmer fibres have more numerous and smoother scales. Underneath the cells is the fibre body consisting of intermediate cells which provide strength and elasticity to the fibre. Lamb's wool is the first fleece shorn from a lamb about six to eight months old. It is of very fine quality, as the fibres are tapered because the ends have never been clipped (Corbman, 1983 and Morton and Hearle, 1993). It should be noted that (as in this case) the term lamb's wool is only applied to fine quality merino wool and is normally about 17-25μm in diameter and staple length of 60-100mm (Lewis, 1992).

### 5.1.3 Scouring of wool

Raw wool contains a mix of dust and dirt, natural grease (yolk) with dry perspiration (suint). Finer wool like lamb's wool and Merino contains higher proportion of impurities compared to coarser ones. To process raw wool, it is

agitated gently in the tanks filled with warm water containing detergent. The raw wool is then squeezed between rollers and carried to another tank. The wool passes through four or more tanks before it is rinsed in clean water. Even though this process removes the impurities in the fibre, they do not necessarily produce white fibre (Cook, 2001). The lamb's wool used in the recycled yarn in this project is scoured lamb's wool and is carded along with the silk remnants to give a unique texture and colour distribution.

### 5.1.4 Silk

Silk is a fine continuous strand unwound from the cocoon of the silk worm. Silk is composed of two protein groups: the fibroin and sericin. The filament silk remnants used for this study are dyed in exciting colours before they are set in the handloom, and the silk remnants collected from the loom after weaving the saris are above three meters in length.

### 5.1.5 Staple yarn

Staple yarns are produced by placing a series of individual fibres to form a linear assembly of staple fibres, held together by intersection of twist to form a continuous strand – which is small in cross section, but of any specified length. Spun yarns are of thicker count than continuous filament yarn (Oxtoby, 1987; Lawrence, 2003). Another feature of staple spun yarns is that they are hairy, that is, the fibre ends and loops of fibre stand out from main body of the yarn (Booth, 1968).The silk remnants collected from the looms were cut in staple form before blending with lamb's wool for carding. In order to convert the filament yarns in staple form, the desized remnants were cut in three inch lengths and carded in a carding machine. It was noticed in the process that both silk and lamb's wool blends well to form a regular sliver. As discussed in the fibre properties, the length of the lamb's wool is approximately three inches (60-100 mm) and length of the remnants were kept as three inches.

## 5.2 Yarn properties

The mechanical properties of the fibre helps to determine the particular character of the yarn. One of the important mechanical properties of fibres is

their tensile property (Morton and Hearle, 1993). Tensile properties relate to stress, which is applied force per unit area resulting in strain. Strain is the resulting extension due to applied force divided by original length and multiplied by one hundred to a percentage value. The stress required to break the fibre is tenacity which is stress divided by fibre count (Rae and Bruce, 1973).

### 5.2.1 Yarn designation

A yarn is designated by three terms

1. Linear density – measure of mass per unit length
2. Direction of twist – 'S' or 'Z'
3. Amount of twist (Rae and Bruce, 1973).

**Yarn counts** (the relation between weight and length of yarn).

"The yarn count is a number giving a measure of the yarn linear density. Linear density is defined as mass per unit length" (Lawrence, 2003, p. 25). There are two methods that are used to determine the linear density of yarns as follows:

- Mass per unit of length, is known as direct method where a higher count number denotes a thicker yarn
- Length per unit of mass, the indirect method, a higher count number denotes a thinner yarn (Oxtoby, 1987).

**Yarn diameter** is related to $\sqrt{yarn\ count}$. Yarn diameter is influenced by factors such as: yarn twist, fibre density and fibre configuration. It does not follow that all yarns of same count necessarily have the same diameter (Oxtoby, 1987).

**"Yarn twist** direction is described as 'S' or 'Z' according to which of these letters has its centre inclined in the same direction as the surface element of a given twisted yarn" (Beech *et al.,* 1986, p.266).

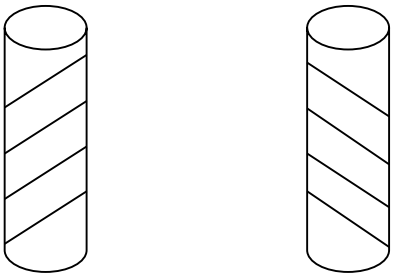


**Fig 5.1 'Z' twist** **'S' twist**

**Yarn twist constants**

If the (turns / metre X $\sqrt{\text{count (tex)}}$) is kept constant for a yarn and the fibres are twisted in the same angle it is defined as twist constant.

Twist constant = turns / metre X $\sqrt{\text{count (tex)}}$ (Rae and Bruce, 1973).

Turns / metre = twist constant / $\sqrt{\text{tex}}$

The below table 5.1 shows the magnitude or amount of twist generally accepted for single woollen yarn (Rae and Bruce, 1973).

**Table 5.1 Twist magnitude for singles woollen yarn**

| Twist designation | Twist constant |
|---|---|
| Hard | > 5400 |
| Medium hard | 4600 – 5400 |
| Normal warp | 3800- 4600 |
| Normal weft | 3000-3800 |
| Soft | 2200-3000 |
| Very soft | < 2200 |

The researcher conducted objective experiments with five commercially sourced double knit yarns; where two samples were lamb's wool, another

being lamb's wool angora, another being 100% filament silk yarn and the last being 100% acrylic. Twist constants for all the six yarns were calculated to determine the twist magnitude. The range of six yarns were hand knitted and tested for fabric shrinkage and pilling propensity discussed in chapter 7.

## 5.3 Weft knitted fabric

The knitted loops structure in weft knitted fabric is produced by a combination of intermeshing of needle loops and yarn that passes from one needle loop to another (Spencer, 2001). In the case of knitted fabric, the stable state is controlled by the interplay of forces that required shaping the interlocking of the yarns. The inter-yarn friction prevents the yarn taking up at its lowest energy state and the magnitude of restoring forces in the knitted fabric (Saville, 2000).

### 5.3.1 Dimensional stability and serviceability of fabric

The dimensional stability of a fabric is the extent to which it keeps the original dimension following manufacture; this can happen as it increases in the dimension of the fabric or decreases (shrinkage). Fabric shrinkage is treated as one of the leading quality problems by manufacturers. Fabric shrinkage can happen mainly during garment manufacture or by subsequent laundering by the customer. At various stages during garment manufacture fabric is steam pressed where it is subjected to the steam for a short period. Laundering is a more rigorous process which involves mechanical agitation, hot water and detergent. Dry cleaning involves appropriate solvents and agitation; but the solvents are not absorbed by the fibres and it does not affect the fibre properties. As the fibres do not swell during the dry cleaning process it can reduce some of the problems that can occur during wet cleaning like colour loss and pilling (Saville, 2000).

There is an attempt to generalise plain knitted structure by studying the basic structure of the knitted loop. The knitted loop is difficult to analyse because of the complex geometric shape of the loop in space and the difficulty in deciding about the stable state of the fabric. An important point is proven in that the stable loop geometry can be realised by certain

mathematical curves that have the property which confers the minimum internal elastic energy on the fabric. The basic solution to find a stable state in knitted fabric is to analyse the structure of the loop, so that its properties can be related to determine the fabric dimensional properties before knitting, and finally this information can be passed to the knitter. However, the problem remains until the fabric is brought to its natural strain-free and stable state. As long a stable state is not achieved it is impossible to label any knitted wool garment a washable commodity (Knapton *et al.*,1968).

### 5.3.2 Washing of samples

The yarn developed for the study is intended for the use as hand knitted garments and accessories. It is important to determine how the resultant fabrics respond to washing and cleaning. In terms of machine washing; the washing programme procedures are given in BS 4923 (methods of individual washing and drying for textile) or ISO 6330. According to their standards the programme used in a standard test machine is intended to be similar to a domestic washing machine. The temperature and washing cycle used in a standard machine is related to any wash-care label that is fixed on the garment or hand knitting yarn. The wash care label keeps the consumer informed about the appropriate laundering treatment to help them avoid suffering from excessive dimensional change (Saville, 2000).

The standard washing machine specifies the level of agitation during heating, washing and rinsing, washing temperature, the liquor level during washing, the washing, cooling and spin time. There are two sets of programmes in the standard machine type (A) which is a front loading machine and type (B) which is a top loading agitator machine. A standard detergent without additives is also specified. An industrial machine is commonly used for these tests and can be programmed for main functions such as: temperature, liquor level during wash and rinsing, washing time, and number of rinses required by the standard (Saville, 2000).

### 5.3.3 Dry cleaning

The British standard method requires a commercial dry cleaning machine. The total load used is 50 kg for each cubic meter of the machine cage. The

solvent used is tetrachloroethylene containing 1g per litre. 6.5 litres of solvent is used in each kilogram of load. The dry cleaning machine is run for 15 minutes at 30°c. The samples are then rinsed in the solvent and tumble dried in warm air (Saville, 2000).

In order to conduct objective and subjective tests, the group of commercially sourced yarns along with the recycled yarn were hand knitted in 5x5 inch swatches. The samples were washed in three ways: hand wash, machine wash and dry clean to test the handle of the fabric. The test results are discussed in chapter 7.

## 5.4 Acid dyes

Acid dyes are anionic dyes (negatively charged ions) characterised by a greater attraction to dye protein fibres (cationic) which have a positive charge. Acid dyes are usually sodium salts of sulphonic acid or carboxylic acid. They are anionic in aqueous solution and dye fibres with cationic sites. The acid protonates the fibre's amino group, so they become cationic (positive charged ions). Under the natural dyeing condition, nonspecific hydrophobic interaction reinforces the electrostatic bonding between both: protein and polyamide fibres (fibres formed from polymers and long chain polyamides) and acid dyes of higher wet fastness (Broadbent, 2001 and Shore, 2002).

Acid dyes are classified according to their dyeing behaviour which is in relation to: dyeing pH, their migration ability during dyeing and washing fastness. The dyeing characteristics are determined by the molecular weight and degree of sulphonation of the dye molecule. The classification of acid dyes are based on their behaviour in protein fibre dyeing:

- Level dyeing or equalising acid dyeing
- Fast acid dyeing
- Milling acid dyes
- Super milling acid dyes

The silk yarns used in weaving Kancheepuram saris are bright in colours and are dyed in levelling acid dyes. Levelling acid dyes have good migration and overcome any initial colour unlevelness. These dyes easily migrate during dying and their fastness to washing is from poor to moderate (Broadbent, 2001). The scoured lamb's wool content in recycled yarns were not dyed and colours in the yarn were achieved from the dyed silk remnants.

During the course of study, in a visit to the dyeing unit in the Vellanchery village, the researcher noticed that there was no quality assurance or dyeing standards followed by the local dyers. The dyeing was done by local labourers who are not familiar with the dyeing standards.

**Fig 5.2 Dyeing of silk yarns in a cottage industry**

In order to achieve the desired vibrant colours in silk saris the fastness properties of the acid dyes were ignored. This could be argued as a reason for colour bleeding from the silk remnants used in the recycled yarns.

## 5.5 Pilling test

Pilling is formed by entangling fibres or filaments to discrete balls as a result of wear, abrasion, washing or a combination of all three on the surface of a garment (Brooks *et al.,* 2006). Studies related to pilling show that there are three distinct stages in the life span of a pill.

- Fibres in a fabric are surfaced as a result of some mechanical action
- The surface fibre matt or entangle into a similar configuration of a pill
- A pill can eventually wear out or pulled away from the fabric (Gintis and Mead, 1959).

An overall understanding of pilling can be achieved through determining the physical properties of the fabric which is related to fuzz formation, entanglement and pill break off. In order to test these features, it was necessary to verify fibres in each of the aforementioned three stages. Fuzz is formed when looser ends of fibre are present on the fabric surface when it is brushed or abraded (Gintis and Mead, 1959). In the case of knitted fabric, their constituent yarns provide a structure where the fibres are more mobile than in the woven structure. This mobility of the knitted structure increases the pilling propensity in knitted fabric. Pilling affects the durability and appearance in the knitted fabric; therefore pilling is another important property to assess the wear qualities of the knitted fabric (Brooks *et al.,* 2006 and Saville, 2000). Pilling deteriorates the fabric appearance, reduces the wearability and eventually be discarded.

There are a number of pilling test methods and instruments used in different laboratories. The knitted swatches of six yarn samples used for comparative study in the project were tested in an ICI pilling box and the results are discussed in chapter 7.

## 5.6 Summary

This chapter examines the literature related with the objective measurements as an effective technique to evaluate the quality and the physical properties of recycled yarn compared to commercially available hand knitting yarns. By analysing the test results of twist constant, fabric shrinkage and pilling test; the information related to the strength and weakness of the recycled yarn were gathered and compared with the commercially sourced yarn samples. The results were reviewed in chapter 7.

In the next stage of the research subjective analysis of these yarns were conducted with hand knitting experts and spinners. This aspect of the study

was aimed to determine the consumer perceptions of the knitting yarns and the resultant samples. The results gathered from the objective analysis were compared with the subjective experiments to measure the outcome. The triangulation of data collected from both the objective and subjective experiments were explained in chapter 7. These experiments has helped the researcher to determine the hand knitters requirements for selecting the knitting yarn and develop a recycled yarn that can compete with the similar commercially available yarn.

# Chapter 6
# Sustainable marketing and branding strategy for the recycled yarn

In this chapter, the researcher explores interpretations of sustainable marketing and branding; and critically reviews the literature related with the current factors influencing sustainable marketing organisations. The purpose of the study is to draw together ideas and theories to derive an appropriate sustainable: marketing, branding and packaging strategy for the recycled yarn – which can be adapted by a small-scale cooperative enterprise.

The literature review set the background for primary research and informed phase 1 of the research by providing an understanding about the basic factors related with the marketing of the recycled yarn. The findings from the initial survey with hand-knitters and informal interviews with the yarn retailers accounted for improving the quality of recycled yarn and also identifying the strength and limitations (discussed in 6.3). In order to achieve a holistic approach to the marketing strategy; a brand name, label and packaging was developed for the yarn.

## 6.1 What is sustainable marketing?

Kotler *et al.* (2008) define marketing as a social and managerial process by which individuals and groups obtain what they need (and want) through creating and exchanging products and value with others. Otherwise, marketing is a process directed towards satisfying the needs and wants through exchange of products, which comprises of finding out what the customer wants and then developing and distributing those products and services. The price of the product should be consistent with the requirements of the supplier and the perceptions of the consumer (Hannagan, 1992). The ultimate goal of an organisation is survival, but an organised behavioural system could exist only by adapting to environmental change and maintaining an ecological equilibrium (Dawson, 1969). Alderson (1965) gave attention to two environmental levels in the ecology of business: first is the proximate environment; where the market is in direct and

continuous contact where it buys, sells and competes. Second, is embracing the ultimate environment which is composed of: technological, ideological, moral and social dimensions. In the long run, business enterprise should maintain an ecological equilibrium within both environments. The organisational systems discussed by Dawson (1969) and Alderson (1965) consider the human role in the physical environment in business.

The extensive environmental damage caused by excessive: manufacturing, marketing, processing, discarding and polluting; has led to the suggestion that a sustainable future is not achievable if key factors of ecological degradation (e.g. population growth and high conception lifestyle) are ignored (Bandura, 2007). As public interest in well-being of society and environment has grown, it has led to sub-disciplines in marketing like the social marketing and green marketing. Social marketing is a marketing technique that is effectively applied to the promotion of social objectives and changing people's behaviour for the benefit of the society as a whole (Kotler and Zaltman, 1971). On the other hand, green marketing is about companies applying a holistic management approach (from production to post-purchasing services) to balance the company's need for profit, with a wider need to protect the environment (Peattie, 1995; Thogerson and Crompton, 2009; Gordon *et al.,* 2011). As sustainability entered the main system of marketing innovative business thinkers developed a holistic business preposition of triple bottom line (3BL). Instead of considering the environment, society and profit separately, 3BL approach combines the three to increase the economic, social and environmental value of a business (Martin and Schouten, 2012; Belz and Peattie, 2009; Emery 2012).

Emery (2012) describes sustainable marketing as a paradigm that sits where the three elements of 3BL intersect. This can be defined as a holistic integrated approach with equal emphasis on: the environment, social equity and economic concerns; in the development of marketing strategies. Belz and Peattie (2009) explain a sustainability oriented version of marketing as a macro-marketing concept (marketing at an aggregated level rather than

individual players) that is ecologically oriented (taking into account the ecological limits of the planet), viable (from the perspective of technical feasibility and economic competitiveness), ethical (promoting greater social justice and equality) and relationship-based (management of relationships between business and their customers and stakeholders). Corresponding to this definition (Belz and Peattie, 2009) refer to sustainable marketing management as: planning, implementing, organising and controlling marketing resources and programmes to satisfy the needs and wants of the consumer – while meeting organisational objectives by considering social and environmental criteria. Martin and Schouten (2012) define sustainable marketing as a process of: creating, communicating and delivering value to the customers in a way that, throughout the process, both natural and human capital are preserved or enhanced. To sum up, sustainable marketing is about maintaining a long-term relationship with consumers, considering the social and the natural environment. In order to market sustainability, organisations have to interact with stakeholders and consumers about the socio-economic and environmental values of: products, services and ideas**.**

## 6.2 Sustainable marketing management

Literature related to sustainable marketing management tends to review the topic on a macro level. However, to develop a marketing strategy for recycled yarn the researcher has to analyse the sustainable market in a micro level. The key actors in the micro environment includes: customers, competitors, suppliers, intermediaries (such as retailers, wholesalers or distributors), communities (where the businesses are located), the government, investors, financial institutions, media, interest groups (linked to social and environmental causes) and the general public (Belz and Peattie, 2009). On the other hand, the sustainable marketing technique should incorporate all the essential marketing elements necessary to sustain a recycled product produced by a small-scale workers cooperative. According to Belz (2006) a managerial approach to the sustainable marketing has six elements:

- Socio-ecological problems
- Consumer behavior with respect to the socio-ecological aspects
- Values and objectives of sustainable marketing
- Sustainable marketing strategies
- Sustainable marketing mix
- Transformational sustainable marketing

The first two elements are external to the organisational environment and help marketers to identify socio-ecological issues in the market place and develop market opportunities. The next three elements are market decisions made at the organisational level; and the last one is the active participation of the companies in the public and political processes to transform in a sustainable way. All the six elements discussed by Belz (2006) incorporate the essential components necessary to develop a sustainable marketing strategy for the recycled yarn. The researcher critically reviewed the first five elements of sustainable marketing discussed by Belz (2006) to derive an appropriate marketing strategy for the recycled yarn.

## 6.2.1 Socio ecological problems

To assess a product's impact on the social and natural environment it is necessary to consider the complete life cycle of the product (fig 6.1).

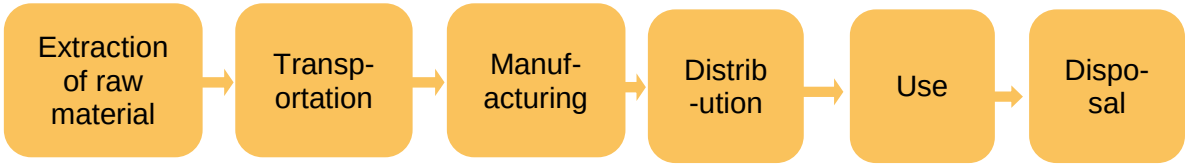



**Fig 6.1 Product life cycle from cradle to grave (Belz and Peattie, 2009, p. 56)**

### 6.2.1.1 Life Cycle Assessment (LCA)

Life Cycle Assessment (LCA) is a quantitative instrument that measures the natural and the environmental impact of products, and is often conducted by: environmental engineers, environmental scientists and worldwide consultants (Belz and Peattie, 2009). The concept of LCA attempts to attribute the environmental load from all stages of a product's life cycle (or

product system) back to the functional unit of the product (Lewis and Gertsakis, 2001).

In order to maximise the potential of cleaner production; a product-oriented approach that integrates: the consumer, waste management problems, issues related to the working conditions, current and anticipated availability of the resources; is more viable than a process oriented one which is more related with the product's end-of-life concerns (Weenan, 1995). In the case of the recycled yarn, the researcher has followed a product-oriented approach. The ingredients for the recycled yarn are: the silk remnants collected from the handlooms mixed with scoured lamb's wool (sourced from the Australian Woolmark Company). The yarn manufacturing process takes into account waste reduction by using technology and equipment that does not highly pollute the environment. The yarn is intended to be produced in a small-scale worker cooperative, where the welfare of the worker is highly prioritised; market surveys and scientific tests were conducted to analyse the functional and aesthetic features of the recycled yarn.

The ultimate aim of cleaner production is to reach zero-emission and avoid negative impacts on the natural environment (Belz and Peattie, 2009), in reality no production can have zero impact on the environment. The researcher's attempt is to prioritise the economic and social values in sustainable marketing while considering the environmental impact during the production process.

A standard is social management systems is the SA 8000. This covers good working conditions of company employees as well as employees of suppliers and sub-contractors. SAI standard helps to develop and implement policies related with child-labour, discrimination, working hours and other important labour related issues (Social Accountability International (SAI)). The International Organisation for Standardisation has developed ISO 26000 which is a guide about social responsibility for organisations which helps them to develop a framework and implement it effectively (ISO, 2014).

### 6.2.2 Consumer behaviour for sustainability

In order to understand the significance of a sustainable product, it is essential to consider the views of potential consumers. The researcher's attempt is to analyse the boundary between the consumption and production dichotomy which is drawn according to: product use (planning and buying), post purchasing (using and disposal) and non-purchasing decisions (the consumer's reasons for not purchasing certain products and services); used to measure the environmental impact of the consumption (Sto *et al*., 2006). For sustainable marketers the success of the product is based on an understanding of consumer behaviour throughout their consumption process. Accordingly, the researcher had developed a marketing strategy and marketing mix for the recycled yarn that would meet customer's needs more effectively when compared to similar commercial competitors.

The trend of green consumption stems from the 1980's and is mainly about consuming green products (products produced in an eco-friendly manner). Later came the concept of sustainable consumption which is concerned with the quality of goods consumed, along with the social concerns that relates to the production process of the goods (Ottman, 2011; Martin and Schouten, 2012; Marchand and Walker, 2007).

According to The Oslo Symposium on sustainable consumption (1994) "sustainable consumption is the use of goods and services that respond to the basic needs of the consumer while minimising the use of the natural resources, toxic materials and emission of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations". Consumption can be classified under categories such as: rational, habitual, sociological, psychological, hedonistic, self-identity, symbolic and communication based (Jackson 2005; Emery, 2012; Belz and Peattie, 2009).

Belz and Peattie (2009) further categorised these classifications under three theoretical approaches that makes it easy to understand, explain and predict customer behaviour from a sustainability perspective. They are the rational, psychological and social explanations.

**6.2.2.1 Rational explanation or rational choice:** the consumers make decisions by calculating the individual cost and benefits of different actions and choose an option that maximises the expected net benefits (Jackson, 2005). As a result of a logical decision-making process based on different reasons, the consumers weigh the functional benefits and the relative affordability of products services against both sustainable and conventional criteria. The rational consumer choice of a concept is the difference between the perceived benefits (benefits the consumer gets from a product compared to its competing product) and perceived cost (like price, transport cost and time). This is formulated as:

Perceived benefits – perceived cost = perceived net benefit (Belz and Peattie, 2009).

In order to increase the net benefit of the product, Jackson (2005) argues that it is essential to provide consumers with sufficient information about products so they can make an informed choice from available options. Also the private decisions made by the consumer do not include social cost, so it is required to internalise these external costs and make them visible to private choice. As Limitations of this approach are that it is difficult to change consumer behaviour consisting of social, moral and altruistic behaviours. It is the social and interpersonal factors that shape and constrain consumer preference.

**6.2.2.2 Psychological explanations:** There are key psychological aspects of consumer behaviour. Important factors discussed by Jackson (2005) and Belz and Peattie (2009) that influence customer's willingness to engage in the sustainability issues are: perceived personal relevance, social responsibility and trust. Perceived personal relevance concerns the extent to which the consumers see a connection between their lives, consumption behaviour and a particular issue. Social responsibility is the willingness of customers to take part in a collective response, and share a sense of responsibility for particular social or environmental issues. Thus, psychology of sustainable consumption describes the consumer in terms of factors that often reflect and combine their values, behaviour and lifestyle. Hamilton

(1964) and Ridley (1996) explain, that the psychological aspect of the consumer does not offer a unique role to competitive or self-interested behaviours; but rather provides an account of the cooperative and the moral behaviour. The individual choices between the competitive and the cooperative behaviour depend mainly on the social climate which the government has a vital role in shaping.

**6.2.2.3 Social explanations**: Conventional marketing theories conceptualise consumers with individual: needs, wants, tastes and desires. In reality, consumption behaviours depend on the nature of the community in which the people live, and their individual lifestyles. In a consumer society, the process of consumption is directed toward: individual happiness, expression, status, wealth and success. Their self-identity, personal taste, status and personality are expressed and communicated to others through a demonstration of consumption patterns. Here the nature of the community in which people live may also shape their behaviour to a great extent. The behaviour of peers and neighbours engaging in the recycling and sustainable activities could influence the consumption pattern of the people. Also with regard to sustainable consumption behaviours, there are voluntary simplifiers whose lifestyle is based on consuming fewer goods. These people tend to live in a smaller and simpler communities and are aware and protect the environment through reduction and recycling of the waste materials and personal growth through development of the personal abilities (Emery, 2012; Belz and Peattie, 2009). For sustainable consumers there is a need for a mutual or cooperative interchange of favour between consumers and other people involved, which may result in the perceived sacrifice or change in lifestyle. Therefore, the potential customer is more likely to purchase sustainable products if such behaviour is duplicated by other stakeholders e.g. company owners, shareholders, employees, partners and government (Emery, 2012).

**6.2.2.4 Unfavourable attitudes to sustainable consumption**

Emery (2012) discusses a range of unfavourable consumer attitudes towards consumption of the sustainable products including conflict of

interest; where the individual consumer demonstrates an aversion towards change in their consumption pattern that entails personal impacts, effects and consequences for their life style. They appear to protect their personal rights to consume in a way they want, and enjoy their choice and variety without interference from the government or stakeholders (Ipsos MORI Reputation centre, 2007). A process of trade-off and self-interest may happen when the customers judge between two competing attributes – the sustainable attribute against the conventional one. An individual customer develops their own personal hierarchy of needs and wants to match a selection of relevant attributes. Consumers with a strong sentiment concerning their personal rights (and mistrust of business and government) may act as a barrier to engage with sustainability. Business and government have to succeed in convincing the people through relevant information and guidance about the sustainability before they succeed in convincing customers.

The risk factor is higher for sustainably motivated consumption, mainly because it is based on a belief in benefits that can take a certain amount of time to become apparent. In this case, there is an amount of research required before the decision to purchase. It is the marketer who has to guide the customer throughout the process of purchase decision-making and providing them with the right information and support during the post purchase period (Settle and Alreck, 1989; Stone and Gronhaung, 1993).

The common way to convey product details to the customers is through labels that have information about product-use and post-purchasing. Also other key factors like media and third party authorisation (like ISO, SIA and Fair Trade) play a crucial role in shaping consumers perception about a particular product.

### 6.2.3 Values and objectives of sustainable marketing (marketing strategy)

The marketing objective of an organisation is to fulfil organisational needs and wants by maximising profit ; achieved through exchange of products and value with individuals and groups. In order to meet this objective, marketers

need to understand customer needs and wants. The needs become wants when customers are directed to a specific object that may satisfy their needs. The basic human needs are physical (food, clothing, shelter and air), social (belonging and affection) and individual (self-expression and knowledge). Wants of individuals are generally shaped by their culture and their personality (Kotler *et al.,* 2008).

#### 6.2.3.1 Human needs and wants

Maslow (1970) developed a hierarchy of needs to explain individual growth which include: psychological needs (food, water, shelter, air), the safety needs (security, law and order, stability), the social needs (sense of belongingness, friends, family), the esteem needs (independence, status, self-respect), and the self-actualisation (self-fulfilment, personal growth). According to Emery (2012) the hierarchy suggests people must reach a certain level to move to the next level. In reality, people have different needs at different times and different priorities are attached to needs, so it is not necessary that they progress the pyramid in the same way as the others. However, considering sustainable issues, environmental sustainability highlights the psychological need for: food, fresh water; and safety needs including: shelter due to soil erosion, floods and other natural calamities. Emery (2012) reviewed the higher level of psychological needs related to the unsustainable materialistic wants that only provide temporary satisfaction. Higher needs like esteem tend to be unsustainable, as it may lead to the consumerist consumption activities such as purchasing on the basis of self-identity and influence by others. Once Maslow's hierarchy of needs is applied in context of sustainability; it is clear that consumers and marketers have to address the core needs at each stage of the hierarchy – and how these needs can be satisfied through alternative sustainable means.

#### 6.2.3.2 Values and objectives involved in sustainable marketing

In a consumerist market the main objectives are to satisfy the customer's needs and wants. In the case of sustainable marketing however, the objective is not only to satisfy wants and meet the needs – but also generate opportunities and happiness leading to lasting satisfaction. To generate the

sustainable market opportunities for different levels of people (whether rich or poor), all are included in the market through innovative products, business models and pricing models (Winn and Krchgeorg, 2006).

Sustainable marketing literature discusses the sustainable objectives in terms of: economic, ecological and social purpose; whereas the consumerist market objectives are revenue, market shares, profit and profitability. In the case of economic sustainability, the objective is to increase revenue and shares of a sustainable product compared to a conventional one. Thus, to attain a sustainable market, it should focus on a long-term relationship with the customer and prioritise their satisfaction and values (Belz and Peattie, 2009).

The ecological objective in sustainable marketing reflects the need to manage the ecological impact of the product and services during the: production, consumption, and disposal phase. The disposal of products and their packaging at the end of use is an important environmental challenge. A recycling or reuse scheme can contribute to increased efficiency. Also, providing appropriate information and labelling with respect to the product is an essential part of sustainable marketing (Lewis and Gertsakis, 2001).

Social objectives include: the improved safety of products during use, reduced negative impact on health, fair wages and employee safety. There is an increase in the number of customers who are concerned about the well-being of the people behind the production process. This has encouraged many companies to contribute to the well-being of wider communities. This is often achieved by means of donations and involvements in social, cultural and educational projects that enhance quality of life. Most companies follow a Cooperate Social Responsibility (CSR) approach for the well-being of their employees (Belz and Peattie, 2009 and Emery, 2012).

**Cooperate Social Responsibility (CSR)**

Bowen's (1953) definition of social responsibility focuses on the decision-making of business managers and their obligation to larger society. This situation is in stark contrast to CSR today; which emphasises the practice of

the institution rather than the decision making of individual managers (Murphy and Schlegelmilch, 2013). Carroll (1979) outlined CSR in a broader way in a pyramid (fig 6.2) of CSR which outlines four types of social responsibilities: economic, legal, ethical and philanthropic.


**Fig 6.2 The pyramid of Cooperate Social Responsibility (Carroll, 1991)**

The principal role of economic responsibility is to produce goods and services that consumers need and want, and make an acceptable profit in the process. Legal responsibilities reflect the view of “codified ethics” where the basic notions of fair operation of a firm are established by lawmakers. Ethical responsibility is concerned with what stakeholders regard as fair and just in keeping with respect to their moral rights. Philanthropic responsibilities encompass corporate actions engaging in acts or programmes to promote human welfare or good will (Carroll, 1991).

Murphy and Schlegelmilch (2013) find it difficult to derive a single definition for CSR because it is an umbrella term for many business related concepts, and evolves over time as values change. However, Mattern and Moon (2008) explain CSR as clearly articulated and communicated policies and practices of corporations that reflect the responsibilities of business for some wider societal good.

**Sustainable marketing and CSR**

Murphy *et al.,* (2013) indicate a link between CSR and the marketing ethics. According to them CSR in marketing encompasses the marketing obligation to all the stakeholders to integrate a firm's moral and legal duties to its constituents and society at large. The primary difference between sustainable marketing and CSR is the notion that market focused sustainability could be a strategy that leads to competitive advantage for an organisation – and ultimately, superior performance. Also organisations can integrate the customer to create a marketing strategy that is: valuable, rare, inimitable and difficult to substitute (Barney, 1991; Wernerfelt, 1984; Ketchen *et al.,* 2007).

Carroll (1991) discusses the ethical component in the CSR pyramid in context to the major stake holders. He explains ethical responsibilities under the principles of: justice, rights and utilitarianism. He categorised these principles under three moral types in the organisational context presented in table 6.1.

**Table 6.1 Principles under three moral types in the organisation**

| | Share holder | Employees | Customer | Local community |
|---|---|---|---|---|
| Immoral Management | Managers maximise their positions without shareholders being made aware | Employees are exploited and manipulated for the gain of individual manager or company | Customers are viewed as opportunities to be exploited for personal or organizational gain | Takes fullest advantage of community resources without giving anything in return |
| Amoral management | No thought is given to the ethical consequences of decisions for any shareholder group, including owners | Treating employees with minimal respect and treated as the law requires | Management is not focused on what is fair from the perspective of the customer and no consideration is given to the ethical implications of interactions with customers | Does not take the community or its resources into account in the management decision making |
| Moral management | All shareholders are treated in a fair and ethical manner | Employee's rights to: due process, privacy, freedom of speech, and safety are maximally considered in all decisions | Managerial focus is on giving the customer: fair value, full information, fair guarantee, and satisfaction | Firm engages in strategic philanthropy and management sees community goals and company goals as mutually interdependent |

According to Bakan (2004), when firms are criticised for irresponsible actions like: pollution, unfair treatment of the employees and suppliers, selling low quality products to the consumers etc.; it is Corporate Social Irresponsibility (CSI). The consumer's expectation to CSR suggests they are not willing to tolerate Corporate Social Irresponsibility (CSI) that leads to negative moral emotions including word of mouth and protest behaviour (Grappi *et al.,* 2013). However, as CSR in an organisation is concerned about the well-being of a broad set of stakeholders, the firms may voluntarily engage in the environmental CSR. This could happen because of new generations of green consumers who are willing to pay higher prices, and firms responding to them; or that businesses are taking proactive steps to avert public pressure and political conflict including: regulatory threats, enforcement pressures, and boycotts from non-governmental organisations (Lyon and Maxwell, 2008). Belz and Peattie (2009) explain the difference between CSR and marketing as the former focuses on the corporate level and stake holders, and the latter give emphasis to products and consumers.

The literature discusses CSR in different approaches such as: economic, legal, ethical and philanthropic – which gives importance to the fair treatment to all the stake holders. However, CSR strategy has to be built individually by each company depending on the environmental and the social issues related with the business. In order to follow a strategy which delivers benefits to the community and society; the ecology and environment has a crucial part to play. As discussed earlier, psychological needs in the 'hierarchy of needs' are fulfilled only through prioritising environmental and social issues.

### 6.2.4 Sustainable marketing strategy

According to Jain (2009) the three C's of marketing strategy are: the customer, the corporation and the competition. There should be a good alliance between the corporation and the customer, where the needs and wants of the customers are positively met. However, if the corporation's approach to the customer is identical to the competitor; the customer may find it difficult to differentiate between the product advantages. This may lead to price war. Based on the interplay of these three C's, the key questions of

marketing strategy develop. They are: where to compete or which market to compete in (segmentation and targeting), when to compete (time) and how to compete (differentiation and positioning). Kotler *et al*., (2008) briefly define marketing strategy as a marketing logic where the organisation hopes to achieve its marketing objectives discussed mainly in terms of: the market segment, market targeting and market differentiation and positioning.

Belz and Peattie (2009) support the idea of a sustainable marketing strategy which is about building a long-term relationship with customers that is beneficial for the business, but also for society and wider ecology. Here the researcher's aim is to discuss the market segment, target, time and positioning of the recycled yarn (incorporating sustainability issues).

#### 6.2.4.1 Market segmentation

A market consists of distinct groups of buyers and individuals who have different needs, characteristics or behaviour. They are divided into different subsets of customers who might require separate products or marketing programmes. It is easier to satisfy customers in sub groups as they are smaller and more homogeneous than the market viewed as a whole. The objective of segmenting is to identify segments of the market that offer the organisation (or retailer) an opportunity to serve the segment, and thus truly satisfy the needs of the customer (Kotler *et al*., 2008 and Cox and Brittan, 2004).

Emery (2012) suggests that segmentation is done according to the consumers' current behaviour and their willingness to act in a sustainable way. The market segment for the recycled yarn are hand knitters who are interested in making hand crafted products. The sustainability aspect of recycled yarn can offer added value the customers in that it is provided by an organisation with an approach of superior social and environmental performance. This may be an advantage that sets it apart from the competitors who provide similar products. A distinctive product with identical or superior performance at a competitive price with a sustainable dimension (and third party authentication) can help the customer identify, recognise and

understand the product and may gradually generate customer loyalty (Emery, 2012; Belz and Peattie, 2009).

#### 6.2.4.2 Market targeting

Market targeting is a process of evaluating market segments and selecting the segments to aim for with the company's offering. This segmentation helps the organisation to identify specific consumers as a focal point for their business activities – known as the target market (Kotler *et al.*, 2008; Cox and Brittan, 2004). In the case of a small scale worker cooperative organisation with minimum productivity of recycled yarn; the targeted market is a small segment (or group of customers) who are aware about the socio-economic credentials behind the project. The marketing priority is to spread the benefits of the product among its target customers in comparison with its competitors. If the recycled yarn can fulfil the expectations of the consumer in terms of quality and price, then the sustainability dimension has the potential to positively influence the customer's buying decision and loyalty.

#### 6.2.4.3 Market positioning

Positioning is a process of creating a product image in the minds of the targeted customer. This is achieved through arranging the product in a distinctive and desirable place compared to the competitors (Kotler *et al.,* 2008). In the case of a sustainable product, the main emphasis should not be sustainability (this has to be seen as an additional benefit). In order to reach customers who are not concerned about the sustainability, the product should be positioned according to other primary benefits, which interest the major part of the market (Ottman, 2011; Martin and Schouten, 2012). The sustainability aspects based around the recycled yarn (e.g. use of recycled silk remnants and low cost appropriate technology) can thus be positioned as secondary to its unique features like colour and texture to compete effectively in the hand knitting market. Alternatively the social credentials behind product production will position it in a niche market (Belz and Peattie, 2009). Here the sustainability factor is a competitive advantage for the product.

#### 6.2.4.4 Time

The researcher visited exhibitions and knitting yarn shops in UK; and then organised focus groups with hand knitters to review the recycled yarn along with the market available yarn. This exercise helped to gather information and about the existing market for the hand knitting yarns; because identifying the correct the timing to enter the market for a new product is very important. Belz and Peattie (2009) and Emery (2012) explain that there are benefits and challenges in introducing a sustainable product. Customers may show interest in a sustainable product, which may differ from their actual willingness to purchase. In order to generate demand for the recycled yarn, it is essential that the it competes with market available yarns in: quality, texture, colour and price.

### 6.2.5 Sustainable marketing mix

The main objective of this section is to evaluate the marketing mix as a marketing tool and critically analyse literature related with the '4P' paradigm. The classical marketing mix is proposed by McCarthy (1964) as the '4Ps', and are a means of translating marketing planning into practice. McCarthy's marketing mix includes: product, price, promotion and place; as the parameters that marketing managers could control (subject to internal and external constraints of the marketing environment).

Kotler *et al.* (2008) define the marketing mix as a set of controllable and tactical marketing tools that an organisation blends to produce the response it wants in the target market. Kotler (1967) broadened McCarthy's '4P' classification (which was about product orientation more than customer orientation). Kotler added: customer, environmental, competitive and marketing decision variables to it. Bennett (1997) explains the marketing process from the customer's perspective under a relationship marketing paradigm. The customers do not approach the adoption of the product and services with detailed knowledge of the marketing mix elements. Instead they look for satisfaction and benefits which are organised through the product and service features. Bennett defined customer sourcing activity as buyer disposition which is a process where the potential customer: thinks

through, evaluates, seeks counsel about, reflects on and finally decides the suitable source of supply for a product or service. The five criteria of buyer disposition are:

*Value* relates to the: quality, purpose, reliability, price, performance, reputation of the supplier, results or outputs, technical capability and symbolic attributes. These symbolic attributes include: uniqueness, irreplaceability and brand status of the acquisition. Value of the product is not purely related to money. The value added strategy is about establishing, maintaining and enhancing a relationship with the customers at a profit where the objectives of the consumer and the marketer are met (Gronroos, 1994).

*Viability* is related to the search for a legitimate or viable source of supply that may depend on the proximity of the individual to the source of supply.

*Volume* is the amount of product or service the client is offered in reality. Volume also refers to the: support for the product, stock availability, ability to buy in advance, consistent supply and self-life of the commodities.

*Variety* is concerned with the customer's freedom of choice. Customer choice should not be overlooked by providers of products and services.

*Virtue* is seen by "the clients and customers in the products and services and they are willing to develop a relationship with the provider when this virtue is a genuine reflection of the meaning of the exchange" (Bennett, 1997, p. 7).

In recent years there has been an important change in marketing thinking. Specifically this is a shift from the transaction-oriented exchange to: relation building, acquisition oriented to retention oriented marketing (Parvatiyar and Sheth, 1997). This change in the marketer's attitude happened because of: market saturation, economic crisis and increasing global competition; combined with unpredictable and inconsistent customer behaviour (Constantinides, 2006). Accordingly the application of Lauterborn's (1990) explanation to the marketing plan prioritising the customer using '4Cs'

instead of ‘4Ps’ indicating the customer-orientation perspective has gained momentum in the sustainable marketing mindset. The ‘4Cs’ are:

*Customer’s wants and needs*: markets have to lure each customer with something they particularly want, and the marketer sells what the consumer specifically wants to buy.

*Customer’s cost*: the price of the product is irrelevant; marketers have to understand the consumer’s cost to satisfy that particular want or need. When the marketer sells a product they are selling it against the customer’s cost of: time, conscience, and value of the product (which is a complex equation with as many different solutions as there are subsets of customers).

*Customer’s convenience*: In this era of catalogues, credit cards and online buying; marketers have to go beyond the traditional distribution channels and they should know how each sub-segment of the market prefers to buy, and be ubiquitous.

*Communication*: Instead of promotion, the marketer communicates with the customer through: interaction, understanding, sharing of information, knowledge and meaning.

The marketing mix offers tools in order to peruse a set of marketing objectives (Kotler *et al.,* 2008). Many academic writers discuss marketing from the customer’s perspective and customer orientation. Here, the researcher’s aim is to derive a conceptual principle, combining the business aspect of the product orientation, with the needs and wants of the customer. The literature reviews discussed have two objectives. The first summarises the existing research related to the sustainable marketing by identifying patterns, themes and issues. The second helps to identify the conceptual content of the field and can contribute to theory development (Harland *et al.,* 2006; Meredith, 1993). In order to develop a sustainable marketing contextual framework the researcher maps the connection between the 4P’s and the 4C’s and the 5V’s (table 6.2). the resultant mapping leads to a framework that represents the marketing strategy suitable for the recycled yarn (fig 6.3).

**Table 6.2 Literature combining the 4Cs, 4Vs and 4Ps of marketing mix**

| Focus<br>4Ps | Focus<br>4Cs | Findings | Focus<br>5Vs | Findings |
|---|---|---|---|---|
| **Product** | Consumer needs and wants. | Companies have to conduct intensive research about the wants and needs of the customer in order to understand customer behaviour. The road to customer wellbeing is through responsible consumption not reduced consumption (Stern, 2010). | Value | Adding customer value through services and benefits for the targeted customers.<br>Distinguish new ways to satisfy the customers distinctly from competitors (Ravald and Gronroos, 1996). |
| | | | Viability | Sustainable products available in the market place should be desirable through: convenience, lower operating cost and better performance (Ottman *et al.,* 2006). |
| | | | Volume | Reduce surplus supply using strategies like better product design, precision in the demand forecasting, and customised development and delivery (Sharma *et al*., 2010). |
| | | | Variety | What and how many products to offer the target market.<br>Introduction time for each product anticipating customer needs.<br>Identifying the physical or augmenting features of the product that do not drive the differentiation, variegation – and reduce variety (Ramdas, 2003). |
| | | | Virtue | Marketers to consider how the consumers are affected by the products.<br>Market should not sell the products that retard the character or virtue development of the consumer (Williams and Murphy, 1990) |

| Focus<br><br>4Ps | Focus<br><br>4Cs | Findings | Focus<br><br>5Vs | Findings |
|---|---|---|---|---|
| **Price** | Customer Cost | "The total customer cost of the product consists of both the monetary and non-monetary costs incurred during the evaluation, purchase, use and disposal" (Kotler and Keller, 2006, p.141).<br><br>A sustainable price account for the economic, environmental and social cost of the product's manufacture and marketing while providing value for the customer and profit for the organisation (Martin and Schouten, 2012). | Value | Most customers are willing to buy a sustainable good or service compared to less sustainable one if their quality and prices are equal to competitors (Roth, 2012). |
| | | | Viability | Improve the organisation's long-term economic development by the coordination of the supply chain activities which leads to fair pricing (Carter and Rogers, 2008). |
| | | | Volume | Actual value of the product is informed to the customer through price honesty that offers information about the price and payment conditions that is accurate and easily understandable which shows that the seller has not taken advantage of the consumers (Carter and Rogers, 2008). |
| | | | Variety | Differential prices are based on several criteria like the purchase moment, geographic area, quantity purchased or customer type. This is based on the customer's behaviour considered individually (Garbarino and Lee, 2003) |
| | | | Virtue | Marketers should place the price perspective in relevance to the potential market.<br><br>Fair pricing that generates ethical behaviour of the organisation implies not to speculate a power position and offer scarcity, a low information degree or other situations that may affect the interest of the stake holders (Diller, 2008) |

| Focus<br>4Ps | Focus<br>4Cs | Findings | Focus<br>5Vs | Findings |
|---|---|---|---|---|
| **Promotion** | Communication | The focal point of sustainable communication is attained through educating customers about the product in order to protect the credibility (the ethical behaviour of the business) and secure the resource in which the business is based (World Business Council for Sustainable Development).<br>Labelling to communicate and clarify sustainable credentials (Belz and Peattie, 2009).<br>Promotion through word of mouth (Kotler, 2011; Rosen, 2000). | Value | Promotional efforts should focus on how ecological aspects complement other functionality to provide better overall value and added benefits (Semon, 2006). |
| | | | Viability | To build an important brand relationship there has to be two-way communications through better listening to the customer and interactivity before, during and after transaction (Duncan and Moriarty, 1998; Zinkhan *et al*., 1996). |
| | | | Volume | A customer cannot exchange money for goods without any communication about what is being offered and what is being asked for in return. So there has to be a significant communication component in the physical and technological handling of the product (Duncan and Moriarty, 1998). |
| | | | Variety | The consumer benefits, the environmental effectiveness and claims of the sustainable products need to be promoted honestly. The sustainable claims can be compared with comparable alternatives or likely usage scenarios (Ottman *et al.,* 2006). |
| | | | Virtue | Promotion advocating a theory of virtue that includes: perseverance, courage, integrity, compassion, candor, fidelity, prudence, public spirit, justice and humility (May, 1984) |

| Focus<br>4Ps | Focus<br>4Cs | Findings | Focus<br>5Vs | Findings |
|---|---|---|---|---|
| **Place** | Customer convenience | Product and services should be conveniently available for the consumers through various means of purchasing like internet, catalogues, using credit cards etc. (Emery, 2012; Belz and Peattie, 2009). | Value | Due to increased outsourcing, the number of companies involved in a supply chain has greatly increased. As a response, the companies have introduced supplier evaluation schemes which integrate environmental and social criteria (Trowbridge, 2001 and Koplin *et al.,* 2007). |
| | | | Viability | The diverse nature of needs and wants relevant to resources may make consumer behaviour less predictable to forecast. In such an atmosphere organisations can succeed only by adjusting their supply to demand (Sharma *et al*., 2010). |
| | | | Volume | Surplus supply by companies may lead to non-consumption of the product. Due to oversupply, some products are never sold and may go to recycling without ever reaching a consumer. Key strategy to overcome this problem is demand-driven manufacturing (Sheth *et al.,* 2000; Sharma *et al*., 2010). |
| | | | Variety | The companies have to devise sustainable products in response to customer demands and market changes (Ottman, 1994 and Menon, 1997). |
| | | | Virtue | Priority on honesty and cooperation in dealing between the multiple intermediaries in the channel of distribution should be more conducive to virtuous behaviour (Gundlach and Murphy, 1994). |

### 6.2.6 Marketing strategy framework for recycled yarn

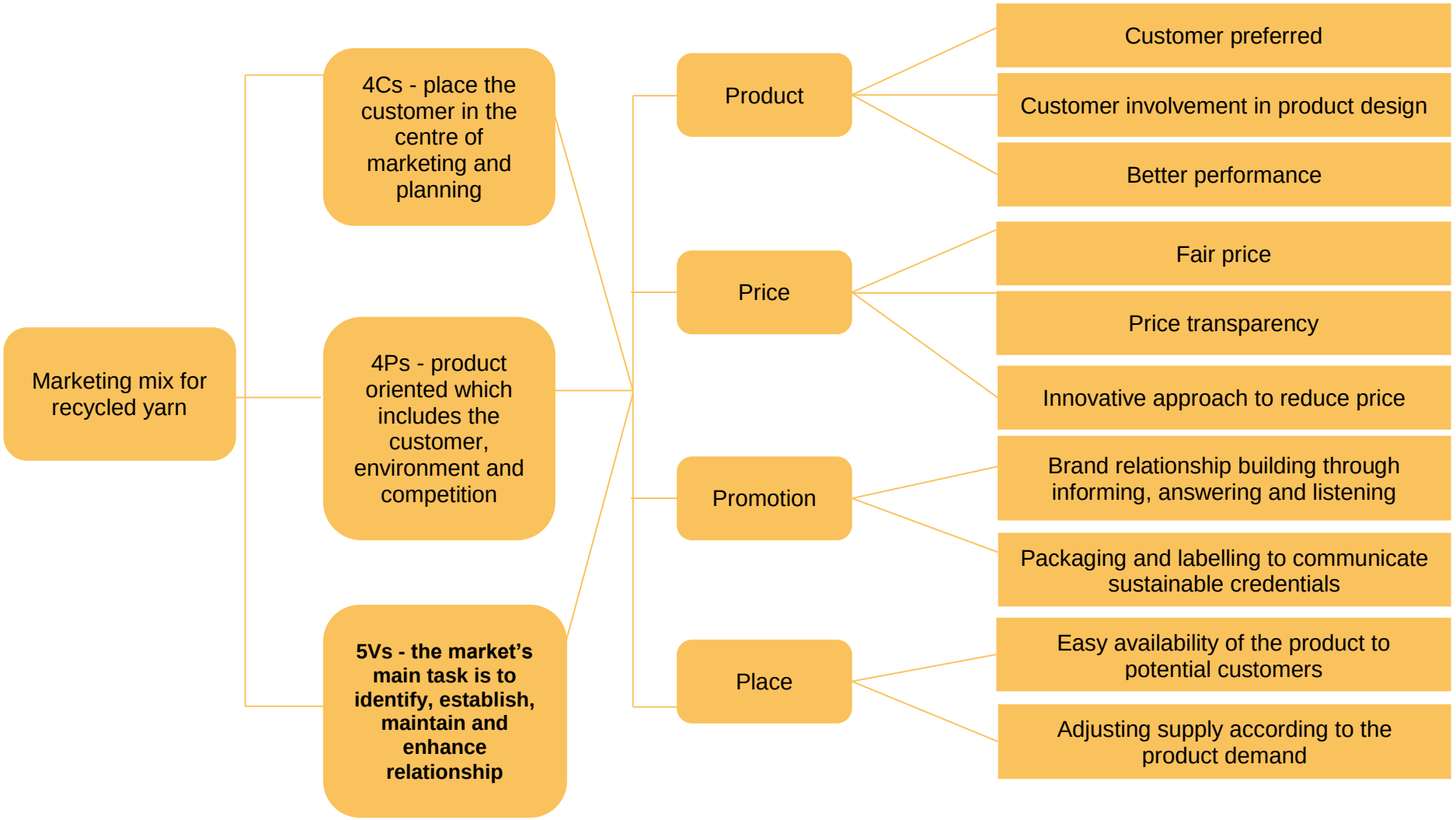



**Fig 6.3 Marketing strategy framework for the recycled yarn**

In order to frame the marketing strategy for the recycled yarn the researcher apply the '4Ps' paradigm to discuss the marketing mix.

### 6.2.6.1 Product

According to Kotler *et al.,* (2008) product design begins with understanding the customer needs. In order to determine the marketability and quality of the recycled yarn, the researcher conducted a series of experiements with hand knitters including: focus groups, and other quantitative and quantitative experiments. The data received from the primary research are critically reviewed along with the secondary data to analyse the sustainable aspects.

Sustainable product development is integrated with reduced environmental impact across the whole product life cycle (Weenen, 1995; Belz and Peattie, 2012; Martin and Schouten, 2012). Life Cycle Assessment (LCA) is a tool used by companies to analyse the environmental impact of a product during its life; from raw material extraction, processing and production, packaging, distribution, product use, and finally, disposal (Belz and Peattie, 2012, Lewis and Gertsakis, 2001). In the case of the recycled yarn the environmental impact is not strictly followed in all stages of the life cycle. Considering the list of the sustainable product characteristics discussed by (Charter *et al.,* 2002) the recycled yarn production includes most of the sustainable elements recommended – in that it is: non-polluting, manufactured from renewable resources, free of forced labour in manufacturing, designed to last, easily repairable, free of hazardous materials in production, provides sufficient product information, reusable and recyclable, using minimal packaging. Furthermore, empowerment of women through an income generating activity is the main objective of this project.

### 6.2.6.2 Price

Price is one type of information that is correlated with quality (Olshavsky *et al*., 1995). A transparent price strategy helps the customer to understand how prices are set for the recycled yarn, This can be attained through posting the split of pricing in an accessible form on the organisational website, or a quadratic residue code (QR code) in the label that can provide

the customer easy access to the cooperative website. The web site can be set up once the production starts running and yarns are market available. Price transparency means the customer can obtain price information easily, and compare it with other choices (Austin and Gravelle, 2008). The production technique used is appropriate technology which is cost effective and it keeps the overall production cost to minimum (Schumacher, 1973).

#### 6.2.6.3 Promotion

Consumers have high expectations that the products they buy do not cause significant environmental or social harm. Many consumers seek information about: how products are made, what they are made from, how far they travel and how they are packed (Arnold *et al.,* 2010). The recycled yarn has strong socio-economic credentials; having a deep rooted connection with the traditional Indian heritage.

The standard definition for a brand is a name or a symbol that is directly used to sell the product or service (Miller and Muir, 2004). The hand spun recycled yarns have specific ideologies and brand image, which highlight the ethics behind the product. In order to develop a branding strategy, it is necessary to design: a brand name, labels and packaging which directs customers into perceiving the brand as it is meant to be (6.4 explains the brand name and packaging for the recycled yarn).

#### 6.2.6.4 Place

Customer convenience (or place) reflects the process of making the products accessible and available to purchase at a place and time that suits the consumer (Belz and Peattie, 2009). Belz (2006) discusses single-trip shopping which is time and resource efficient. Considering these facts the recycled yarn proposes promotion through e-marketing (electronic marketing) techniques and craft exhibitions. According to Constantinides (2006) internet marketing is a complicated terrain combining several categories like: consumer marketing, retail marketing, service marketing, and relationship marketing. Constantinides (2006) proposes that planning e-marketing is based on eight critical factors: potential audience, integration,

market support, brand migration, strategic partnership, organisational structure, and budget. Even though e-marketing is a wide area of research with various challenges; the researcher has considered the potential of e-marketing and social networking as a reliable medium to market the recycled yarn. The supply of the yarn is restricted according to the supply of silk remnants from the handlooms. As discussed by (Sheth *et al.,* 2000 and Sharma *et al.,* 2010) the supply can be demand-driven or custom made according to the customer requirement, which is more convenient through an online customer interaction.

## 6.3 Initial market research for the recycled yarn

Phase 1 of the research, as presented in table 2.4 (Phases of data collection and evaluation), highlights the unstructured interviews with yarn retailers in UK, and the survey conducted with the hand knitters at the Knitting and Stitching Exhibition at Harrogate.

**Recycled yarn review with UK retailers**

The researcher conducted two unstructured interviews with the Managing Director, Texere Yarns Ltd, a business that supplies the hand-craft sector with a variety of yarns (some of which are sold to the hand knitting sector). The other unstructured interview was conducted with the Managing Director of Gossypium. Gossypium was founded in 1998 and it is one of UK's first organic and fair-trade clothing shops in Lewes High Street.

### 6.3.1 Informal interview with retailer 1

The first meeting with Managing Director, Texere Yarns, was conducted on 1st of March 2012, a month after the project had started. The aim of the visit was to observe the variety of hand knitting yarns available, the market potential of hand knitting yarns in UK. The objectives for the visit were:

- To understand consumer choice for the knitting yarns in terms of colour, fiber content, weight and yarn structure
- To investigate the possibility of retailing the recycled knitting hand spun yarn.

According to the interviewee, there is always demand for hand knitting yarn and his customers were particularly interested in: colourful, textured fancy yarns, which can knit unique patterns. It is difficult to interpret the customer's personal taste and preferences in terms of: colours, structure or yarn design; as there was no particular trend followed by the hand knitters, and his customers were always ready to experiment with a variety of yarns. The store have 100% recycled silk sari yarn (fig 6.4). These yarns were imported from industrial weaving mills in India, which were hand spun to knitting yarn. The yarn skeins were measured by length (not weight) as the weight may vary from batch to batch. According to the retailer these yarns are coarse and hairy and not preferred by his customers because of the poor tactile property.


**Fig 6.4 Recycled sari yarn downloaded from Texere yarns Ltd website on 22/10/2012**

The retailer showed interest in the idea of combining the silk remnants with the lamb's wool, and advised to refine the recycled yarn in terms of handle and texture. In the second visit, the researcher carried four hand knitted samples using recycled hand spun yarn with different fibre content. The samples were knitted using 4mm and 5mm needles. One of the sample was in acrylic mixed with silk, and the remaining were two combinations of

recycled yarn with 50% lamb's wool and 50% silk remnants, and 70% lamb's wool and 30% silk remnants.

The retailer did not consider the acrylic combination because of the handle and appearance. From the lamb's wool silk combination it was difficult for him to differentiate the swatches knitted using 50% and 30% silk remnants. This encouraged the researcher to keep the silk remnants as 30% of the total content of the yarn.

### 6.3.2 Informal interview with retailer 2

Gossypium was founded in 1998 and it is one of UK's first organic and fair-trade clothing shops on Lewes High Street in the UK. Gossypium products are made from pure organic cotton. The cotton is produced by small-scale farming families who are part of Agrocel farming project in Kutch, Western India. Gossypium use cotton, which is grown under environmentally friendly conditions, without exploiting farmers.

The informal interview with the Managing Director, Gossypium was an opportunity for the researcher to discuss the quantity requirements for retailing the recycled yarn. The discussion was conducted in the Clothworkers Building, University of Leeds. Samples of the recycled yarn and the method of production were explained to the retailer. According to her, the silk remnants and lamb's wool combination of 30/70% and 50/50% did not show variance in colour and handle. In addition she stated that: the yarn has a good tactile property, the colour combinations were attractive, and the method of production is environmentally sound. She suggested to maintain a colour file for the silk remnants that were available, and develop a range of recycled yarns according to the colour file which can be reproduced later according to the market requirements. The uncertainty in guaranteeing colour combinations and quantity requirements to knit an item could make the marketing aspect of the yarn challenging. Also Gossypium showed interest to be a potential market access point and offered technical help for the product.

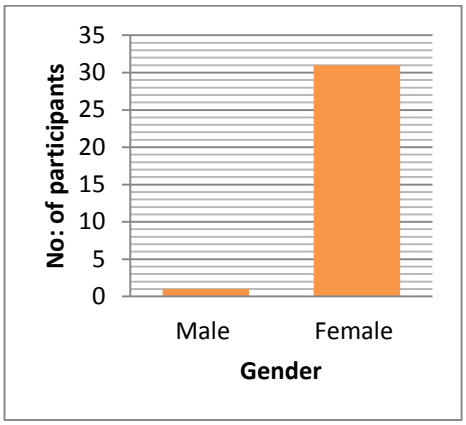
Based on the data gathered from the retailers, the researcher was able to analyse the limitations for retailing the recycled yarn. The main constraints to commercially retail the yarn was to keep consistency in the colour combinations for repeated orders, and to maintain retailing minimums. This is mainly because the producer cannot have control over the colours available in silk remnants collected from the handloom. As discussed earlier in the chapter, the researcher identified craft exhibitions and online selling as the appropriate means to promote the yarn.

### 6.3.3 Survey method used to review the overall features of the recycled yarn

Based on the data gathered from retailers the next step was to test the quality and appearance of the yarn with hand knitters. The common values followed by hand knitters in the selection of yarn (e.g. colour, texture, handle) were included in the questionnaire along with questions related to the social and recycling factors of the yarn. The survey was conducted at Knitting and stitching show at Harrogate.

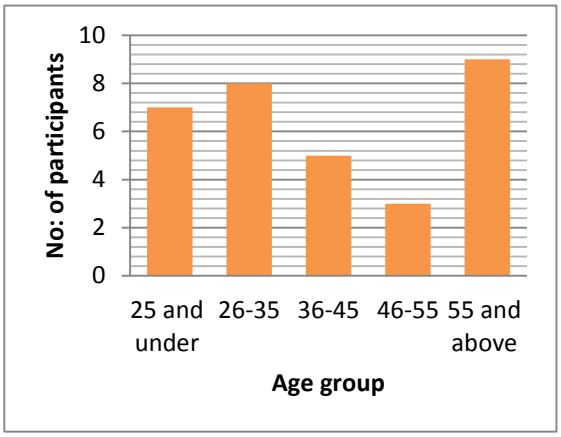
De Vaus (1996) describes questionnaires as the easiest way of generating a structured data matrix, and it is believed that they are the most common technique used in survey research. According to Herzog (1996) the questions used for the survey must be, clear which can be achieved by using specific words or phrase rather than general ones. The descriptions of the recycled yarn were carefully selected and were arranged in options for the respondents to select. The initial design of the questionnaire was delivered to some of the textile students as a pilot test. They responded enthusiastically and provided useful suggestions in improving the user friendliness of the questionnaire. Based on the changes, a final questionnaire was developed and the survey was conducted on 24$^{th}$ November 2012 with 32 respondents.

## Survey results



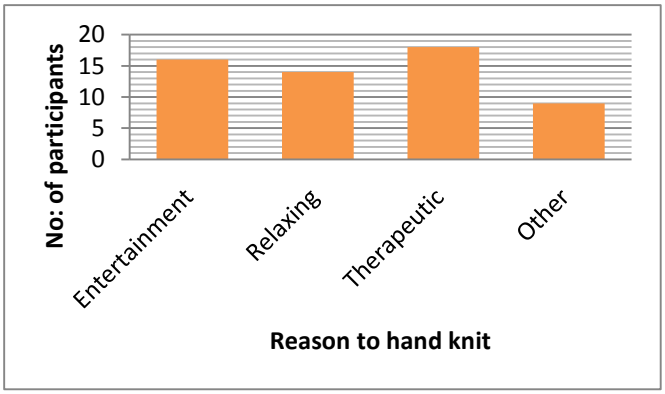

| Gender | |
|---|---|
| Male | 1 |
| Female | 31 |

**Fig 6.5 Respondents' in terms of gender**



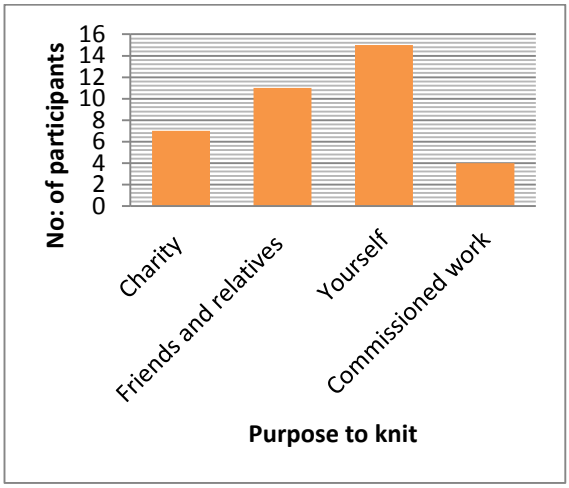

| Age | |
|---|---|
| 25 and under | 7 |
| 26-35 | 8 |
| 36-45 | 5 |
| 46-55 | 3 |
| 55 and above | 9 |

**Fig 6.6 Respondents' in terms of age**



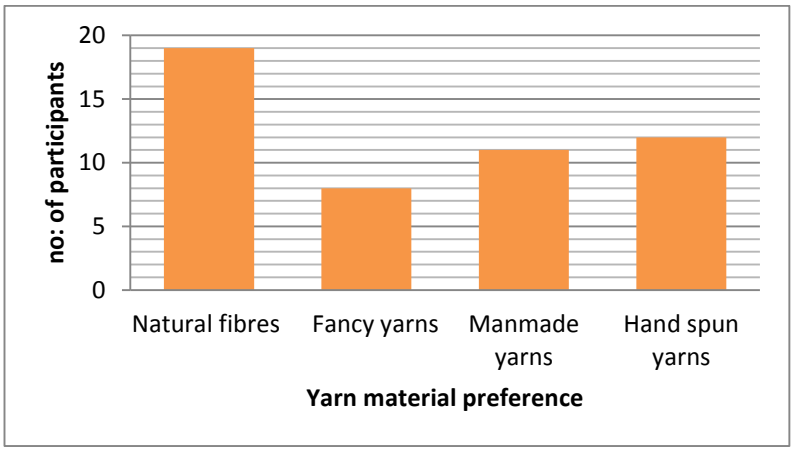

| | |
|---|---|
| Entertainment | 16 |
| Relaxing | 14 |
| Therapeutic | 18 |
| Other | 9 |

**Fig 6.7 Respondents' reason to hand knit**



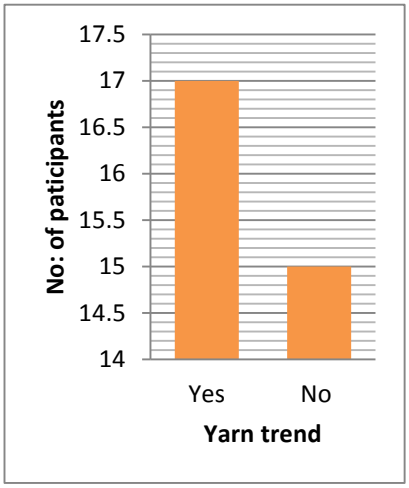

| | |
|---|---|
| Charity | 7 |
| Friends and relatives | 11 |
| Yourself | 15 |
| Commissioned work | 4 |

**Fig 6.8 Respondents' purpose to knit**



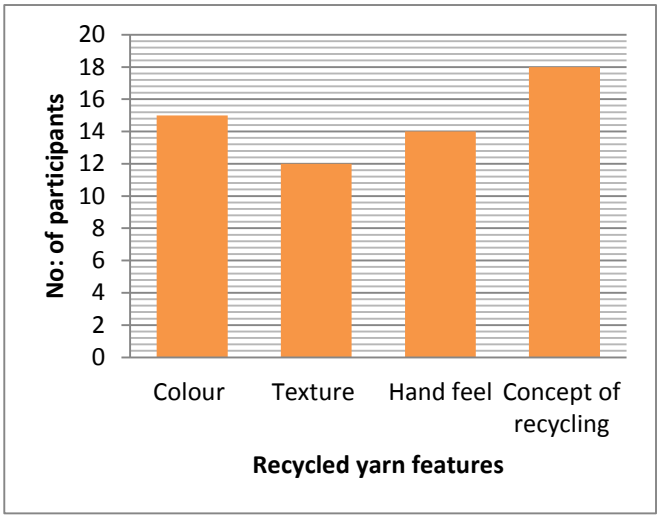

| | |
|---|---|
| Natural fibres | 19 |
| Fancy yarns | 8 |
| Manmade yarns | 11 |
| Hand spun yarns | 12 |

**Fig 6.9 Respondents' material preference**



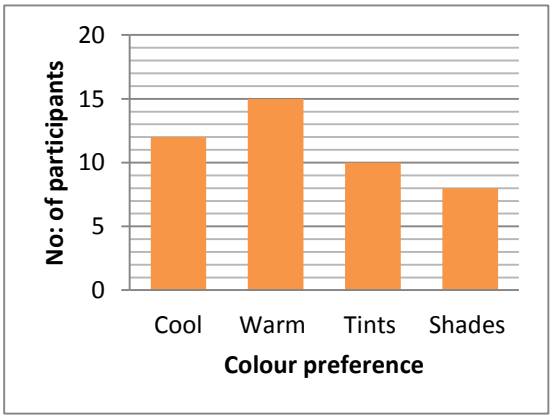

| | |
|---|---|
| Yes | 17 |
| No | 15 |

**Fig 6.10 Respondents' consideration for yarn trends**



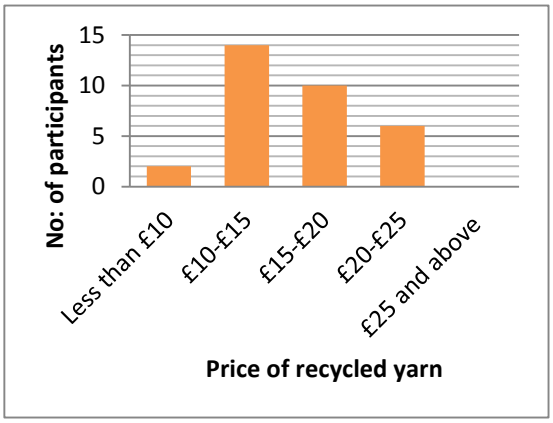

| | |
|---|---|
| Colour | 15 |
| Texture | 12 |
| Hand feel | 14 |
| Concept of recycling | 18 |

**Fig 6.11 Response to recycled yarn features**



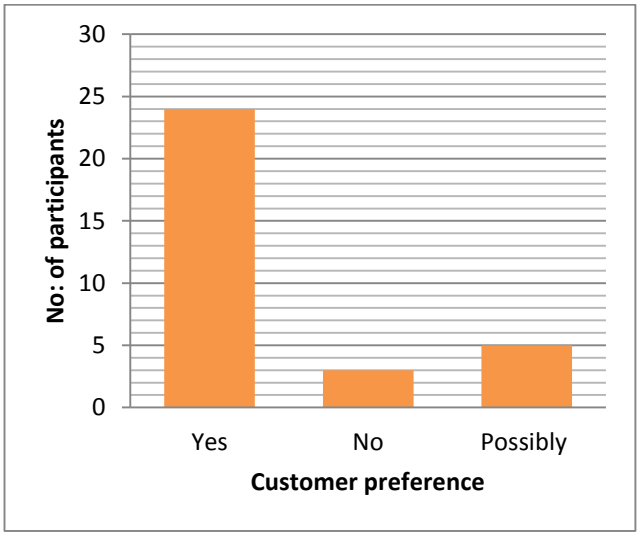

| | |
|---|---|
| Cool | 12 |
| Warm | 15 |
| Tints | 10 |
| Shades | 8 |

**Fig 6.12 Respondents' colour preference**




| | |
|---|---|
| Less than £10 | 2 |
| £10-£15 | 14 |
| £15-£20 | 10 |
| £20-£25 | 6 |
| £25 and above | 0 |

**Fig 6.13 Respondents' willingness to pay for 100g skein of recycled yarn**




| | |
|---|---|
| Yes | 24 |
| No | 3 |
| Possibly | 5 |

**Fig 6.14 Influence of socio-economic factors in customers buying preference**

The analysis of the survey results revealed significant evidence about the hand knitter's preference in choosing the knitting yarns. The results have guided the researcher to improve the handle and texture of the recycled yarn through carding the silk remnants separately – this made it easier to open the fibre and blend evenly with the lamb's wool (discussed in chapter 4). The hand spinning quality also improved through controlling the twist insertion. The survey outcome helped the researcher to frame the questions for the focus group which was conducted at the next stage of the research (present in chapter 7).

## 6.4 Branding of the recycled yarn

From the initial market observations the researcher identified various range of hand spun and recycled knitting yarns that are already available in the market. In order to distinguish the recycled yarn from market available yarns

the researcher developed a brand name, packaging and labelling that conveys the social ideology behind the product to the customer.

Kotler (2011) defines branding as a way of differentiating company's goods, or services from those of its competitors. The brand help the customers make their choice and an important feature for a brand is the brand name. Kotler (2011) describes six criteria for choosing a brand name: memorable (short and easy to pronounce), meaningful, likable (relates to the aesthetic of the name), transferable (name to represent the new product in a new market), adaptable and protectable (legal aspects of trade mark). Accordingly the researcher developed a brand name and packaging considering the social ethics behind the development of the yarn and its unique features (e.g. colour and texture) that differentiate it from the other market available yarns. A survey that includes both closed questionnaires and open online discussions was conducted on www.ravelry.com a knitter's website where the members exchange their knitting ideas and experience. More than 100 respondents participated and their feedback and comments helped to understand the packaging preference of the knitters. A comment received on the Ravelry summed up the study of the target market for hand knitters, "Folks who buy yarn come in all ages, genders, socio-economic niche. You name the classification; there are fibre people in it. Goths to gamers, grannies and everyone in between and their cousins and co-workers besides; we do it for fun, for love, for fashion, for charity, for stress relief, for artistic expression, and on and on". After receiving comments from the participants it was concluded to "Kamal" (meaning 'lotus' in Hindi) as a brand name (the online data collection method is added in appendix).

According to Blythe (2006), packaging can be considered as part of the product. Successful brands have understood that the packaging is not only meant to cover and protect the product, but it can also market it, starting from the selection of the colours used. Most of the participants preferred a simple packaging with the yarn in skeins that included a brief story about the making of the yarn. A clean good quality reusable tag holding the yarn

skeins was found to be interesting to the participants. It could be used as a gift tag with easy to understand care instructions.

**Design outcome**

The label was designed first and based on that outcome, the rest of the deliverables were designed. The label included information about the composition of the yarn, the socio-economic impact, the technical details like the needle size and the hook size, weight of the yarn, the shrinkage of the knitted fabric.

A write-up was prepared which explains the significance of the lotus and the socio-economic impact behind the project. A photograph of the sari remnants with loose yarn ends was used as design element. This portrays to the customer that the yarns came from the silk remnants collected from the handloom after weaving the sari. Recycled paper was used to give the packaging a visually textured design, evoking the recycling of materials embedded in the yarn (fig 6.15).

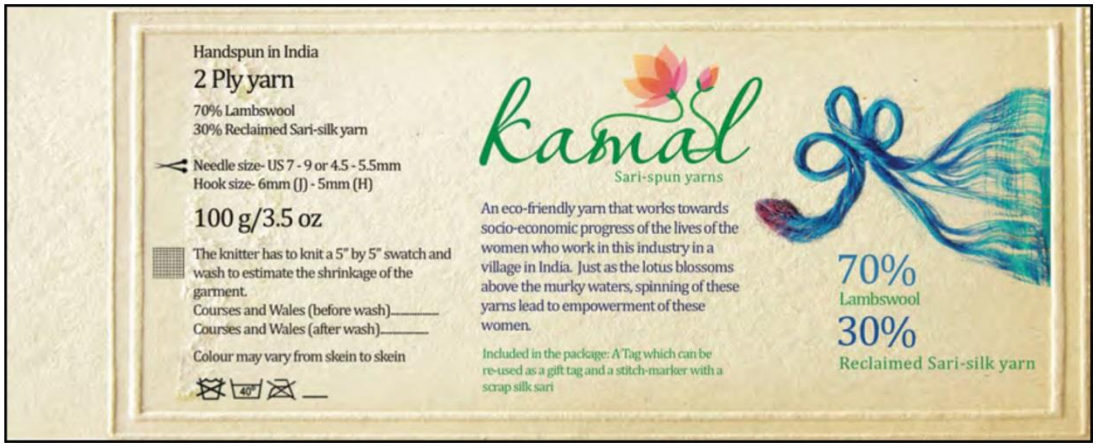



**Fig 6.15 Final labels for the recycled yarn**

The textured background along with the photograph of the sari-remnants was used in all the deliverables to give the brand an consistent visual identity. The gift-tag is double sided; one side had the logo and the wash-care instructions while the other side had a personalised message “hand-crafted for you with love” (fig 6.16). Space was left where the knitter could

write their own name and the name of the person they are gifting the garment to.


**Fig 6.16 Final tags for recycled yarn**

A box was designed to sell multiple skeins in a more eco-friendly and attractive way. Information gathered from the primary research conducted on labelling and packaging, it was evident that the consumers brought yarns in bulk – as they needed at least 5-7 skeins containing 100grams yarn to complete a sweater (fig 6.17).


**Fig 6.17 Gift box**

Thus, the box provided an incentive to buy yarns in larger quantities. The box was designed in a way that it could be re-used as a gift box. The background for the box was designed to be similar to the tag and labels; as to appear uniform and consistent with the brand. The flap in the front, which

closed the box, had a ‘made with love’ design printed on it and small round magnets are placed inside the box and on the flap. The gold dust paper was used for the sides of the box so it adds an ethnic Indian appeal to the box. This was specifically chosen because the Kanchepuram saris have a very classic and auspicious image; thus in order to carry forward that image, the golden colour was chosen to cover the sides of the box. The base inside the box had a knitted fabric image printed on it to give a visually textured design and to communicate to the consumer that the box intended as a gift-box for the knitted item. The edge detailing was done with leftover waste sari remnants to add emphasis on the fact that the yarns were sari-spun.

## 6.5 Summary

In recent years sustainable marketing studies have focused on the environmental, social and economic implications of marketing. Through the literature review, the implications of these three factors in marketing are analysed. It is found that integration of all three factors is essential to form a sustainable marketing strategy. Sustainability is a holistic approach for the organisational activities, which is not restricted only to the marketing. The literature acknowledges the fact that along with the organisation; the attitude of the consumer’s consumption behaviour has to change. The tools used to modify relevant attitudes and behaviour include: regulations, economic instruments and provision of information educating organisations and consumers about the socio-environmental damage that can happen due to unsustainable production and consumption (Rogerson *et al*., 2010). Holyland *et al.,* (1953) argues that, in order to change customer behaviour the communication channels deployed have to consider three main factors: the source (who), the message (what) and the audience (to whom). Source factors include the credibility, attractiveness, expertise and likability in the subject area. Message factors are: the order of the argument, side of the argument and type of appeal (fear or humour). Audience factors are the: demographic, personality, interest and knowledge and all these elements have to be taken into consideration while doing a campaign.

Gorden *et al.,* (2011) in his sustainable marketing framework developed a combination of: green marketing, societal marketing and critical marketing. The actors in the critical marketing discussed are: marketers, organisations and the government who can change the market system and regulate to encourage and provide sustainable production and consumption. In reality, the education and awareness that is used when targeting the attitudes and behaviour of organisations and customers are strong. However, these measures may have little influence on generating the required behavioural shift in consumers if they encounter incentives such as prices or social norms (Rogerson *et al*., 2010). Stirling (2008) argues that interactive and efficient communication between: decision makers, technical experts, stakeholders and the public; may change consumer attitude and behaviour. The marketing strategy developed by researcher for the recycled yarn uses the elements of the marketing mix which were complementary to each other. The main focus is to keep the relevant stakeholders connected from preproduction until postproduction stages of the yarn. The aim is to involve customers right from the product development stage through transparency in pricing communicated through packaging and labelling; alongside managing availability of the product according to customer demand – thus keeping the stakeholders informed about the product features and its sustainability aspects.

# Chapter 7
# Data collection and analysis

This chapter discusses, in detail, the analysis of the research data collected to investigate the functional and aesthetic properties of the recycled yarn in phase 2 (table 2.4) of the research. This chapter is organised in three stages. Stage 1 presents the data composed of the objective tests, stage 2 discusses the subjective tests; and stage 3 examines the wearer test results (table 7.1). The results from each of the different data collection methods were triangulated to compare the findings from the three stages (fig 7.1).

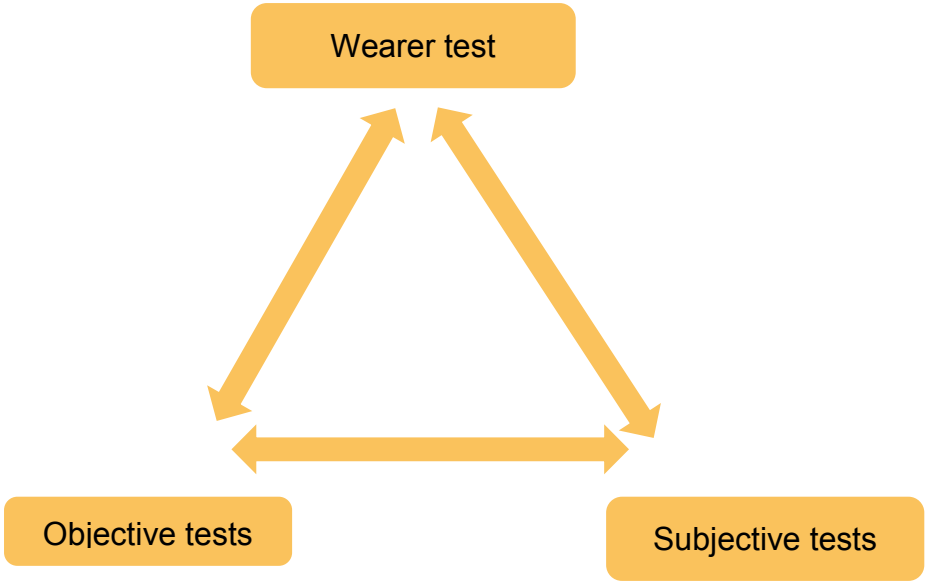



**Fig 7.1 Triangulation of data collected using different methods**

**Table 7.1 Stages of data collection**

| **Phase 2** | | |
|---|---|---|
| Stage 1 ⟷ | Stage 2 ⟷ | Stage 3 |
| Twist constant calculation | Focus group | Wearer test |
| Fabric shrinkage | Semantic differentiation test | |
| Pilling propensity | Yarn appearance test | |

## 7.1 Stages in phase 2

In order to compare and evaluate the physical properties of the recycled yarn in stage 1 and stage 2, the researcher had sourced five market available yarns. In total six knitting yarns were used for experiments; out of which one is the recycled hand knitting yarn using 30% silk remnants and 70% lamb's wool. The commercially sourced yarns included two samples of lamb's wool, one in 100% acrylic, one in 90% lamb's wool and 10% angora, and the finally a continuous filament silk yarn.

Stage 1 (Twist constant calculation): a twist tester was used to unwind the twist in the yarn until the fibres were parallel to the yarn axis. This test helps to count the number of turns required to do this (Saville, 2000). This test was done to calculate the magnitude of the yarn twist.

Stage 1 (Fabric shrinkage): the yarn samples were knitted in 5x5 inch swatches and were cleaned in three different ways: hand wash, machine wash and dry clean. The courses and wales per inch of the swatches were calculated before and after wash to determine shrinkage.

Stage 1 (Pilling test): is conducted to test the fabric samples resistance to pilling. The test was conducted in an ICI pilling box that has two boxes on both the sides lined with rough surface.

Stage 2 (focus group): To focus groups were conducted to evaluate the aesthetic, functional and socially sustainable aspects of the recycled yarn in comparison with the market available yarn. The focus groups results were decomposed to a matrix to analyse the quality criteria for a range of six yarns and to select appropriate adjectives to frame semantic differentiation grids for next stage of the study.

Stage 2 (Semantic differential test to analyse the handle of yarns and fabric); a group of 20 participants tested the tactile qualities of five market available yarns along with the recycled yarn under a feely box. The participants were asked to evaluate the knitting yarns on a bipolar scale with adjectival

description taken from the focus group transcript. The samples were evaluated in both yarn and in fabric stage.

Stage 2 (yarn appearance test): a set of 25 participates analysed the overall appearance and colour of the six yarn samples. The participants were asked to arrange the yarn samples in an order according to their preference.

Stage 3 (wearer test); a large size men's sweater was hand knitted using the recycled yarn and wearer tested for eight months with two participants. The change in the physical properties of the sweater was recorded before and after the test. This experiment examines the physical properties of the sweater in wet and dry stage.

## 7.2 Objective analysis of the recycled hand spun yarn

This section discusses the objective test results in stage 1 in phase 2 of the research.

### 7.2.1 Twist constant calculation

The yarn samples were conditioned in a standard testing atmosphere before conducting the experiments. A simple twist tester is used to unwind the twist in the yarn.

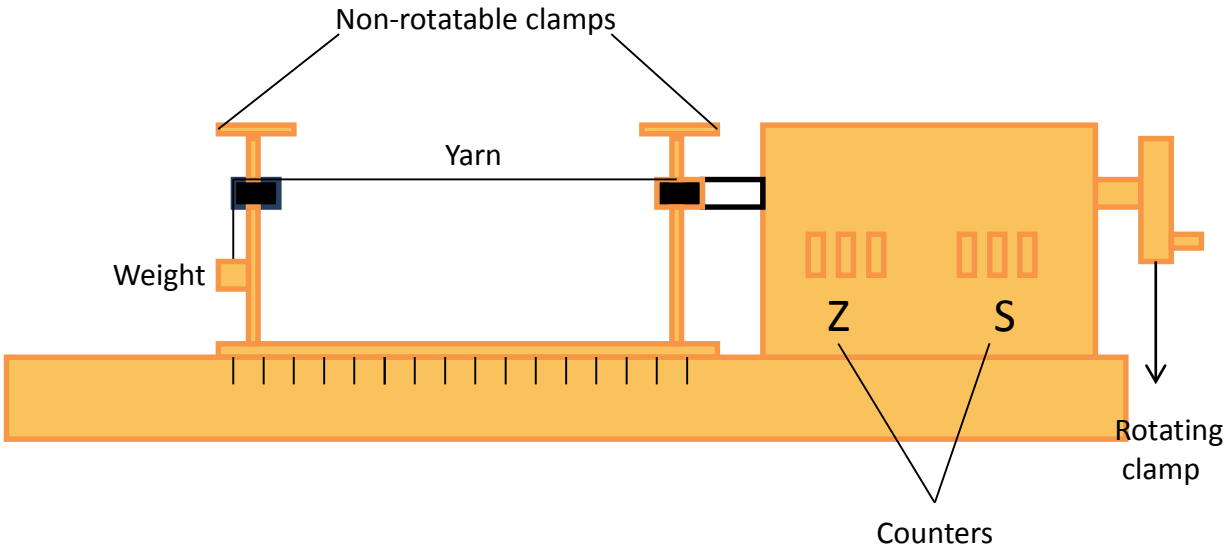



**Fig 7.2 Yarn twist tester**

The testing is conducted with 10cms lengths of plied yarn which was cut and weighed from the samples. The yarn was fixed between the two non-rotatable clamps which were set at a distance of 10 cm. The rotating clamps are attached to a counter that records whole turns and fractions of a turn. This helps to unwind the twist in the yarns until the fibres were parallel to the yarn axis and count the number of turns. The twist was removed by turning the rotatable clamp until it was possible to insert a needle between the fibres across the non-rotatable clamps. The twist direction and turns per centimetre were recorded. In the case of folded and plied yarns, two levels of twist was recorded. Firstly the individual strands and secondly the twist that holds the individual plies together. In order to analyse the twist in individual yarns, first remove the folding twist and then cut out individual yarns leaving a single strand which is measured in the twist tester (Saville, 2000).The magnitude of the twist constants for single woollen yarns are described in the table 7.2.

**Table 7.2 Twist magnitude for singles woollen yarn (Rae and Bruce, 1973)**

| Twist designation | Twist constant |
|---|---|
| Hard | > 5400 |
| Medium hard | 4600 – 5400 |
| Normal warp | 3800- 4600 |
| Normal weft | 3000-3800 |
| Soft | 2200-3000 |
| Very soft | < 2200 |

To conduct the experiment a group of yarns in which five are commercially sourced yarns along with the recycled yarn developed by the researcher. The yarns are coded as:

Y1 - 100% Lamb’s wool

Y2 - Lamb’s wool angora

Y3 - 100% silk

Y4 - 100% Oiled Lamb’s wool

Y5 - Recycled yarn

Y6 - 100% Acrylic

Calculation of the twist constant of yarn samples aids the identification of the twist designations; this in turn assists the categorisation of the samples according to the standard yarn weight system in table 7.2. The table 7.3 give an overview of gauge ranges, and recommended needle and hook sizes

### 7.2.2 Standard yarn weight system

**Table 7.3 Categories of yarn, gauge ranges, and recommended needle and hook sizes (www.craftyarncouncil.com/weight)**

| Yarn Weight Symbol & Category Names |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| **Type of Yarns in Category** | Fingering 10-count crochet thread | Sock, Fingering, Baby | Sport, Baby | DK, Light Worsted | Worsted, Afghan, Aran | Chunky, Craft, Rug | Bulky, Roving |
| **Knit Gauge Range* in Stockinette Stitch to 4 inches** | 33–40** sts | 27–32 sts | 23–26 sts | 21–24 st | 16–20 sts | 12–15 sts | 6–11 sts |
| **Recommended Needle in Metric Size Range** | 1.5–2.25 mm | 2.25—3.25 mm | 3.25—3.75 mm | 3.75—4.5 mm | 4.5—5.5 mm | 5.5—8 mm | 8 mm and larger |
| **Recommended Needle U.S. Size Range** | 000–1 | 1 to 3 | 3 to 5 | 5 to 7 | 7 to 9 | 9 to 11 | 11 and larger |
| **Crochet Gauge* Ranges in Single Crochet to 4 inch** | 32–42 double crochets ** | 21–32 sts | 16–20 sts | 12–17 sts | 11–14 sts | 8–11 sts | 5–9 sts |
| **Recommended Hook in Metric Size Range** | Steel*** 1.6–1.4 mm | 2.25—3.5 mm | 3.5—4.5 mm | 4.5—5.5 mm | 5.5—6.5 mm | 6.5—9 mm | 9 mm and larger |
| **Recommended Hook U.S. Size Range** | Steel*** 6, 7, 8 Regular hook B– | B–1 to E–4 | E–4 to 7 | 7 to I–9 | I–9 to K–10 1⁄2 | K–10 1⁄2 to M–13 | M–13 and larger |

### 7.2.2.1 Twist constant calculation to identify twist designation for lamb's wool (Y1-3 ply yarn).

**Table 7.4 Twist constant calculation Y1**

| Yarn no: | Weight in g/10cms | Turns/ 10 cm |
|---|---|---|
| 1 | .017 | 3 |
| 2 | .018 | 3 |
| 3 | .018 | 3 |
| 4 | .018 | 2 |
| 5 | .020 | 3 |
| 6 | .018 | 2 |
| 7 | .018 | 3 |
| 8 | .018 | 2 |
| 9 | .019 | 3 |
| 10 | .017 | 3 |
| Average | .018 | 2.7 |

Tex of single ply = g/10cm x $10^4$ = 180

Turns/meter = Turns/10cms x 10 = 27

Twist constant = Turns/meter x √Tex

Twist constant for Y1 in single ply = 27 x √180 = 362.24

Y1 is a '3 ply' yarn with twist direction Z/Z and seems to have very low single ply twist which means that this has been taken out in the plying process. The twist designation is very soft as it appears to be a felted yarn.

### 7.2.2.2 Twist constant calculation to identify twist designation for 90% lamb's wool 10% angora (Y2-4 ply).

**Table 7.5 Twist constant calculation Y2**

| Yarn no: | Weight in g/10cms | Turns/10 cm |
|---|---|---|
| 1 | .049 | 10 |
| 2 | .048 | 10 |
| 3 | .051 | 10 |
| 4 | .048 | 11 |
| 5 | .050 | 10 |
| 6 | .048 | 10 |
| 7 | .049 | 11 |
| 8 | .049 | 10 |
| 9 | .049 | 10 |
| 10 | .050 | 11 |
| Average | .0491 | 10.3 |

Tex of plied yarn = g/10cm x $10^4$ = 491

Turns/ meter= Turns/10cms x 10 = 103

Twist constant = Turns/meter x √Tex

Twist constant for Y2 = 103 x √491 = 2282

Y2 is a '4 ply' yarn with twist direction Z/S and it seems to have low single ply twists which means that the singles twist has been taken out in the plying process. In this case the ply twist constant is calculated in order to find the twist designation which is soft as the twist constant is lower than 3000.

### 7.2.2.3 Twist constant calculation to identify twist designation for 100% silk (Y3-2 ply yarn).

**Table 7.6 Twist constant calculation Y3**

| Yarn no: | Weight in g/10cms | Turns/ 10cms |
|---|---|---|
| 1 | .039 | 5 |
| 2 | .039 | 5 |
| 3 | .040 | 5 |
| 4 | .039 | 5 |
| 5 | .039 | 5 |
| 6 | .039 | 5 |
| 7 | .039 | 5 |
| 8 | .040 | 5 |
| 9 | .039 | 5 |
| 10 | .039 | 5 |
| Average | .0392 | 5 |

Tex of single ply yarn = g/ 10cm x $10^4$ = 392

Turns/meter = Turns/10cms x 10 = 50

Twist constant = Turns/meter x √Tex

Twist constant for Y3 in single ply = 50 x √392 = 990

Y3 is a ‘2 ply’ yarn with twist direction Z/S and it seems to have very low single ply twist which is due to this being a continuous filament yarn. The twist designation is very soft as the twist constant is much less than 2200.

### 7.2.2.4 Twist constant calculation to identify twist designation for oiled pure wool (Y4-2 ply yarn).

**Table 7.7 Twist constant calculation Y4**

| Yarn no: | Weight in g/10cms | Turns/10cms |
|---|---|---|
| 1 | .030 | 10 |
| 2 | .030 | 10 |
| 3 | .029 | 10 |
| 4 | .030 | 10 |
| 5 | .030 | 10 |
| 6 | .031 | 10 |
| 7 | .028 | 10 |
| 8 | .030 | 10 |
| 9 | .031 | 10 |
| 10 | .031 | 10 |
| Average | .030 | 10 |

Tex of single ply = g/10cm x $10^4$ = 300

Turns/ meter= Turns/10cms x 10 = 100

Twist constant = Turns/meter x √Tex

Twist constant for Y4 in single ply = 100 x √300 = 1732

Y4 is a ‘2 ply’ yarn with twist direction Z/S and the twist designation is very soft as the twist constant is lower than 3000.

### 7.2.2.5 Twist constant calculation to identify twist designation for recycled hand spun yarn (Y5–2 ply).

**Table 7.8 Twist constant calculation Y5**

| Yarn no: | Weight in g/10cms | Turns/ 10cms |
|---|---|---|
| 1 | .021 | 25 |
| 2 | .021 | 25 |
| 3 | .022 | 24 |
| 4 | .022 | 26 |
| 5 | .021 | 25 |
| 6 | .022 | 26 |
| 7 | .022 | 24 |
| 8 | .022 | 24 |
| 9 | .021 | 26 |
| 10 | .022 | 25 |
| Average | .0216 | 25 |

Tex of single ply = g/10cm x $10^4$ = 216

Turns/ meter= Turns/10cms x 10 = 250

Twist constant = Turns/meter x √Tex

Twist constant for Y5 in single ply = 250 x √216 = 3674

Y5 is a ‘2 ply’ yarn with twist direction Z/S and the twist designation is slightly high as the twist constant is more than 3000. This is probably due to the hand spinning but has been compensated at the folding stage.

### 7.2.2.6 Twist constant calculation to identify twist designation for 100% acrylic yarn (Y6- 2 ply).

**Table 7.9 Twist constant calculation Y6**

| Yarn no: | Weight in g/10cms single twist (Blue) | Weight in g/10cms single twist(melange) | Turns/10cms (Blue) | Turns/ 10cms(mel -ange) |
|---|---|---|---|---|
| 1 | .014 | .030 | 9 | 9 |
| 2 | .014 | .030 | 9 | 8 |
| 3 | .014 | .031 | 9 | 9 |
| 4 | .015 | .030 | 9 | 9 |
| 5 | .014 | .030 | 9 | 8 |
| 6 | .015 | .031 | 8 | 9 |
| 7 | .014 | .030 | 9 | 9 |
| 8 | .015 | .031 | 9 | 9 |
| 9 | .015 | .030 | 8 | 8 |
| 10 | .014 | .031 | 9 | 9 |
| Average | .014 | .030 | 8.8 | 8.7 |

Tex in single ply (blue component) = g/10cm x $10^4$ = 140

Turns/ meter (blue component) = Turns/10cms x 10 = 88

Twist constant = Turns/meter x √Tex

Twist constant for Y6 in the blue component = 88 x √140 = 1041

Tex in single ply (melange component) = g/10cm x $10^4$ = 300

Turns/meter (melange) = Turns/10cms x 10 = 87

Twist constant for Y6 in the melange component = 87 x √300 = 1507

Y6 is a '2 ply' yarn with twist direction Z/S the weight of the plies are different but the turns/10cm for single yarns are similar. In order to calculate the twist designation of the yarn the weights and turns of the two single plies are

calculated separately. Also this is a worsted spun yarn with very soft twist designation and low twist constants.

All yarn samples were under very soft category (table 7.2). According to the standard yarn weight chart, the commercially sourced knitting yarns (5 samples), and the recycled yarn developed by the researcher were hand knitted using 4mm needles. All the six samples were also knitted on a Dubied machine (3.5 gauge) except the 'Y1' sample which is a three plied yarn knitted in 2.5 gauge.

### 7.2.3 Calculation of courses and wales density of the knitted fabric

The commercially sourced yarn samples and the recycled yarn was knitted into 5"x5" swatches. All the hand and machine knitted samples were washed in three ways to determine the physical properties like: shrinkage, colour bleeding and handle. Three cleaning methods were used:

1. Hand wash at 30°c using delicate wool wash liquid detergent
2. Machine wash in a domestic front load washing machine at wool wash setting using the same liquid detergent and
3. Commercial dry cleaning.

The number of courses and wales were counted and recorded in order to measure the fabric density and dimension.

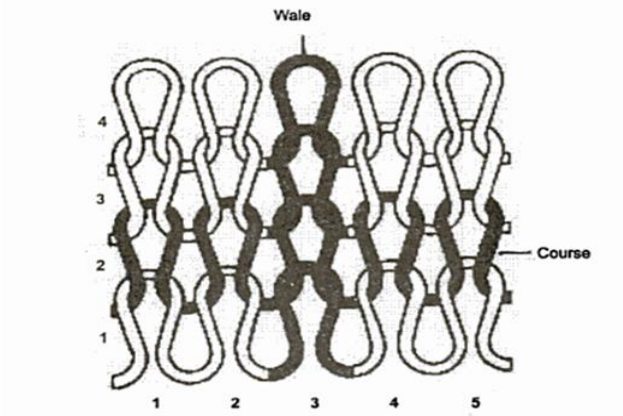



**Fig 7.3 Courses and Wales in a knitted fabric (Khurana and Sethi, 2007, p. 67)**

A course in knitted fabric is the row of loops across the width of the fabric and wales is the column of loops along the length of the fabric. The traditional unit length used for counting courses and wales is one inch (Denton and Daniels, 2002). This method is used to calculate the number of courses and wales per inch in the 5” x 5” knitted sample.

### 7.2.3.1 Knitted swatch details (hand knit – hand wash)

**Table 7.10 Courses and wales calculation after hand wash**

| Yarn no: | Content on label | Course x 1” Wales x 1” before wash | Course x 1” Wales x 1” after wash |
|---|---|---|---|
| 1 | Pure lamb’s wool | 5x6 | 5x7 |
| 2 | 90% wool 10% angora | 5x7 | 6x8 |
| 3 | Pure spun silk | 5x7 | 5x8 |
| 4 | Oiled pure wool | 5x7 | 5x8 |
| 5 | Recycled hand knitting yarn | **5x7** | **5x7** |
| 6 | 100% Acrylic | 5x7 | 5x7 |

### 7.2.3.2 Knitted swatch details (hand knit – machine wash)

**Table 7.11 Courses and wales calculation after machine wash**

| Yarn no: | Content on label | Course x 1” Wales x 1” before wash | Course x 1” Wales x 1” after wash |
|---|---|---|---|
| 1 | Pure lamb’s wool | 5x6 | 5x7 |
| 2 | 90% wool 10% angora | 5x7 | 5x8 |
| 3 | Pure spun silk | 5x7 | 5x7 |
| 4 | Oiled pure wool | 5x7 | 5x8 |
| 5 | Recycled hand knitting yarn | **5x7** | **5x7** |
| 6 | 100% Acrylic | 5x7 | 5x7 |

### 7.2.3.3 Knitted swatch details (hand knit – dry clean)

**Table 7.12 Courses and wales calculation after dry clean**

| Yarn no: | Content on label | Course x 1” Wales x 1” before wash | Course x 1” Wales x 1” after dry cleaning |
|---|---|---|---|
| 1 | Pure lamb’s wool | 5x6 | 6x7 |
| 2 | 90% wool 10% angora | 5x7 | 5x8 |
| 3 | Pure spun silk | 5x7 | 5x6 |
| 4 | Oiled pure wool | 5x7 | 5x7 |
| 5 | Recycled hand knitting yarn | **5x7** | **5x8** |
| 6 | 100% Acrylic | 5x7 | 5x7 |

### 7.2.3.4 Knitted swatch details (machine knit single jersey (V bed) before wash)

**Table 7.13 Courses and wales calculation before wash**

| Yarn no: | Content on label | Machine Gauge | Machine Tension | No: of needles selected | Course x 1” Wales x 1” before wash |
|---|---|---|---|---|---|
| 1 | Pure lamb’s wool | 2.5 | 3 | 20 | 5x7 |
| 2 | 90% wool 10% angora | 3.5 | 2.5 | 30 | 5x8 |
| 3 | Pure spun silk | 3.5 | 2.5 | 30 | 5x7 |
| 4 | Oiled pure wool | 3.5 | 2.5 | 30 | 5x8 |
| 5 | Recycled hand knitting yarn | 3.5 | 3 | 30 | **5x8** |
| 6 | 100% Acrylic | 3.5 | 2.5 | 30 | 5x6 |

### 7.2.3.5 Knitted swatch details (machine knit single jersey (V bed) hand wash)

**Table 7.14 Courses and wales calculation after hand wash**

| Yarn no: | Content on label | Machine Gauge | Machine Tension | No: of needles selected | Course x 1” Wales x 1” before wash | Courses x 1” Wales x 1” after wash |
|---|---|---|---|---|---|---|
| 1 | Pure lamb’s wool | 2.5 | 3 | 30 | 5x7 | 5x8 |
| 2 | 90% wool 10% angora | 3.5 | 2.5 | 30 | 5x8 | 5x8 |
| 3 | Pure spun silk | 3.5 | 2.5 | 30 | 5x7 | 5x6 |
| 4 | Oiled pure wool | 3.5 | 2.5 | 30 | 5x8 | 5x8 |
| 5 | Recycled hand knitting yarn | 3.5 | 3 | 30 | **5x8** | **5x7** |
| 6 | 100% Acrylic | 3.5 | 2.5 | 30 | 5x6 | 5x6 |

### 7.2.3.6 Knitted swatch details (machine knit single jersey (V bed) machine wash)

**Table 7.15 Courses and wales calculation after machine wash**

| Yarn no: | Content on label | Machine Gauge | Machine Tension | No: of needles selected | Course x 1” Wales x 1” before wash | Courses x 1” Wales x 1” after wash |
|---|---|---|---|---|---|---|
| 1 | Pure lamb’s wool | 2.5 | 3 | 20 | 5x7 | 5x8 |
| 2 | 90% wool 10% angora | 3.5 | 2.5 | 30 | 5x8 | 5x8 |
| 3 | Pure spun silk | 3.5 | 2.5 | 30 | 5x7 | 5x7 |
| 4 | Oiled pure wool | 3.5 | 2.5 | 30 | 5x8 | 5x8 |
| 5 | Recycled hand knitting yarn | 3.5 | 3 | 30 | **5x8** | **5x8** |
| 6 | 100% Acrylic | 3.5 | 2.5 | 30 | 5x6 | 5x6 |

### 7.2.3.7 Knitted swatch details (machine knit single jersey (V bed) dry clean)

**Table 7.16 Courses and wales calculation after dry clean**

| Yarn no: | Content on label | Machine Gauge | Machine Tension | No: of needles selected | Course x 1” Wales x 1” before wash | Courses x 1” Wales x 1” after dry clean |
|---|---|---|---|---|---|---|
| 1 | Pure lamb’s wool | 2.5 | 3 | 20 | 5x7 | 5x7 |
| 2 | 90% wool 10% angora | 3.5 | 2.5 | 30 | 5x8 | 6x9 |
| 3 | Pure spun silk | 3.5 | 2.5 | 30 | 5x7 | 5x6 |
| 4 | Oiled pure wool | 3.5 | 2.5 | 30 | 5x8 | 5x7 |
| 5 | Recycled hand knitting yarn | 3.5 | 3 | 30 | **5x8** | **5x8** |
| 6 | 100% Acrylic | 3.5 | 2.5 | 30 | 5x6 | 5x8 |

The above results show the elongation and shrinkage level of the six fabric samples under different cleaning process. The recycled hand spun yarn demonstrates good dimensional stability under: hand wash, machine wash

and dry cleaning. However, considering the fact that continuous machine washing may cause felting in the woollen fabric due to agitation; it was decided to keep the washing strategy of the recycled yarn as hand wash only. A wearer test was carried out for eight months using a recycled yarn hand knitted sweater to analyse: colour bleeding, pilling and dimensional stability of the garment which is discussed later in this chapter.

It was also noticed that the silk remnants in the yarn bled colour during washing. The sari remnants in the recycled yarn were dyed in deeper shades of acid dye, so these yarns have a tendency to bleed while washing. As discussed earlier in chapter 5 in section 5.4 it should be noted that silk dying in the village is a cottage industry where the dying standards were not followed mainly due to inexperienced workers and poor working conditions. Kancheepuram saris are used by Indian women for auspicious functions like weddings and festivals and these saris, and are thus dry-cleaned occasionally to maintain the quality of silk, colour and lustre.

### 7.2.4 Sampling for pilling test

The pilling test samples were coded as

S1: 100% space dyed lamb's wool

S2: Lamb's wool angora

S4: Oiled lamb's wool

S5: Recycled hand knitting yarn

S6: 100% acrylic

Pilling test for all five sample types: S1, S2, S4, S5, S6 was done separately. Eight swatches of each fabric sample were wound around a six-inch rubber tube. Washed and unwashed samples were placed separately in the two boxes of the machine. The ICI pilling box was then rotated at 60 rev/ min for five hours (Booth, 1968).

The pilling severity in the fabric was accessed using subjective methods like comparing the pill samples with a set of standard photographs or following

the British standard schemes (Ramgulam *et al.,* 1993). For the test samples, after tumbling for five hours, the extent of pilling is visually assed comparing with the EMPA standard SN 198525. Four ratings were used in this system:

K1 (1-2) - Extremely high pilling

K2 (2-3) - Unacceptable pilling

K3 (3-4) - Moderate pilling for borderline acceptability

K4 (4-5) - Slight but tolerate pilling

The pilling test results reveal that all the washed and unwashed samples were under the category K4 (4-5) - Slight but tolerate pilling. It was noticed in 'S5' sample forming more fuzz than pilling. Considering it in a step-wise fashion, fuzz formation has the greatest effect on pilling. In this case any property which alters the amount of fuzz produced can have a major impact on pilling (Gintis and Mead, 1959).

The samples knitted using recycled hand spun yarn (S5) form more fuzz compared to other samples in both unwashed and washed state after the pilling test. This was caused due to breaking of weak fibres during abrasion – leading to shorter but more dense fuzz (Gintis and Mead, 1959). The sample 'S5' was hand spun yarn and the twist inserted in the yarn was not exactly controlled like machine spun yarn. This could result in loose fibres coming out of the fabric during severe abrasion. The 100% silk yarn was not pilling tested because it is a continuous filament yarn which may not show any pilling or fuss formation compared to wool and acrylic fabrics.

## 7.3 Focus group with hand knitters and hand spinners

The aim of the focus group was to review the participants views about the range of six double knit yarns. The criteria for participation in the focus groups depended on their experience in hand knitting and hand spinning. The participants had to be based in UK as the recycled yarn is aimed as an export product. Their years of experience in hand knitting were to be greater than two and they were to have a fair understanding about the physical

properties of the hand knitting yarns. Two focus groups with six participants each were conducted (fig 7.4).

**Fig 7.4 A snapshot from the focus group**

Participants were given a power point presentation and brief introduction regarding the main study. This explained that the study is about the social aspect of empowering the women through employment and the production method of the recycled yarn. To ensure that the right message was communicated to the participants, open ended questions listed in table 7.18 were prepared for discussion. The whole event was recorded using digital video for further analysis.

Personal information of participants

Gender

Age

Years of experience in hand spinning and knitting

Email address

Phone no

**Table 7.17 Discussion questions for the focus group**

| Topic areas and discussion questions |
|---|
| What features do you like about the range of six yarn samples / what are the features you do not like about the yarn samples? |
| What fibre content do you prefer for the hand knitting yarns / what fibre content you do not prefer for hand knitting yarns? |
| How do you make the colour choice while selecting yarns? |

## 7.3.1 Analysis of the focus groups

The analysis was conducted following the methodology of thematic coding approach combined with a matrix diagram method discussed in table 2.5 chapter 2. The whole process of the transcript and its analysis is placed in the appendix, which will be presented in the form of a compact disk. The focus groups were transcribed and broken down to key phrases and facts. The responses to each concept were grouped into relevant categories.

**The process of focus group transcript distillation**

- List: The descriptions given by the participants in the focus group about the aesthetic and functional characteristics of the range of six yarns were listed
- Grouping: From the list, each yarn characteristics were moved together and grouped
- Merging: Same or highly similar descriptions of each yarn were separated and merged them into one combined description
- Transforming: Transformation of sentences that were originally abbreviated into full descriptions for easier understanding in terms of readability
- Final grouping: Identify all similar descriptions which describe related yarn characteristic features and move them together to assemble the final groups
- The descriptions of the range of yarns were transformed into questions in order to verify the quality acceptance by the participants

- What are the functional and aesthetic features of each yarn described?
- Which yarn in the category commands the highest quality?
- How do the participants perceive the quality of the recycled yarn compared to the range of market available yarn?

- The records of two focus groups were sorted, analysed and distilled into complete descriptions of yarn features representing: tactile properties, wash, sustainability factors and colour
- The list of the yarn features was generated gathering information about; the aesthetic and factional attributes the participants valued for the selection of the hand knitting yarn
- Key words were assigned with specific codes, and then word cells with similar phrases related to the yarn were moved close together to assemble categories of: high usability, low usability, high quality and low quality
- A coordinate system was constructed by horizontal axis representing low quality to the left, and high quality to the right; and a vertical axis representing high usability at the top, and low usability at the bottom. Each word cell is coded in a ‘small icon’ since the word cells take too much space in the graph
- A colour categorising system was created based on RGB colour fill feature of word software. In this system, the horizontal axis is defined with:
  - Low quality on the left, which is assigned with the colour components ‘G0/R255’
  - High quality on the right, which is assigned with the colour components ‘G255/R0’
- The vertical axis is defined with
  - Low usability on the bottom which is assigned with the colour components ‘R0/G112’
  - High usability on the top which is assigned with the colour components ‘R255/G112’.

The examples were shown in fig 7.6, 7.8, 7.10, 7.12, 7.14, 7.16. As shown in fig 7.6 till fig 7.16 the colour varies gradually in proportion to the position of each ‘small icon’ on both axes. A specific RGB value which consists of the unique colour could be assigned to each ‘small icon’ under the colour categorising system. For example, a small icon ‘Y1A’ in fig 7.6 is represented by colour ‘R171/G0’ and ‘Y1E’ is represented by colour ‘R112/G112’.

### 7.3.2 Y1 – space dyed lamb's wool

**Fig 7.5 Spaced dyed lamb's wool**

**Table 7.18 Distilled description of Y1**

| **Distilled description of the characteristics of Y1- Space dyed lamb's wool** | **Code** |
|---|---|
| The yarn is good to knit big cardigans for festivals | Y1A |
| The colours add to the texture | Y1B |
| Dark deep colours in the yarn are a design aspect | Y1C |
| Many independent dyers tend to arrange yarns in skeins to display uneven spread of colours | Y1D |
| People consider yarn thickness depending on the time available for them to knit and pattern | Y1E |
| Knitted fabric made with Y1 do not drape very well | Y1F |
| The yarn is crunchy, coarse and three plied that is spun using felted wool | Y1G |
| The feel of the yarn is terrible and horrendous. | Y1H |
| The yarn needs washing | Y1I |
| Fabric knitted using this yarn will felt in the machine wash | Y1J |

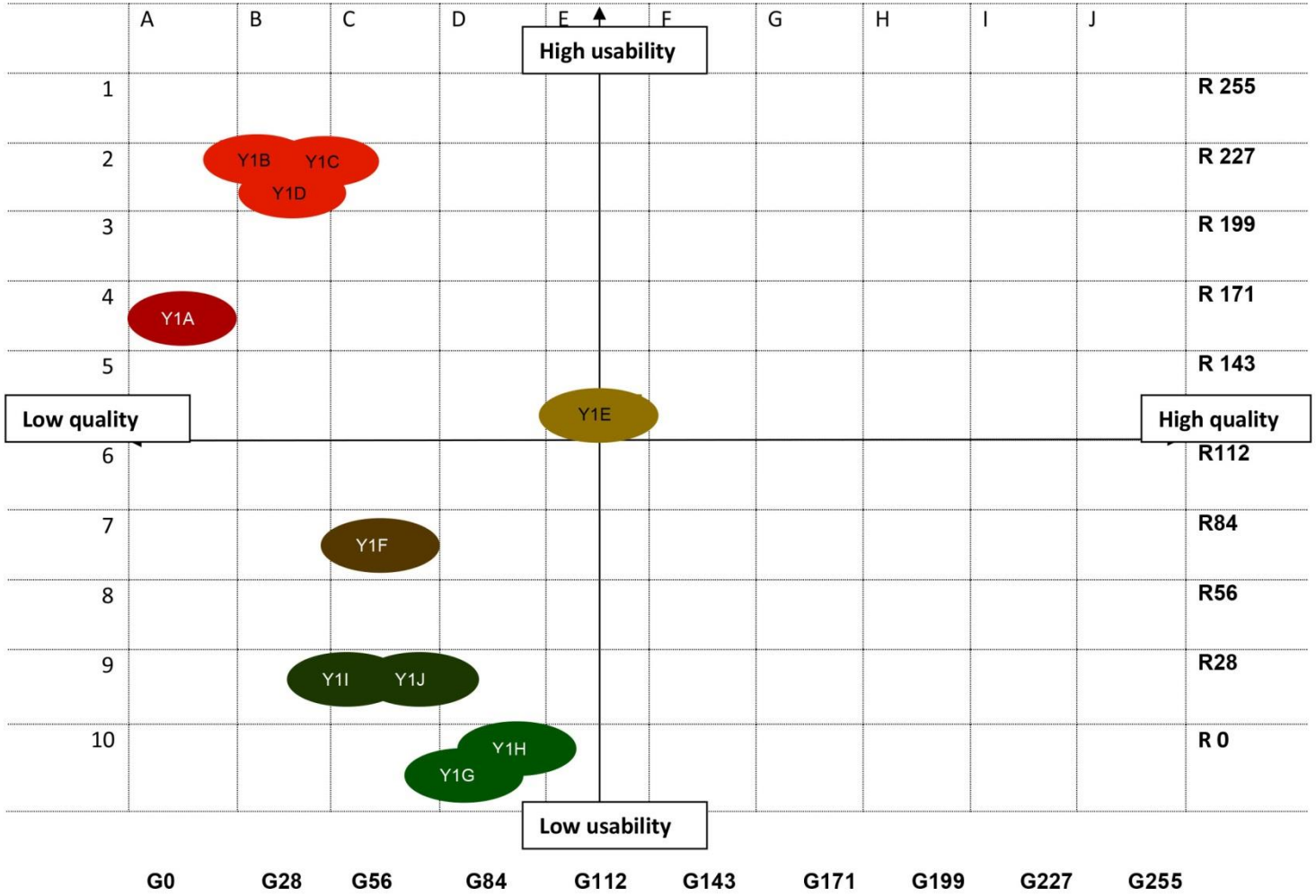



**Fig 7.6 Positioning chart of yarn sample Y1**

#### 7.3.2.1 Discussion regarding the positioning yarn colour codes

(Y1A) The colours and the textures give the yarn a bohemian appearance. The participants mentioned that these features attract festival goers. Although considering the coarseness and the poor tactile property of the yarn position it under (A, 4) high usability and low quality.

(Y1B) (Y1C) (Y1D) Features are positioned in (B,2) higher usability and low quality, because of the colour combination and the thickness of the yarn. Those were the major attributes that draw the customers' attention even though it has poor tactile property. The yarn is space dyed and displayed in skeins which helps the customer view the uneven spread of colours, and check the quality of the yarn before purchasing it.

(Y1E) Most of the hand knitting and crochet leaners start knitting using thicker yarns as it is easy and timesaving to knit and make patterns. Thus it is positioned at (E,5) in the middle of the axis because the knitters make their yarn choice according to their project.

(Y1F) The weight of the fabric affects the drapability of the garment, that makes it more suitable for outer wear. Thickness of the yarn may be considered as an attribute to increase its use during the winter season. However, the poor tactile property positions the yarn under (C,7) low quality and low usability.

(Y1G), (Y1H) The lamb's wool fibres were slightly felted to hold it together in the yarn, which is proven in the twist constant test conducted by the researcher. The felting of fibres made the yarn coarse and loosely spun at the same time three plying made it thicker. Thus it is placed under (D,10) low quality and low usability. (Y1I), (Y1J) are similar features. The participants mentioned that the yarn is slightly felted and the knitted fabric can felt in the machine wash. However, it is clearly mentioned in the yarn care label that the knitted fabric is hand-wash only and it is up to the user to decide the wash care for the fabric. These attributes were positioned under (C,9) low quality and low usability.

### 7.3.3 Y2 – lamb's wool angora


**Fig 7.7 Lamb's wool angora**

**Table 7.19 Distilled description of Y2**

| **Distilled description of the characteristics of Y2-lamb's wool angora.** | **Code** |
|---|---|
| The yarn probably knit well and highlights the pattern | Y2A |
| The yarn has a nice texture | Y2B |
| Most of the commercial knitting yarns were wound in balls and the knitter cannot notice the knots and faults in the yarn before buying | Y2C |
| People prefer yarns sold in skeins as they can open and check the yarn quality in the shop before buying | Y2D |
| The yarn is not fluffy and it does not feel good | Y2E |
| The colour selection of yarns depends on the knitter's personality | Y2F |
| The pattern dictates the type of yarn to purchase | Y2G |
| It is the life style of the person that decides the wash and handle of the knitted fabric. People who do not work and do not have children at home, could afford to hand wash and dry it naturally | Y2H |
| User has to check the wash care label before washing the fabric | Y2I |

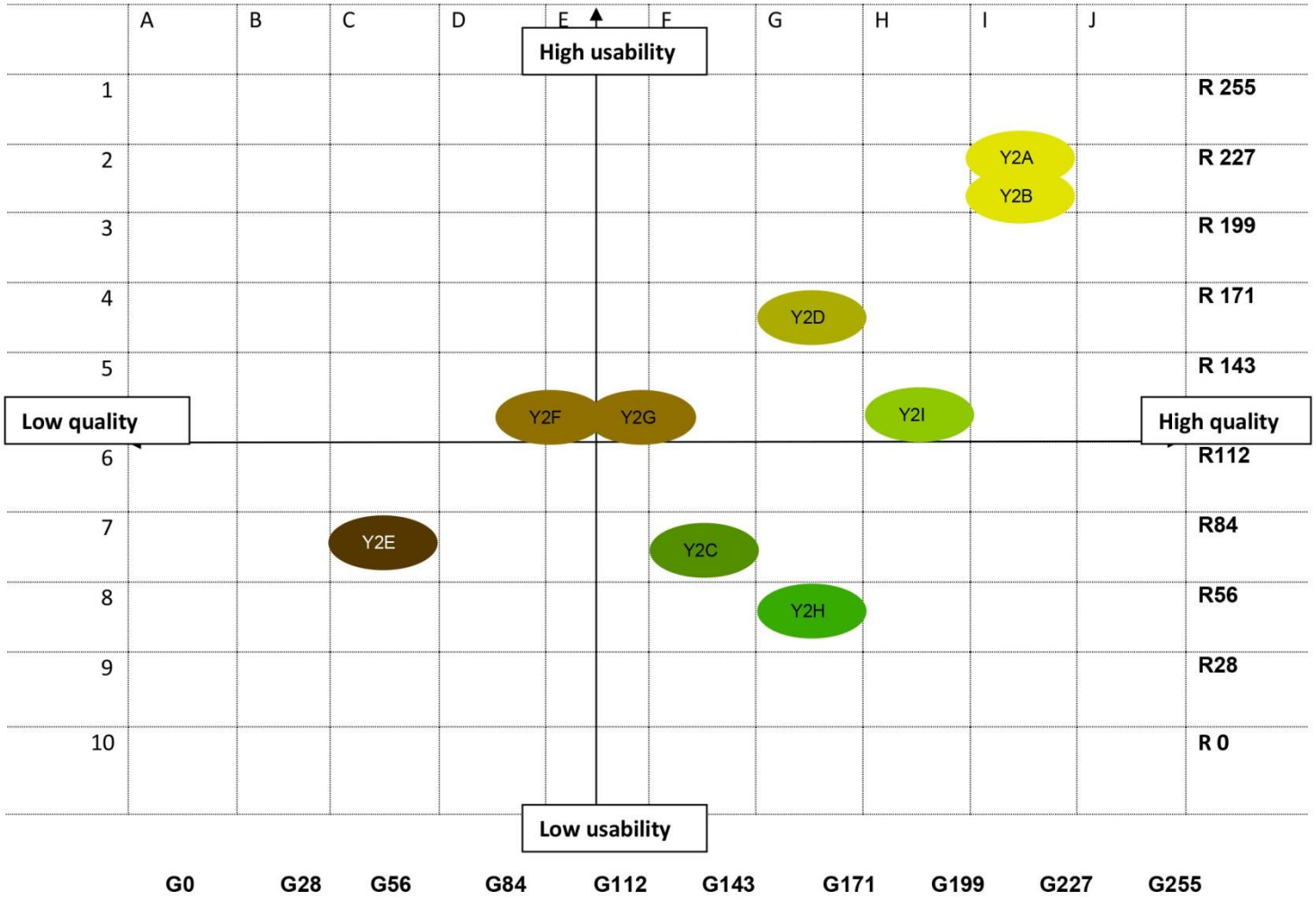



**Fig 7.8 Positioning chart of yarn sample Y2**

#### 7.3.3.1 Discussion regarding the positioning yarn colour codes

(Y2A) and (Y2B) both suggest the hand feel of the yarn interests the knitters to knit a variety of products. The texture of the yarn may enhance the overall appearance of the garment. These features encourage the knitter to use the yarn placed under (I,2) high quality and high usability.

(Y2C) The comment highlights the point that the knitter would like to feel and check the defects in the yarn before they decide to purchase. The yarns in balls are convenient to display in the shop floor but it does not allow the knitter to open and check the defects or knots in the yarn. This feature creates an ambiguity whether to purchase the yarn. In spite of the fact that many participants in the focus group liked the yarn, they were not happy about the yarn wound in ball. Thus it is positioned at (F,7) high quality and low usability.

(Y2D) The participants suggested that the yarns sold in skeins were easy to inspect for defects. Also the characteristics of the yarn like the distribution of colours and texture were more visible in skeins than in balls. Thus (Y2D) is positioned at (G,4) high quality and high usability.

(Y2E) The yarn appears to be fluffy because extra fibres are inserted between the twist and it is loosely spun; which is proved in the scientific test conducted by the researcher. After knitting, the yarn may compress and it can lose some softness and fluffiness. These features positioned it at (C,7) low quality and low usability.

(Y2F) (Y2G) The participants mentioned that their colour selection of yarn depends on their age, personality, design and complexion. Colour selection is personal and it is difficult to determine the knitters colour choice which is also influenced by the texture and unique design features added to the yarn. So it is positioned at the middle of the axis.

(Y2H) Fabrics knitted using higher quality yarns are hand wash only. In order to maintain the durability of the garment, care must be taken during washing. This feature encourages some of the knitters to choose synthetic fibre yarns

that are machine washable. Thus it is positioned at Y2H under (G,8) high quality and lower usability.

(Y2I) is positioned at (H,5) high quality and low usability. It suggests that the end user should follow the wash care instructions in order to maintain the quality and longer life of the garment. Most of the high quality knitted fabrics are hand wash only using mild detergent at a low temperature.

### 7.3.4 Y3 – 100% silk yarn

**Fig 7.9 100% silk yarn**

**Table 7.20 Distilled description of Y3**

| **Distilled description of the characteristics of Y3-100% silk** | **Codes** |
|---|---|
| The yarn may knit a good christening shawl that can pass through the family. It is a good value for money | Y3A |
| The yarn looks synthetic and tensile | Y3B |
| The yarn appears slippery due to the lustre | Y3C |
| The yarn does not hold a rib | Y3D |
| The yarn may weave up well and give the fabric a good drape | Y3E |
| The yarn can knit a beautiful evening shawl or a nice summer hat in different colours | Y3F |
| Expensive yarns were used for knitting accessories more than jumper | Y3G |

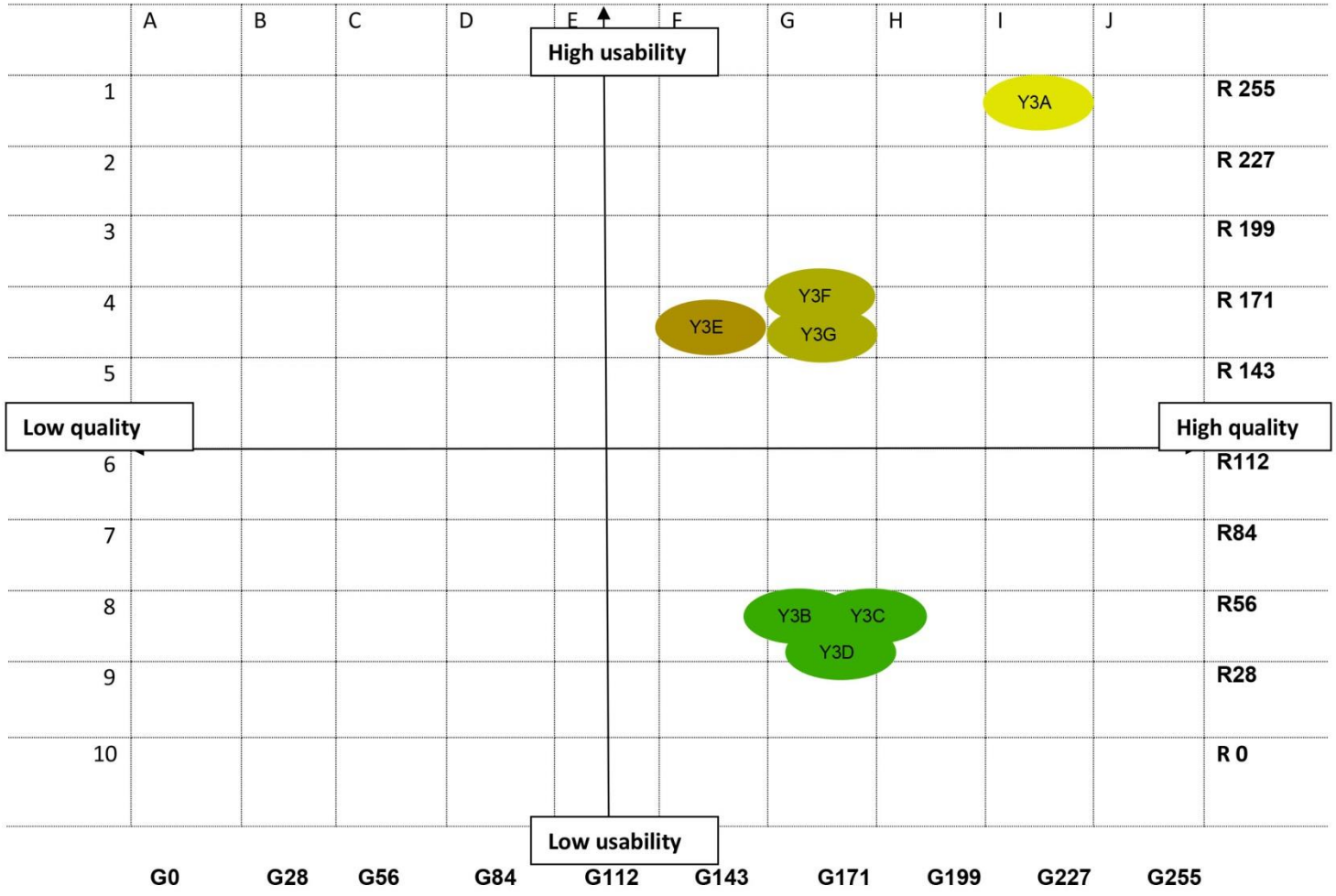



**Fig 7.10 Positioning chart of yarn sample Y3**

### 7.3.4.1 Discussion regarding the positioning yarn colour codes

**(**Y3A) is positioned at (I,1) high quality and high usability as the yarn is described as featuring good quality and durability. The higher price of the yarn encourages the user to take special care that can increase the life cycle of the fabric. This also makes the creation and sharing of a garment over generatiuons a sustainable act.

(Y3B), (Y3C) The yarn is 100% silk and the smooth fine filament fibres may slip from the knitting needle while knitting. This comment evokes an opinion of mixing silk with other fibres that can reduce the lustre and slippage of yarn while knitting. Mixing silk with other natural fibres can give fullness and body to the knitted fabric. These three features were positioned under (8,G) which is high quality and low usability.

(Y3D) In order to hold the rib, the fabric should be elastic. Silk does not have elasticity and fabric knitted using silk is flat compared to other natural fibres. So this comment is placed under (8,G) high quality and low usability.

(Y3E) Retention of shape and good drapability are two main properties of silk. The knitted fabric in silk yarn drapes well. Thus it is placed under (F,4) high quality and high usability.

(Y3F), (Y3G) The participants in the focus group showed interest in knitting accessories using the yarn more so than a full garment. Reasons given were that silk is expensive, and yarn consumption is less for accessories and thus it is more suitable for knitting hats and scarfs which are not washed regularly. Also less washing helps to increase the life of the fabric. Thus it is placed at (G, 4) high quality and high usability.

### 7.3.5 Y4 – 100% oiled lamb's wool

**Fig 7.11 100% oiled lamb's wool**

**Table 7.21 Distilled description of Y4**

| **Distilled description of the characteristics of Y4- oiled lamb's wool** | **Codes** |
|---|---|
| Oiled wool yarns are smooth and nicer to knit. After wash the stitches in the fabric would mould together a little bit more and produces a nicer quality and finished fabric. This is not achievable if the yarn is washed first and then knitted | Y4A |
| The customer would like to feel the fabric after wash before buying the yarn | Y4B |
| The yarn is hard and scratchy | Y4C |
| The lamb's wool content in the yarn should not be a by-product. | Y4D |

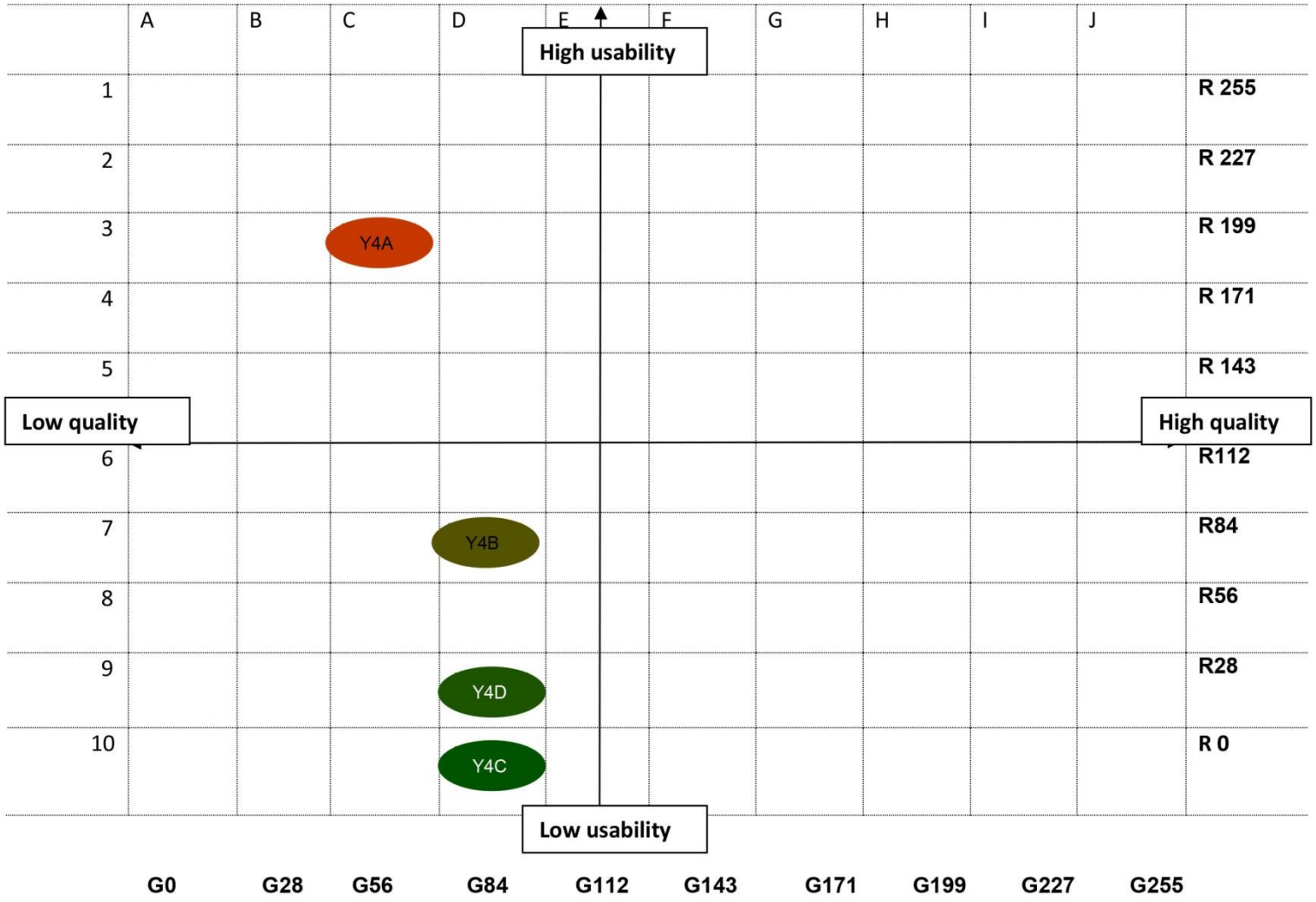



**Fig 7.12 Positioning chart of yarn sample**

### 7.3.5.1 Discussion regarding the positioning of yarn colour codes

(Y4A) Many fishermen jumpers are knitted using oiled lamb's wool yarn, and that such sweaters are durable and the hand feel gets softer after each wash. Although it is not guaranteed that people would not like the feel of the garment knitted using this yarn it is positioned at (C,3) low quality and high usability.

(Y4B) The focus group participants were not convinced about the change in handle of the fabric after wash, and they want to feel the washed fabric before purchasing the yarn. Thus it is positioned at (D,7) low usability and low quality. This response also highlights that keeping the customers informed about the properties of the yarn at fabric stage, both before and after wash, is a good marketing strategy.

(Y4C) The tactile property of the yarn is very poor and does not interest the participants. They would like to knit with yarns which have a softer feel. So the comment is positioned under (D,10) low quality and low usability.

(Y4D) The coarseness of the yarn may raise a question that it is sheared from lambs that are slaughtered for meat. The knitters do not like to use a bi-product of this process and want to know the origin and source of the wool mentioned in the yarn label. Even though this is a quality issue it depends on the user's choice. Thus (Y4D) is positioned at (D, ) low quality and low usability in the matrix.

### 7.3.6 Y5 – recycled hand spun yarn

**Fig 7.13 Recycled hand spun yarn**

**Table 7.22 Distilled description of Y5**

| **Distilled description of the characteristics of Y5 - recycled yarn** | **Codes** |
|---|---|
| The colour variations in the yarn shows in the pattern | Y5A |
| Depth of the colour and softness makes it very interesting to work with the yarn | Y5B |
| Each batch of yarn is slightly different and that is a feature (rather than a problem) | Y5C |
| Hand spun yarns give the joy that somebody had made it especially for the knitter | Y5D |
| The spread of colours are unpredictable and it is a joy to knit (rather than irritating for the knitter) | Y5E |
| Knitting or weaving with the yarn is like a story that the knitter starts and gradually develops | Y5F |
| It has more potential for recycling | Y5G |
| Yarns made in India and China always visualise the sweat shop and people who are not paid well. So if the yarn label shows made in India then it should also narrate why it is produced in India. The reason is the use of silk remnants collected from the handloom. It has a brilliant story, a cottage industry, very small and local | Y5H |
| Hand knitted fabric is ‘something’ which is hand wash only, then obviously the wearer should be careful about that. It is ‘something’ to bear in mind | Y5I |

| | |
|---|---|
| People do not necessarily go for the hand spun yarn. They may intentionally go for the commercial acrylic because they want to gift something hand knitted and washable | Y5J |
| The story could be used as a selling point more than that the customer should be satisfied with the product | Y5K |

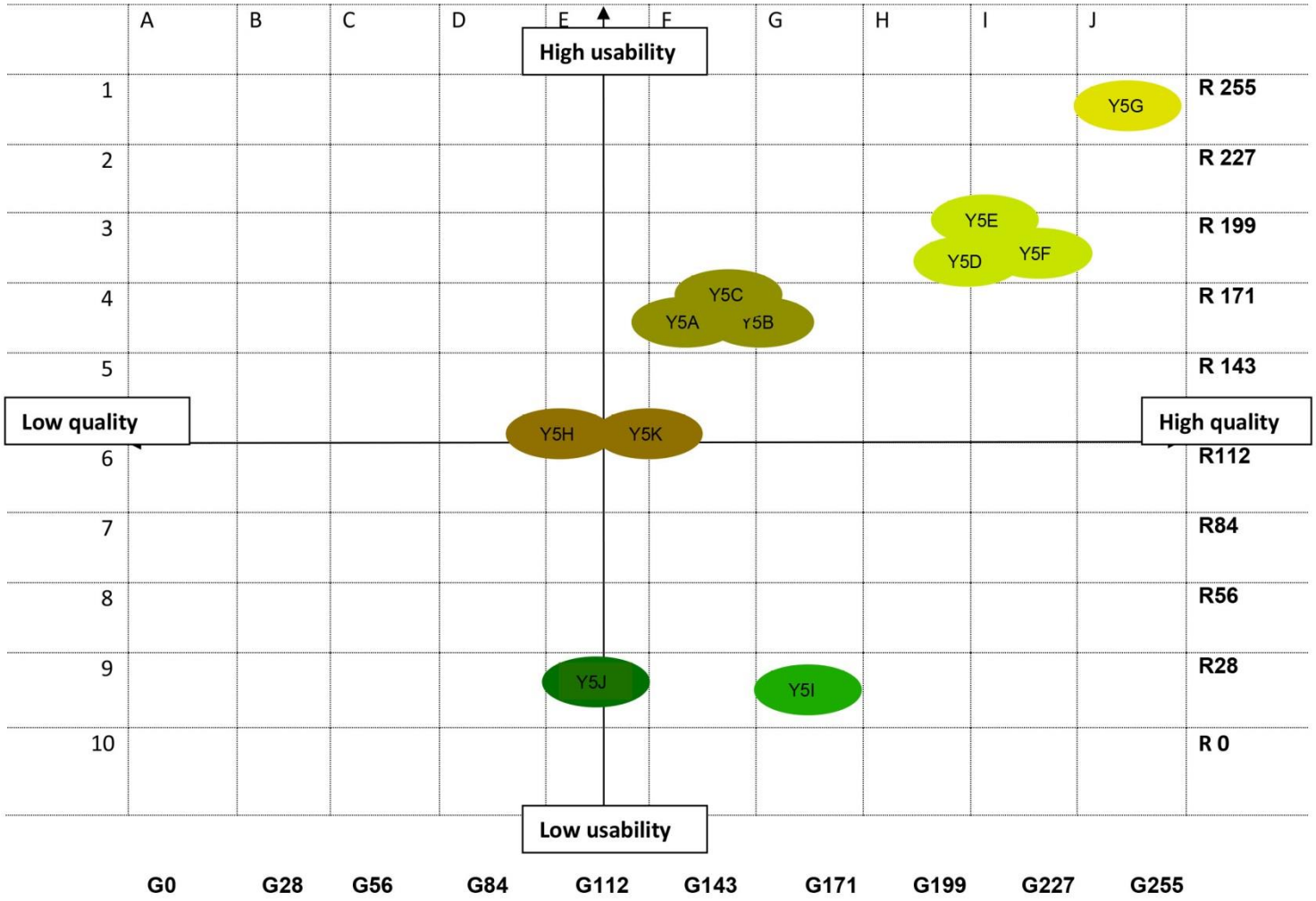



**Fig 7.14 Positioning chart of yarn sample Y5**

#### 7.3.6.1 Discussion regarding the positioning yarn colour codes

(Y5A) (Y5B) (Y5C) comments review the unevenness in the colour distribution. The participants consider it as an unique feature of this yarn. The soft handle of the yarn is achieved through multiple carding of fibres before it is hand spun. The change in the colour along the pattern repeats adds to the aesthetics of the garment. Thus it is positioned at (F,4) high quality and high usability.

(Y5D) (Y5E) (Y5F) are some of the yarn features that excite the knitters about the recycled yarn. The comments were very personal and different compared to the analysis of market available yarn samples. These behaviours differentiate the recycled yarn from the rest of the yarns which place them above (I,3) high quality and high usability.

(Y5G) The life cycle of a sustainable product starts from the raw material, the method of production and its final disposal. The main feature of the yarn is the recycling of silk remnants mixed with lamb's wool. At the disposal stage, the knitters can felt the fabric or ravel the yarn out and weave it to other interesting craft items which position it at (J,1) high usability and high quality.

(Y5H) The production of the recycled yarn draws focus on involving the women in the community under a sustainable cooperative system, operated and administered by them. It is a good marketing and branding strategy to keep the customer informed about the story behind the production of the yarn, so they are aware about the cause before they decide to purchase the yarn. Therefore it is positioned in the middle of the axis (E,5).

(Y5I) Hand knitters are aware about the extra care that should be given to the garment. They will value the time and creativity that is gone into making of the product and will consider care while washing. So it is positioned under (G,9) high quality and low usability.

(Y5J) although the yarn is of high quality and pleasant for knitter to use, the receiver of knitted garment may not have the same emotional attachment

towards it, and may consider the hand washing requirement tedious and therefore can considered to be of low usability and high quality positioned at (E,9).

(Y5K) In spite of the fact that the story behind the product is a good marketing strategy the recycled yarn should compete with other market available yarn. In order to achieve a high quality yarn, objective and subjective tests were conducted by the researcher and the results were analysed to derive the best outcome. The quality and price of the yarn should be competitive to other available knitting yarns to convince the customers to make their choice that positions it in the middle of the axis.

### 7.3.7 Y6 – 100% acrylic


**Fig 7.15 100% acrylic yarn**

**Table 7.23 Distilled description of Y6**

| **Distilled description of the characteristics of Y6- 100% Acrylic** | **Codes** |
|---|---|
| In spite of the yarn being in different colours, it is flat | Y6A |
| The yarn can be used for trial projects and practice | Y6B |
| Hand knitting is a process to use good yarns rather than buying something that is cheap and commercial | Y6C |
| People invest time for a project, so they want to use yarns that justify the time | Y6D |
| The yarn feels synthetic | Y6E |
| The mix of colours is good to knit laces | Y6F |
| The colour combination is attractive that encourages to knit | Y6G |
| The people who work might choose fibre content in the yarn that is suitable for machine wash and dry | Y6H |

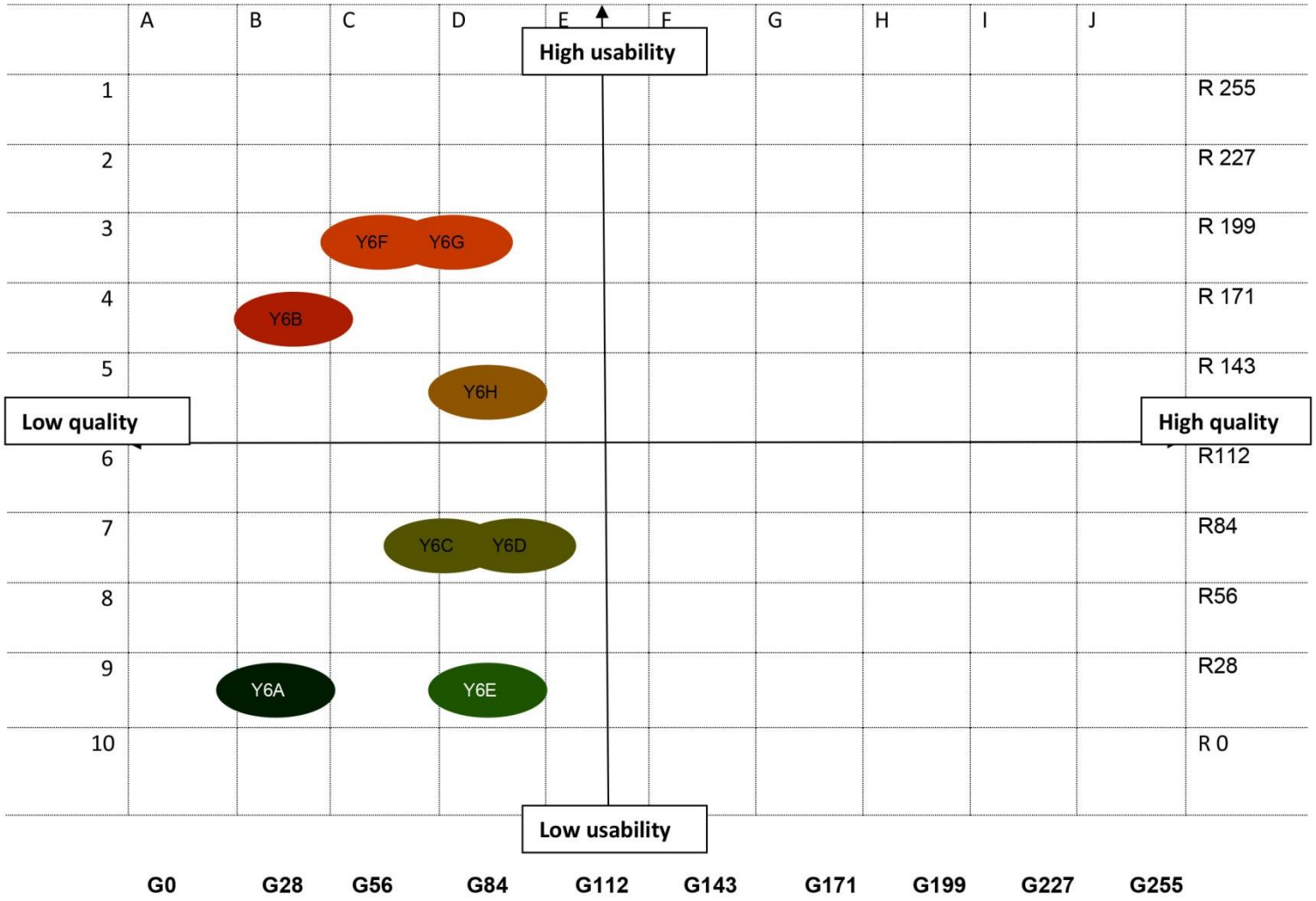



**Fig 7.16 Positioning chart of yarn sample Y6**

#### 7.3.7.1 Discussion regarding the positioning yarn colour codes

(Y6A) According to the participants, the main attraction of the yarn is the multiple colours. However, the acrylic content makes the fabric appear flat and do not give fullness like wool. Thus it is positioned under (B,9) low quality and low usability.

(Y6B) Acrylic yarns are cheaper in price compared to other yarns, so it is good for trial projects and learners. Thus it was positioned under (B,4) low quality and higher usability.

(Y6C) and (Y6D) state hand knitting is a process which is enjoyed by the knitters and they prefer to use yarns with good tactile property, texture and colours. Also it is time consuming activity and the knitter may prefer to spend money for a better quality yarn. Thus it was positioned under (D,7) low quality and low usability.

(Y6E) The details of the yarn were kept anonymous from the focus group, although the participants were able to identify the content by feeling the yarn. The handle did not interest the knitters that positioned it under (D,9) low quality and low usability.

(Y6F) and (Y6G) the colour combination of the yarn interests the knitters and they suggested that it may look attractive as small trims and laces. They were not fully disagreeable to use acrylic yarn; considering it to be highly usable, but low quality placed at (C,3).

(Y6H) acrylic is suitable for machine wash and easy to care for which increases the use of the fabric. Despite this it does not have a good handle and tactile properties like the other natural yarns used in the focus group. Thus it is placed under (D,5); low quality and higher usability.

### 7.3.8 Summary of the focus group

The use of thematic coding combined with matrix diagram allowed the identification of the main factors related with the quality issues involved in the hand knitting yarns. However, this research method is not culturally specific and can be applied in different cultural contexts.

## 7.4 Semantic differentiation test

The focus group assisted the researcher to identify the properties knitters are looking for in the hand knitting yarns and their resultant fabric. The aim of this experiment is to investigate consumers' perception of the hand knitting yarn. This is achieved with the help of semantic differential technique of attitude measurement using bipolar adjectives carefully selected from the focus group transcript. Six double knit yarns were used for the experiment. In order to eliminate visual colour preferences a "feely box" was constructed and the yarns and fabrics were placed in pairs in the hands of assessors. Twenty participants who have been knitting for a number of years and textile experts were selected to participate in the experiment.

The experiment is split in two parts where in 'Part 1' the participants have to feel the yarns and evaluate it in a bipolar scale of:

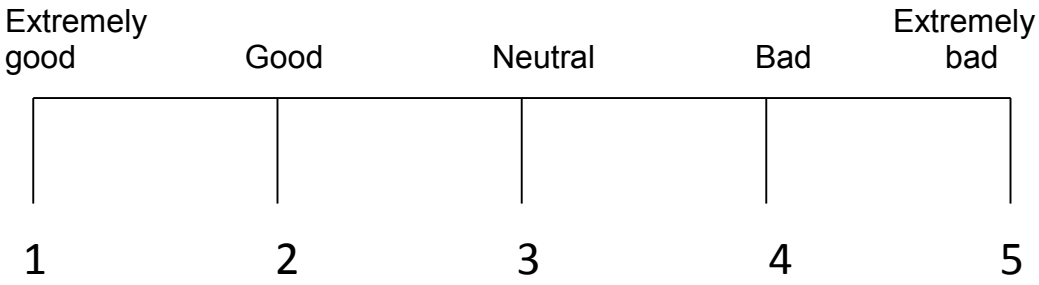



**Fig 7.17 Semantic differentiation grid**

This semantic differentiation scale (fig 7.17) is set to rate the tactile preference of the hand knitting yarns and knitted swatches developed. It is based upon a five point rating scale that has two bipolar adjectives at each end. For the experiment, a rage of yarn samples in various: prices, fibre content and twist constants similar to the recycled yarn were picked from a yarn store.

**Yarn cording**

Y1- Space dyed lamb's wool

Y2- lamb's wool angora (90% lamb's wool and 10% angora)

Y3- 100% silk filament yarn

Y4- 100 % lamb's wool

Y5- recycled yarn (30% silk remnants and 70% lamb's wool)

Y6- 100% Acrylic

### 7.4.1 Selecting process for adjectives

Bipolar adjectives developed for evaluating the hand knitting yarn were selected from the focus group transcript. To examine the validity of the adjectives for the experiment, the researcher reviewed the following literature (table 7.24) related to semantic differential tests conducted to evaluate the tactile properties in textiles.

**Table 7.24 Word pairs used for describing tactile properties in textile (Jacobsen *et al.,* 1992; Mahar *et al*. 2013; Hui *et al.,* 2004)**

| | | |
|---|---|---|
| Heavy/Light | Static/Non-static | Rough/Smooth |
| Airy/Dense | Flat/Textured | Hairy/Clean |
| Even/Uneven | Bulky/ Non-bulky | Hard/Soft |
| Drapable/Stiff | Light/Heavy | Warm/Cool |
| Bulky/Delicate | Thin/Thick | Light/Heavy |
| Fine/Thick | Silky/Scratchy | Loose/Tight |
| Coarse/Fine | Smooth/Rough | Greasy/Dry |
| Soft/Harsh | Fine/Coarse | |
| Prickly/Smooth | Limp/Crisp | |
| Smooth/Fluffy | Flexible/Stiff | |
| Stiff/Pliable | Soft/Hard | |
| Body/Limp | Flimsy/Firm | |
| Insulating/Conducting | Compact/Loose | |
| Drab/Elegant | High Drape/Low Drape | |
| Luxurious/Cheap | Cool/Warm | |
| Distorts/Maintains Shape | | |

Finally, the following bipolar attributes (fig 7.18) were developed for evaluating the tactile properties of each yarn sample used in the experiment.

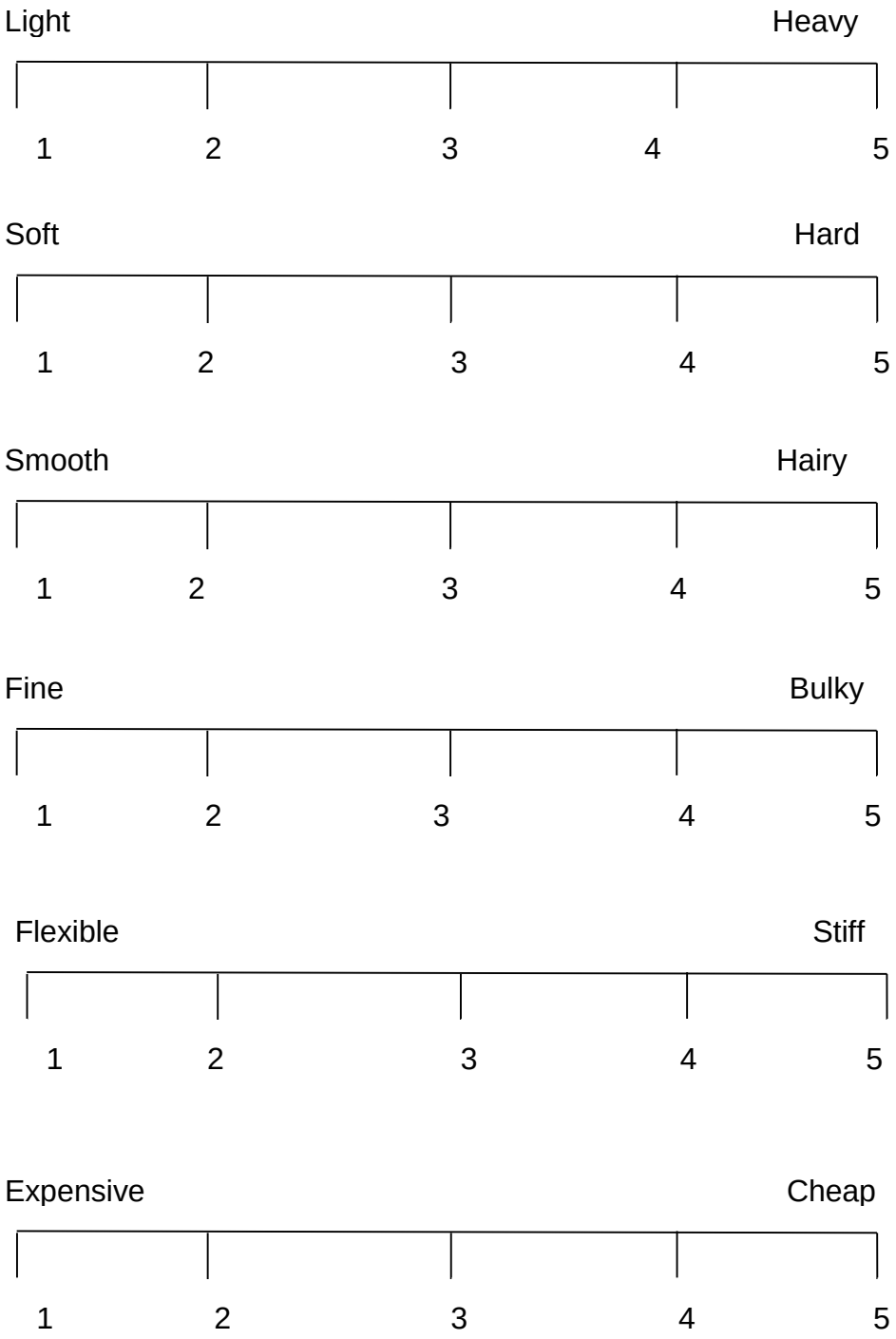



**Fig 7.18 Semantic differential grid developed for the experiment**

In Part 2 of the experiment each yarn sample was knitted in three ways: two ways involved hand-knitting (stocking stitch and garter stitch); and the other involved a dubied machine knit. The fabric swatches were coded as:

F1 - space dyed lamb's wool

F2 - lamb's wool angora

F3 - 100% silk filament yarn

F4 -100% oiled lamb's wool

F5 - recycled hand spun yarn

F6 - 100% acrylic

Four swatches in each yarn sample were knitted and colour tagged according to wash: unwashed (red), hand wash (green), machine wash (black) and dry clean(blue). The swatches were colour tagged for the researcher to identify the washes while conducting the experiment. During the experiment, participants were not informed about the fabric type or wash.

Two pilot studies were carried out to assess the feasibility of the data collection method. A sensory feely box was used to feel the knitted swatches without knowing the quality or wash. Each participant is given two swatches in different washes in each of their hands, and asked to feel the fabric against their skin and select the one which had a better hand-feel. The time scale of the pilot study examining the knitted swatches in three different knitted structures took more than four hours depending on the time taken by each participant. It was also noted that the interest level of the participant in the experiment went low after an hour and the results did not show much accuracy. In order to reduce the timescale of the experiment two knitted structures: garter stitch and machine stitch were eliminated for the final experiment. The data was collected and then analysis was performed by calculating the standard deviation and average values.

### 7.4.2 Data analysis part1: semantic differentiation test

Each of the twenty participants was handed printed copies of semantic differentiation grid and asked to plot their concept of different attributes for each yarn sample. The participants were allowed to explore the hand feel and texture of each yarn behind the feely box without viewing the yarn (fig 7.19). The results of the experiments are examined in tables 7.25, 7.26, 7.27, 7.28, 7.29, 7.30 where the lower average value represents better handle of the yarn.

**Fig 7.19 Feely box testing for yarn samples**

### 7.4.2.1 Y1 - space dyed lamb's wool

**Table 7.25 Semantic differentiation test results for space dyed lamb's wool**

| | L-H | S-H | S-H | F-B | F-S | E-C |
|---|---|---|---|---|---|---|
| **p1** | 2 | 2 | 3 | 2 | 2 | 4 |
| **p2** | 4 | 3 | 3 | 4 | 3 | 4 |
| **p3** | 2 | 3 | 4 | 4 | 4 | 4 |
| **p4** | 2 | 2 | 2 | 4 | 2 | 2 |
| **p5** | 3 | 3 | 2 | 4 | 3 | 3 |
| **p6** | 4 | 2 | 4 | 4 | 2 | 4 |
| **p7** | 3 | 4 | 3 | 3 | 3 | 2 |
| **p8** | 3 | 4 | 3 | 4 | 3 | 3 |
| **p9** | 2 | 3 | 3 | 3 | 3 | 4 |
| **p10** | 4 | 4 | 4 | 4 | 4 | 2 |
| **p11** | 4 | 3 | 3 | 4 | 2 | 4 |
| **p12** | 2 | 3 | 3 | 3 | 1 | 5 |
| **p13** | 3 | 3 | 3 | 4 | 3 | 4 |
| **p14** | 4 | 3 | 4 | 3 | 3 | 4 |
| **p15** | 3 | 4 | 3 | 5 | 3 | 3 |
| **p16** | 3 | 3 | 4 | 4 | 3 | 3 |
| **p17** | 5 | 3 | 2 | 5 | 2 | 4 |
| **p18** | 4 | 3 | 4 | 5 | 4 | 4 |
| **p19** | 3 | 3 | 4 | 4 | 4 | 4 |
| **p20** | 4 | 3 | 2 | 5 | 3 | 4 |
| **Average** | 3.2 | 3.1 | 3.2 | 3.9 | 2.9 | 3.6 |
| **S.D** | 0.9 | 0.6 | 0.7 | 0.8 | 0.8 | 0.8 |

| | **Bipolar attributes** |
|---|---|
| L-H | Light-Heavy |
| S-H | Soft-Hard |
| S-H | Smooth-Hairy |
| F-B | Fine-Bulky |
| F-S | Flexible-Stiff |
| E-C | Expensive-Cheap |

The higher average value in the table represents lower preference of Y1 sample compared to Y2, Y3, Y5 and Y6. The lower SD values suggests that the participants were in more agreement with one another.

### 7.4.2.2 Y2 - lamb's wool angora

**Table 7.26 Semantic differentiation test results for lamb's wool angora**

| | L-H | S-H | S-H | F-B | F-S | F-C |
|---|---|---|---|---|---|---|
| **p1** | 3 | 3 | 2 | 2 | 3 | 3 |
| **p2** | 2 | 3 | 3 | 3 | 3 | 3 |
| **p3** | 2 | 2 | 3 | 3 | 2 | 3 |
| **p4** | 1 | 2 | 2 | 2 | 2 | 2 |
| **p5** | 2 | 2 | 2 | 3 | 3 | 3 |
| **p6** | 2 | 2 | 3 | 2 | 2 | 3 |
| **p7** | 2 | 2 | 2 | 3 | 3 | 3 |
| **p8** | 2 | 2 | 2 | 3 | 3 | 3 |
| **p9** | 2 | 2 | 2 | 2 | 2 | 3 |
| **p10** | 2 | 2 | 2 | 2 | 3 | 2 |
| **p11** | 3 | 2 | 2 | 2 | 1 | 2 |
| **p12** | 3 | 2 | 2 | 2 | 1 | 3 |
| **p13** | 2 | 1 | 3 | 3 | 2 | 2 |
| **p14** | 2 | 2 | 1 | 2 | 2 | 3 |
| **p15** | 2 | 2 | 3 | 3 | 2 | 2 |
| **p16** | 2 | 2 | 3 | 2 | 2 | 2 |
| **p17** | 3 | 2 | 4 | 3 | 2 | 3 |
| **p18** | 3 | 2 | 4 | 3 | 2 | 2 |
| **p19** | 3 | 3 | 2 | 3 | 3 | 4 |
| **p20** | 3 | 3 | 2 | 3 | 2 | 3 |
| **Average** | 2.3 | 2 | 2.4 | 2.5 | 2.3 | 2.7 |
| **SD** | 0.6 | 0.5 | 0.8 | 0.5 | 0.6 | 0.6 |

| | **Bipolar attributes** |
|---|---|
| L-H | Light-Heavy |
| S-H | Soft-Hard |
| S-H | Smooth-Hairy |
| F-B | Fine- Bulky |
| F-S | Flexible-Stiff |
| E-C | Expensive-Cheap |

The lower average value in the table represents higher preference of Y2 sample compared to Y1, Y4, and Y6.

### 7.4.2.3 Y3 - 100% silk filament yarn

**Table 7.27 Semantic differentiation test results for 100% silk filament yarn**

| Y3 | L-H | S-H | S-H | F-B | F-S | E-C |
|---|---|---|---|---|---|---|
| **p1** | 1 | 1 | 1 | 1 | 1 | 1 |
| **p2** | 2 | 1 | 1 | 2 | 1 | 2 |
| **p3** | 2 | 1 | 1 | 2 | 2 | 2 |
| **p4** | 2 | 1 | 1 | 1 | 1 | 2 |
| **p5** | 1 | 1 | 2 | 2 | 2 | 2 |
| **p6** | 1 | 1 | 1 | 1 | 1 | 2 |
| **p7** | 1 | 1 | 1 | 1 | 3 | 1 |
| **p8** | 1 | 1 | 2 | 1 | 1 | 2 |
| **p9** | 2 | 1 | 2 | 1 | 2 | 3 |
| **p10** | 2 | 1 | 1 | 1 | 3 | 2 |
| **p11** | 1 | 1 | 1 | 2 | 1 | 2 |
| **p12** | 4 | 1 | 1 | 1 | 1 | 2 |
| **p13** | 2 | 2 | 2 | 2 | 1 | 2 |
| **p14** | 2 | 1 | 2 | 1 | 2 | 2 |
| **p15** | 2 | 2 | 2 | 3 | 2 | 3 |
| **p16** | 4 | 1 | 1 | 1 | 1 | 1 |
| **p17** | 2 | 1 | 1 | 1 | 1 | 2 |
| **p18** | 4 | 1 | 2 | 2 | 1 | 1 |
| **p19** | 4 | 3 | 2 | 3 | 3 | 2 |
| **p20** | 1 | 1 | 1 | 2 | 1 | 2 |
| **Average** | 2.1 | 1.2 | 1.4 | 1.6 | 1.6 | 1.9 |
| **SD** | 1.1 | 0.5 | 0.5 | 0.7 | 0.8 | 0.6 |

| | **Bipolar attributes** |
|---|---|
| **L-H** | Light-Heavy |
| **S-H** | Soft-Hard |
| **S-H** | Smooth-Hairy |
| **F-B** | Fine-Bulky |
| **F-S** | Flexible-Stiff |
| **E-C** | Expensive-Cheap |

The lower average value in the table represents higher preference for Y3 compared to Y1, Y2, Y4, Y5 and Y6 and it was listed as the best yarn sample.

### 7.4.2.4 Y4 - oiled lamb's wool

**Table 7.28 Semantic differentiation test results for oiled lamb's wool**

| Y4 | L-H | S-H | S-H | F-B | F-S | E-C |
|---|---|---|---|---|---|---|
| **p1** | 4 | 5 | 5 | 3 | 4 | 4 |
| **p2** | 3 | 4 | 3 | 3 | 3 | 3 |
| **p3** | 4 | 5 | 4 | 3 | 5 | 4 |
| **p4** | 3 | 4 | 4 | 4 | 2 | 3 |
| **p5** | 3 | 4 | 3 | 3 | 3 | 4 |
| **p6** | 4 | 4 | 4 | 4 | 4 | 5 |
| **p7** | 2 | 4 | 4 | 4 | 5 | 4 |
| **p8** | 3 | 4 | 4 | 4 | 4 | 4 |
| **p9** | 2 | 4 | 4 | 3 | 4 | 4 |
| **p10** | 2 | 5 | 5 | 5 | 4 | 3 |
| **p11** | 3 | 3 | 4 | 4 | 2 | 4 |
| **p12** | 2 | 5 | 5 | 5 | 1 | 5 |
| **p13** | 2 | 4 | 4 | 3 | 4 | 4 |
| **p14** | 3 | 4 | 4 | 3 | 4 | 4 |
| **p15** | 4 | 4 | 3 | 4 | 3 | 3 |
| **p16** | 2 | 4 | 4 | 4 | 3 | 4 |
| **p17** | 5 | 4 | 4 | 5 | 4 | 3 |
| **p18** | 2 | 5 | 3 | 3 | 4 | 4 |
| **p19** | 4 | 2 | 3 | 3 | 4 | 4 |
| **p20** | 5 | 4 | 4 | 5 | 4 | 5 |
| **Average** | 3.1 | 4.1 | 3.9 | 3.8 | 3.6 | 3.9 |
| **SD** | 1.0 | 0.7 | 0.6 | 0.8 | 1.0 | 0.6 |

| | **Bipolar attributes** |
|---|---|
| L-H | Light-Heavy |
| S-H | Soft-Hard |
| S-H | Smooth-Hairy |
| F-B | Fine-Bulky |
| F-S | Flexible-Stiff |
| E-C | Expensive-Cheap |

The higher average value in the table represents lower preference for Y4, the yarn sample with least tactile attributes.

### 7.4.2.5 Y5 - recycled hand spun yarn

**Table 7.29 Semantic differentiation test results for the recycled hand spun yarn**

| Y5 | L-H | S-H | S-H | F-B | F-S | E-C |
|---|---|---|---|---|---|---|
| **p1** | 2 | 2 | 2 | 2 | 2 | 2 |
| **p2** | 2 | 2 | 3 | 3 | 3 | 3 |
| **p3** | 3 | 3 | 3 | 4 | 2 | 2 |
| **p4** | 2 | 2 | 2 | 4 | 2 | 2 |
| **p5** | 2 | 2 | 2 | 3 | 3 | 2 |
| **p6** | 2 | 2 | 2 | 2 | 2 | 3 |
| **p7** | 2 | 3 | 3 | 2 | 3 | 3 |
| **p8** | 3 | 3 | 3 | 3 | 2 | 3 |
| **p9** | 2 | 3 | 3 | 3 | 3 | 3 |
| **p10** | 3 | 4 | 3 | 2 | 2 | 2 |
| **p11** | 2 | 3 | 3 | 2 | 2 | 3 |
| **p12** | 3 | 3 | 3 | 3 | 1 | 3 |
| **p13** | 2 | 1 | 2 | 4 | 2 | 2 |
| p14 | 2 | 3 | 3 | 2 | 3 | 3 |
| p15 | 3 | 3 | 2 | 3 | 2 | 2 |
| **p16** | 3 | 2 | 2 | 2 | 2 | 2 |
| **p17** | 2 | 2 | 3 | 4 | 2 | 3 |
| **p18** | 2 | 1 | 3 | 5 | 2 | 2 |
| **p19** | 2 | 3 | 3 | 3 | 3 | 4 |
| **p20** | 3 | 3 | 3 | 3 | 2 | 3 |
| **Average** | 2.4 | 2.5 | 2.6 | 2.9 | 2.3 | 2.6 |
| **SD** | 0.5 | 0.8 | 0.5 | 0.9 | 0.6 | 0.6 |

| | **Bipolar attributes** |
|---|---|
| L-H | Light-Heavy |
| S-H | Soft-Hard |
| S-H | Smooth-Hairy |
| F-B | Fine-Bulky |
| F-S | Flexible-Stiff |
| E-C | Expensive-Cheap |

The lower average values in the table show that the participants like the hand feel of the Y5 sample compared Y1, Y4 and Y6.

### 7.4.2.6 Y6 - 100% acrylic

**Table 7.30 Semantic differentiation test results for 100% acrylic**

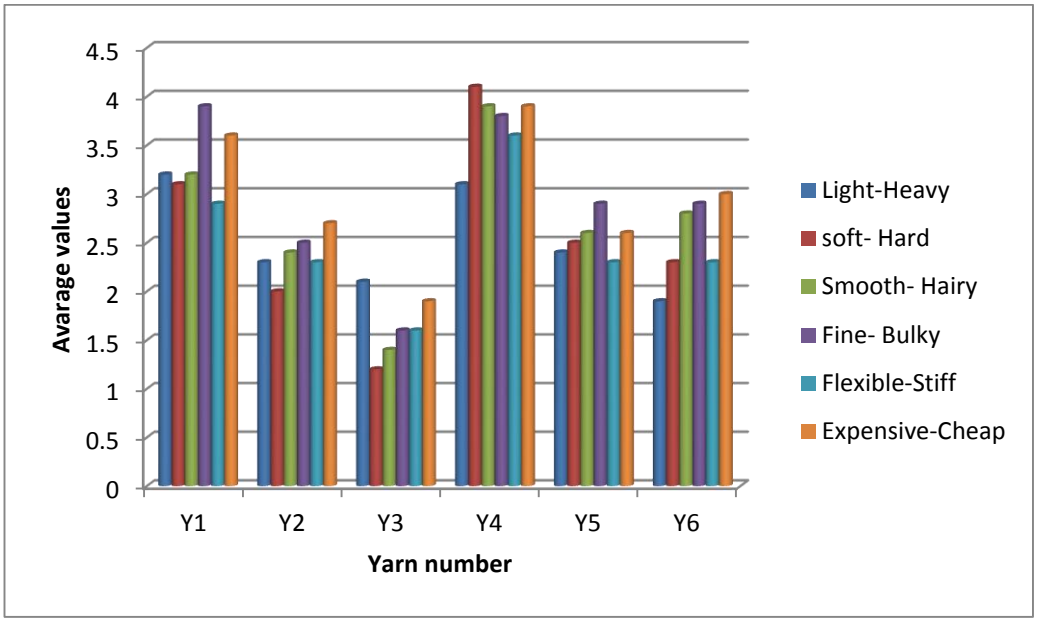
| Y6 | L-H | S-H | S-H | F-B | F-S | E-C |
|---|---|---|---|---|---|---|
| p1 | 1 | 2 | 2 | 2 | 2 | 4 |
| p2 | 2 | 3 | 3 | 3 | 2 | 3 |
| p3 | 3 | 2 | 2 | 4 | 2 | 2 |
| p4 | 2 | 2 | 2 | 4 | 2 | 2 |
| p5 | 1 | 2 | 2 | 2 | 2 | 3 |
| p6 | 2 | 1 | 2 | 2 | 1 | 3 |
| p7 | 2 | 2 | 2 | 3 | 4 | 3 |
| p8 | 2 | 2 | 3 | 3 | 3 | 3 |
| p9 | 1 | 3 | 3 | 3 | 3 | 4 |
| p10 | 2 | 1 | 5 | 2 | 3 | 2 |
| p11 | 3 | 2 | 3 | 4 | 2 | 4 |
| p12 | 2 | 3 | 3 | 3 | 1 | 3 |
| p13 | 2 | 3 | 2 | 2 | 2 | 3 |
| p14 | 2 | 3 | 2 | 3 | 3 | 4 |
| p15 | 2 | 3 | 3 | 3 | 2 | 4 |
| p16 | 2 | 2 | 3 | 2 | 2 | 2 |
| p17 | 2 | 2 | 4 | 4 | 2 | 2 |
| p18 | 1 | 2 | 3 | 2 | 2 | 2 |
| p19 | 2 | 2 | 3 | 3 | 3 | 3 |
| p20 | 3 | 3 | 4 | 4 | 3 | 4 |
| **Average** | 1.9 | 2.3 | 2.8 | 2.9 | 2.3 | 3 |
| **SD** | 0.6 | 0.6 | 0.8 | 0.8 | 0.7 | 0.8 |

| | **Bipolar attributes** |
|---|---|
| L-H | Light-Heavy |
| S-H | Soft-Hard |
| S-H | Smooth-Hairy |
| F-B | Fine-Bulky |
| F-S | Flexible-Stiff |
| E-C | Expensive-Cheap |

The average values in the table show that the participants prefer the handle of the Y6 sample compared Y1 and Y4.

### 7.4.2.7 Comparative analysis of the bipolar adjectives for six yarn samples

The averages of the yarn were plotted in a bar diagram (fig 7.20) to compare the results of all six yarn samples according to rating of attributes in the semantic differential grid. Lower average values represent descriptions of better handle in the relevant yarn sample.




| Bipolar attributes | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |
|---|---|---|---|---|---|---|
| Light-Heavy | 3.2 | 2.3 | 2.1 | 3.1 | 2.4 | 1.9 |
| soft- Hard | 3.1 | 2 | 1.2 | 4.1 | 2.5 | 2.3 |
| Smooth- Hairy | 3.2 | 2.4 | 1.4 | 3.9 | 2.6 | 2.8 |
| Fine- Bulky | 3.9 | 2.5 | 1.6 | 3.8 | 2.9 | 2.9 |
| Flexible-Stiff | 2.9 | 2.3 | 1.6 | 3.6 | 2.3 | 2.3 |
| Expensive-Cheap | 3.6 | 2.7 | 1.9 | 3.9 | 2.6 | 3 |

**Fig 7.20 Comparative analysis of attributes for six yarn samples**

The value of the parameters provide a measure for the yarn attributes. Higher averages show poor tactile properties and lower averages represent better tactile property. The composition of the set of attributes in the graph represents that Y3-100% silk filament yarn as the best yarn in the group with excellent handle. Y2-lamb's wool angora and Y5-recycled yarn (30% silk remnants and 70% lamb's wool) were categorised as good quality yarn.

However, Y5 is rated bulkier compared to Y2. Y6 100% acrylic is classified better in handle than yarn samples Y1 and Y4.

### 7.4.3 Data analysis part 2 : fabric handle test

In the second part of the experiment the twenty participants were asked to feel similar fabric in two different washes under a feely box (fig 7.21) and select the one which they liked. The fabric hand refers to the total sensation experienced when a fabric is touched or manipulated between the fingers (Hatch, 1993). All the six yarn samples used for the semantic differential test were knitted to swatches and each fabric sample was washed in three ways to examine the appropriate wash suitable for the fabric (table 7.31).

**Table 7.31 List of fabric samples used for fabric handle experiment**

| Fabric content | Fabric code |
|---|---|
| 100% space dyed lamb's wool | F1 |
| Lamb's wool angora | F2 |
| 100% silk filament | F3 |
| 100% oiled lamb's wool | F4 |
| 30% silk remnants and 70% lamb's wool | F5 |
| 100% acrylic | F6 |

**Fig 7.21 Fabric handle test using feely box**

The results for each participant was recorded in table 7.32, by the researcher during the experiment and finally examined to select the appropriate wash for each fabric type.

**Table 7.32 Example for individual fabric handle test**

| participant | Fabric hand feel test | fabric coding | Hand knit stocking stitch**(A)** |
|---|---|---|---|
| **P** | Unwashed – Hand wash | **F1A1** | HW |
| | Unwashed – Machine wash | **F1A2** | **HW** |
| | Unwashed – Dry clean | **F1A3** | UW |
| | Hand wash – Unwashed | **F1A4** | UW |
| | Hand wash- Machine wash | **F1A5** | HW |
| | Hand wash – Dry clean | **F1A6** | DC |
| | Machine wash – Unwashed | **F1A7** | UW |
| | Machine wash – Hand wash | **F1A8** | HW |
| | Machine wash – Dry clean | **F1A9** | MW |
| | Dry clean – Unwashed | **F1A10** | UW |
| | Dry clean- Hand wash | **F1A11** | HW |
| | Dry clean- Machine wash | **F1A12** | DC |
| | Unwashed – Hand wash | **F2A1** | HW |
| | Unwashed – Machine wash | **F2A2** | MW |
| | Unwashed – Dry clean | **F2A3** | HW |
| | Hand wash – Unwashed | **F2A4** | **HW** |
| | Hand wash- Machine wash | **F2A5** | MW |
| | Hand wash – Dry clean | **F2A6** | HW |
| | Machine wash – Unwashed | **F2A7** | HW |
| | Machine wash – Hand wash | **F2A8** | MW |
| | Machine wash – Dry clean | **F2A9** | HW |
| | Dry clean – Unwashed | **F2A10** | DC |
| | Dry clean- Hand wash | **F2A11** | HW |
| | Dry clean- Machine wash | **F2A12** | MW |
| | Unwashed – Hand wash | **F3A1** | UW |
| | Unwashed – Machine wash | **F3A2** | **MW** |
| | Unwashed – Dry clean | **F3A3** | UW |
| | Hand wash – Unwashed | **F3A4** | HW |
| | Hand wash- Machine wash | **F3A5** | HW |
| | Hand wash – Dry clean | **F3A6** | HW |
| | Machine wash – Unwashed | **F3A7** | MW |
| | Machine wash – Hand wash | **F3A8** | MW |

| | | | |
|---|---|---|---|
| | Machine wash – Dry clean | **F3A9** | MW |
| | Dry clean – Unwashed | **F3A10** | UW |
| | Dry clean- Hand wash | **F3A11** | HW |
| | Dry clean- Machine wash | **F3A12** | MW |
| | Unwashed – Hand wash | **F4A1** | HW |
| | Unwashed – Machine wash | **F4A2** | UW |
| | Unwashed – Dry clean | **F4A3** | DC |
| | Hand wash – Unwashed | **F4A4** | **HW** |
| | Hand wash- Machine wash | **F4A5** | HW |
| | Hand wash – Dry clean | **F4A6** | DC |
| | Machine wash – Unwashed | **F4A7** | MW |
| | Machine wash – Hand wash | **F4A8** | HW |
| | Machine wash – Dry clean | **F4A9** | MW |
| | Dry clean – Unwashed | **F4A10** | DC |
| | Dry clean- Hand wash | **F4A11** | HW |
| | Dry clean- Machine wash | **F4A12** | DC |
| | Unwashed – Hand wash | **F5A1** | UW |
| | Unwashed – Machine wash | **F5A2** | MW |
| | Unwashed – Dry clean | **F5A3** | DC |
| | Hand wash – Unwashed | **F5A4** | HW |
| | Hand wash- Machine wash | **F5A5** | **HW** |
| | Hand wash – Dry clean | **F5A6** | **DC** |
| | Machine wash – Unwashed | **F5A7** | MW |
| | Machine wash – Hand wash | **F5A8** | HW |
| | Machine wash – Dry clean | **F5A9** | MW |
| | Dry clean – Unwashed | **F5A10** | DC |
| | Dry clean- Hand wash | **F5A11** | HW |
| | Dry clean- Machine wash | **F5A12** | DC |
| | Unwashed – Hand wash | **F6A1** | UW |
| | Unwashed – Machine wash | **F6A2** | **UW** |
| | Unwashed – Dry clean | **F6A3** | DC |
| | Hand wash – Unwashed | **F6A4** | UW |
| | Hand wash- Machine wash | **F6A5** | MW |
| | Hand wash – Dry clean | **F6A6** | DC |
| | Machine wash – Unwashed | **F6A7** | UW |
| | Machine wash – Hand wash | **F6A8** | HW |
| | Machine wash – Dry clean | **F6A9** | DC |
| | Dry clean – Unwashed | **F6A10** | UW |
| | Dry clean- Hand wash | **F6A11** | HW |
| | Dry clean- Machine wash | **F6A12** | DC |

The results of each participant were recorded in similar tables and the highest repeating wash was selected for each fabric type which is highlighted in red. The highlighted wash in each participants table was grouped together in a separate table (7.33) and the averages of repeated wash were calculated in order to identify the appropriate wash for each fabric type.

### 7.4.3.1 Fabric wash preference

**Table 7.33 Data analysis of fabric wash preference**

| Participants | F1 | F2 | F3 | F4 | F5 | F6 |
|---|---|---|---|---|---|---|
| **p1** | UW | HW | UW | HW | HW | DC |
| **p2** | DC/HW | HW | DC | HW | DC | MW |
| **p3** | UW/HW | UW | HW | HW | DC | UW/HW |
| **p4** | HW | MW | HW | HW | HW | DC |
| **p5** | HW | MW | UW/HW | DC/HW | HW/MW | MW |
| **p6** | UW/HW | HW | HW | HW | MW | UW/MW |
| **p7** | DC | MW | UW | HW/UW | MW | UW |
| **p8** | HW | HW | UW | HW/UW | HW | UW/MW |
| **p9** | HW | HW | MW | HW | HW/DC | UW |
| **p10** | HW | HW | UW | HW | DC | HW |
| **p11** | UW | HW/DC | MW | HW | HW | UW/HW |
| **p12** | HW/MW | MW | UW | HW | MW | UW/MW |
| **p13** | MW/UW | MW | HW | UW/DC | HW/DC | MW |
| **p14** | MW | HW | HW | UW | HW/UW | MW |
| **p15** | HW | UW | MW | MW/DC | DC | DC |
| **p16** | DC | MW | UW | UW/MW | MW/DC | HW |
| **p17** | HW | DC | DC | MW | HW | MW |
| **p18** | HW | MW | UW | UW | MW | MW |
| **p19** | HW | MW | UW | HW | MW | DC |
| **p20** | HW/DC | MW | HW | HW/MW | HW/DC | MW |
| **wash preference** | **Hand wash** | **Machine Wash** | **Un wash** | **Hand wash** | **Hand wash** | **Machine Wash** |

The participants wash preference for each fabric samples are listed below

- Unwashed – F3 (100% silk filament)
- Hand wash- F1 (space dyed lamb's wool), F4 (oiled lamb's wool), F5 (recycled hand spun yarn)
- Machine wash- F2 (lamb's wool  angora)

- Dry clean- none

The six bipolar attributes pertaining to the tactile qualities were evaluated for the six hand knitting yarn and fabric samples. The yarns and resultant fabric used in the evaluations represent five commercially available hand knitting yarn along with the recycled yarn developed by the researcher. Furthermore, the responses to the yarn and in fabric stage differ in some instances.

## 7.5 Yarn appearance test

The yarns were coded as Y1, Y2, Y3, Y4, Y5 and Y6 and the respondents were asked to arrange the yarns according to overall appearance of the yarn and colour preference. Twenty five textile students in two batches took part in the experiment (fig 7.22). The participants were handed a printed copy explaining the yarn content and requested to rate the yarns according to the overall appearance and colour.

**Fig 7.22 Yarn preference test**

E.g. 1 – overall appearance

| | | | | | |
|---|---|---|---|---|---|
| Y1 | Y3 | Y2 | Y6 | Y4 | Y5 |

E.g. 2 – colour preference

| | | | | | |
|---|---|---|---|---|---|
| Y2 | Y3 | Y6 | Y4 | Y5 | Y1 |

### 7.5.1 Yarn preference in terms of overall appearance

**Table 7.34 Calculation of SD for overall appearance of six yarn samples**

| participants | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |
|---|---|---|---|---|---|---|
| 1 | 3 | 5 | 4 | 6 | 2 | 1 |
| 2 | 3 | 6 | 1 | 2 | 4 | 5 |
| 3 | 1 | 4 | 6 | 5 | 3 | 2 |
| 4 | 5 | 3 | 4 | 6 | 1 | 2 |
| 5 | 2 | 5 | 6 | 3 | 1 | 4 |
| 6 | 6 | 4 | 5 | 2 | 3 | 1 |
| 7 | 5 | 1 | 3 | 2 | 6 | 4 |
| 8 | 6 | 4 | 3 | 2 | 5 | 1 |
| 9 | 1 | 4 | 6 | 2 | 3 | 5 |
| 10 | 1 | 5 | 4 | 6 | 3 | 2 |
| 11 | 2 | 1 | 6 | 3 | 4 | 5 |
| 12 | 6 | 2 | 5 | 4 | 3 | 1 |
| 13 | 5 | 1 | 6 | 3 | 2 | 4 |
| 14 | 4 | 3 | 6 | 5 | 1 | 2 |
| 15 | 6 | 4 | 2 | 5 | 3 | 1 |
| 16 | 4 | 1 | 5 | 6 | 2 | 3 |
| 17 | 2 | 3 | 5 | 4 | 1 | 6 |
| 18 | 5 | 4 | 2 | 6 | 3 | 1 |
| 19 | 6 | 1 | 2 | 3 | 4 | 5 |
| 20 | 6 | 5 | 2 | 4 | 3 | 1 |
| 21 | 3 | 5 | 4 | 6 | 2 | 1 |
| 22 | 5 | 1 | 2 | 4 | 3 | 6 |
| 23 | 5 | 1 | 2 | 4 | 3 | 6 |
| 24 | 4 | 3 | 6 | 5 | 1 | 2 |
| 25 | 3 | 6 | 1 | 4 | 2 | 5 |
| **Average** | **4.0** | **3.3** | **3.8** | **4.1** | **2.7** | **3.0** |
| **SD** | **1.7** | **1.7** | **1.8** | **1.5** | **1.3** | **1.9** |

The smaller value for SD suggests that the participants were in more agreement with each other. However, in the case of yarn sample ‘Y5’ the value of SD is closest to 1.0 therefore the level of agreement is higher compared to the other yarn samples.

## 7.5.2 Yarn preference in terms of colour

**Table 7.35 Calculation of SD for colour preference of six yarn samples**

| Participants | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |
|---|---|---|---|---|---|---|
| 1 | 2 | 5 | 6 | 4 | 1 | 3 |
| 2 | 3 | 4 | 5 | 6 | 2 | 1 |
| 3 | 3 | 4 | 5 | 6 | 1 | 2 |
| 4 | 5 | 4 | 3 | 6 | 2 | 1 |
| 5 | 4 | 1 | 6 | 2 | 3 | 5 |
| 6 | 6 | 3 | 4 | 5 | 1 | 2 |
| 7 | 5 | 2 | 4 | 1 | 6 | 3 |
| 8 | 6 | 4 | 5 | 2 | 3 | 1 |
| 9 | 4 | 2 | 3 | 6 | 1 | 5 |
| 10 | 3 | 4 | 5 | 6 | 1 | 2 |
| 11 | 1 | 2 | 4 | 5 | 6 | 3 |
| 12 | 6 | 3 | 4 | 5 | 2 | 1 |
| 13 | 5 | 2 | 6 | 3 | 1 | 4 |
| 14 | 4 | 5 | 3 | 6 | 2 | 1 |
| 15 | 6 | 3 | 5 | 4 | 2 | 1 |
| 16 | 3 | 1 | 6 | 5 | 4 | 2 |
| 17 | 2 | 3 | 5 | 4 | 1 | 6 |
| 18 | 4 | 2 | 5 | 3 | 1 | 6 |
| 19 | 6 | 1 | 5 | 2 | 4 | 3 |
| 20 | 4 | 5 | 2 | 6 | 3 | 1 |
| 21 | 3 | 5 | 4 | 6 | 2 | 1 |
| 22 | 6 | 1 | 3 | 2 | 4 | 5 |
| 23 | 6 | 1 | 3 | 2 | 4 | 5 |
| 24 | 6 | 3 | 5 | 4 | 1 | 2 |
| 25 | 6 | 4 | 2 | 5 | 1 | 3 |
| **Average** | **4.4** | **3.0** | **4.3** | **4.2** | **2.4** | **2.8** |
| **SD** | **1.6** | **1.4** | **1.2** | **1.7** | **1.6** | **1.7** |

The SD value for yarn sample ‘Y5’ is 1.6. Thus the level of agreement is low compared to Y3 and Y2 samples.

## 7.6 Wearer Test

Objective test results detailing an analysis of the physical properties of six yarn samples were reviewed early in this chapter. Gaps in the objective and subjective tests impacting the quality of the yarn in fabric stage was explored through a wearer test. The wearer test was conducted in an attempt to study the yarn behaviour in the garment stage and support the researcher to in examining the: wash properties, colour bleeding, abrasion of the garment for a period of time. Two participants (P1 and P2) were involved in the wearer test for a period of eight months. The study covered a range of data collection methods like observations and recording of the measurements before and after wash of the garment. Both sets of results were brought together in the data analysis section to present the findings

**Table 7.36 Hand knitted sweater specifications for wearer test**

| Photograph | Measurements<br>Size: L | Knitting needle size | Wash care to follow by participants |
|---|---|---|---|
|  <br>Hand knitted sweater (yarn used is approximately 6 skeins, where each skein is 100gs) | Chest - 21”<br>Shoulder - 18”<br>Sleeve length - 25.5”<br>Garment full length - 26”<br>Neck width - 5”<br>Bottom opening - 21”<br>Sleeve opening -5” | Body - 4mm<br>Bottom rib - 3.5mm<br>Sleeve and neck rib - 3mm | Hand wash only<br>Wash temperature -40°c<br>Flat dry |

## 7.6.1 Discussion of the wearer test

This section reports the wearer study findings extracted from the participants through informal interviews and photographs. Participants provided information on which physical properties of the garment had changed over a period of eight months. This information is analysed and assisted to provide the necessary recommendations for the care label of the recycled yarn.

## 7.6.2 Factors affecting the physical properties of the garment

According to Hui *et al.,* (2004) a traditional method for describing fabric handle is based on the experience and variable sensitivity of human beings. The participants for the test were carefully selected considering their gender, age, education and cultural background. Both the participants were English

men where participant 1 is between the age group 55-60 and participant B is between the age group 25-30. Emirhanova and Kavusturan (2008) argue that handle and appearance are two important classes of the fabric. Berkalp *et al.,* (2003) explains that the fabric may lose its aesthetic appeal due to wear which is a combination of several factors like: abrasion, repeated laundering and the application of forces in dry and wet stage which arises from everyday use and service. Surface abrasion is considered as one of the important factors in fabric testing. The wearer trial illustrated the following:

- Tactile (feel and comfort)
- Appearance
- Shredding of silk remnants from the garment
- Fabric abrasion (pilling)
- Laundering
- Colour bleeding
- Measurement change in the garments

### 7.6.2.1 Wearer test discussion about the physical properties of garment

**Table 7.37 Wearer test results**

| Attributes | Participant 1 (May- July 2014) | Participant 2 (August – December 2014) |
|---|---|---|
| Tactile (feel and comfort) | The garment had good comfort level and there was no skin irritation from the silk remnants | The comfort level of the garment was good and there was no ticking or scratchiness from the silk remnants in the yarn |
| Appearance | The complexity of the garment (from the hand spun and hand knitted yarn) added value to the appearance. The colour combination is attractive | The garment drapes well and colour combination is excellent |
| Shredding of silk remnants | In the first week of trial, prior to the first wash there was shredding of silk remnants which were less than three inches in length | There was no shredding of silk remnants from the garment |
| Laundering | Hand washed in warm water and spin dried in washing machine at delicate setting using a wool mark detergent and flat dried | Hand washed in warm water and flat dried |
| Colour bleeding | Grey colour bleeding from the garment during wash | Grey colour bleeding from the garment during wash |

### 7.6.2.2 Colour variation in the garment

The fig 7.23 shows the colour variance in different sections of the garment. The participants noticed grey colour bleed during hand wash. The garment examined after wearer test had grey patches which may have happened due to mixing of black coloured silk remnants along with other colours. However, it can be argued that the black dye bleeding from the silk remnants was absorbed by the scoured lamb's wool; which then appears as grey patches in the garment. In order to avoid this error, the producer should be careful

while mixing different colours of silk remnants. The combinations could be achieved by mixing similar hues. (e.g. cool and warm colours separately).

**Fig 7.23 Colour patches in the garment**

### 7.6.2.3 Fabric abrasion

The appearance retention of the fabric is directly related to the longevity and serviceability of the fabric. The aesthetic appeal of the fabric may decrease due to factors like: abrasion and repeated laundering (Emirhanova and Kavusturan, 2008). In a period of eight months the garment was washed eight times resulting in noticeable abrasion in the fabric and underarm pilling (fig 7.24). The pilling is caused mainly due to the fabric friction.

**Fig 7.24 Under arm pilling in the sweater**

### 7.6.2.4 Variation in garment measurements

The garment was measured before and after the wearer trial (table 7.38). The shoulder measurement was 18” initially. The first participant noticed stiffness at the underarm and shoulder area, the measurements taken after the wearer trail reflects a significant difference in the shoulder measurement that was increased by 3.5”. Other observations were: difference in sleeve length (an increase of 1.5”) and neck opening (from 5” to 7”). These changes indicate that the garment has a good elastic property that could alter according to the wearer’s body shape.

**Table 7.38 Variation in garment measurement**

| Measurements (14-05-2014) | Measurements(12-12-2014) |
|---|---|
| a) Chest - 21”<br>b) Shoulder - 18”<br>c) Sleeve length - 25.5”<br>d) Garment full length - 26”<br>e) Neck opening - 5”<br>f) Bottom opening - 21”<br>g) Sleeve opening - 5” | a) Chest - 21”<br>b) Shoulder - 21.5”<br>c) Sleeve length - 27”<br>d) Garment full length - 26”<br>e) Neck opening - 7”<br>f) Bottom opening - 21”<br>g) Sleeve opening - 5” |

The additional observations are looser rib at the cuff and bottom hem (fig 7.25 and 7.26). The loose knitted ribs can be avoided by using smaller size knitting needle to knit the ribs.

**Fig 7.25 Increase in sleeve length and loose rib in the cuff**

**Fig 7.26 Loose rib in the bottom opening**

### 7.6.3 Summary of the wearer test findings

The findings from the subjective and objectives studies of the recycled yarn have provided sufficient evidence to suggest that it is compatible with market sourced yarns. However, the wearer tests have delivered an insight into the behaviour of the yarn in the garment stage. This stage has provided important information for the hand knitters to consider while knitting with the recycled yarn as well as care instructions for the garment. The garment should be hand washed and flat dried in order to maintain the original shape and body measurements. The results of this experiment highlight the yarn can withstand the forces as a garment in: both dry and wet stages as well as repeated laundering.

## 7.7 Summary

Phase 2 of the study involved investigations conducted to detect problems and generate solutions which included objective and subjective data analysis. The results from each experiment were used to frame the next stage of data collection. The findings of the activities were triangulated. Objective analysis was compared with the consumers' perception of the quality of yarn, and at the fabric stage. According to Jacobsen *et.al* (1992) a yarn that may be acceptable at the point of purchase may not have similar features when knitted into fabric. The fabric handle test and the wearer test examined the recycled yarn properties at the fabric stage, guiding the researcher to develop garment care instructions for the recycled yarn label.

The participatory action methodology of questioning and investigating an issue by involving participants through an action plan was followed by the researcher. The data collection methods were framed according to the action plan of: questioning, refining, investigating and finally implementing. The final outcome of this research is a sustainable cooperative frame work developed in the context of combining three overlapping concepts: the worker cooperative as an organisation for production, sustainable marketing of the yarn and technology for production. Further insight on an attempt to test the acceptance of the contextual framework developed (on the basis of combining the primary and secondary research) will be discussed in the next chapter.

# Chapter 8
# Discussion

Chapter 3 to 7 discusses the primary and secondary information of the research. As such, the structure of the thesis explores the contribution to the understanding of developing a conceptual framework for the production and marketing of recycled yarn. This chapter discusses a bigger picture of the role of different elements in establishing a sustainable cooperative. Furthermore, it includes a discussion of why factors like: choice of technology and a sustainable marketing strategy; were essential to establish the conceptual framework for a sustainable cooperative leading to the empowerment of women. The author has included a discussion of the conceptual framework with sustainable design experts and features a critical review of the framework and its implications in a real world situation. Finally, the importance of this process is outlined and the limitations of the framework are explored.

The scope of the research was intended to be broad, given that the study is to develop a sustainable cooperative framework that combined a range of disciplines and subject areas. Fig 8.1 depicts the subject areas incorporated.

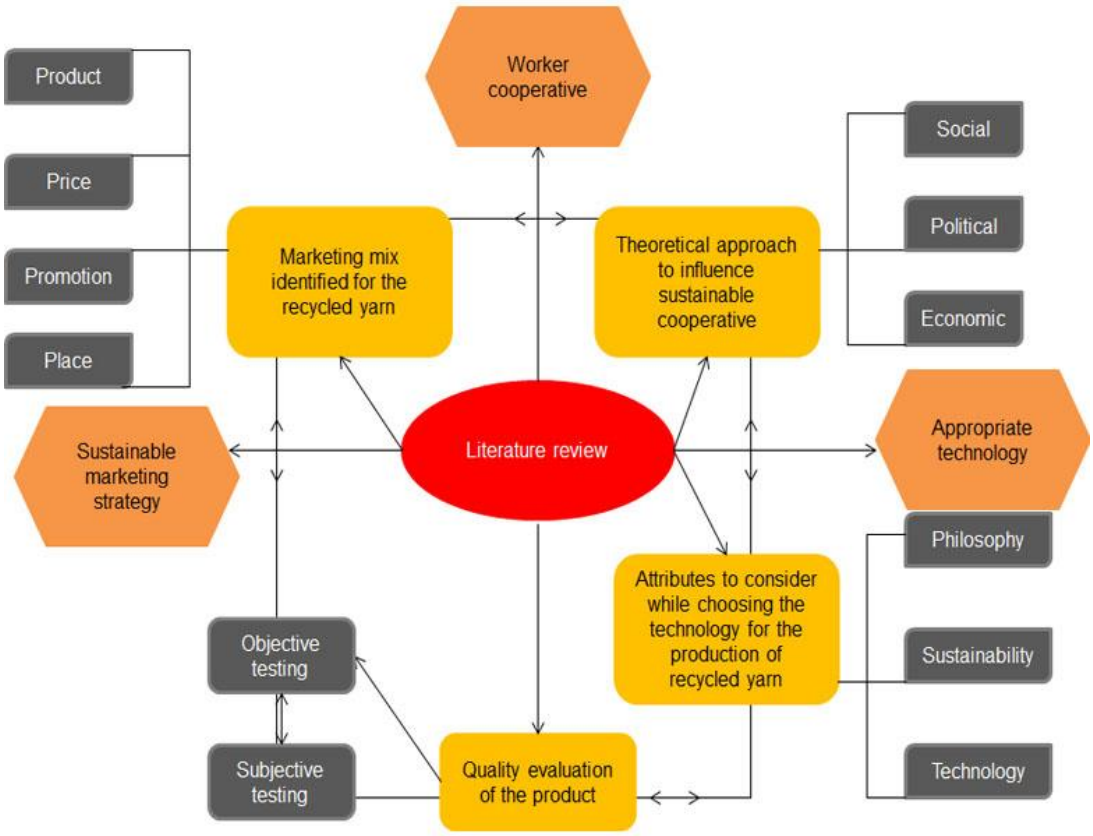



**Fig 8.1 Flow chart to present the connection between subject areas**

First, the author explains which factors affect the economic empowerment of the women in rural India; through government intervention and other international agencies. The literature identifies that: credit facilities and sufficient training for women in marketing techniques and production methods were important criteria to consider while setting a worker cooperative. This also includes outlining the evidence of support from their family and the community, along with a detailed explanation on the complexities that were involved in marketing the product (chapter 3).

Second, the author identified a method of production that is appropriate for the community considering the social and cultural dimensions of the society. The method of production should be environmentally friendly, labour intensive and therapeutic – which makes it more creative and unique. The features of the recycled yarn like colour combination and texture depend on the availability of the silk remnants and hand spinning technique used to

develop the yarn. The production could happen in a small-scale organisation that practices quality control and product innovation in direct contact with customers (drawing on chapter 4, chapter 5).

Third, the researcher explains the significance of a sustainable marketing strategy and packaging for the recycled yarn. In this section the author had combined the ‘4Cs’ (of customer orientation) with the ‘5Vs’ (of the relationship marketing paradigm) and derived a marketing mix of ‘4Ps’ (drawing on chapter 6).

Fourth, the researcher examined the quality of the recycled yarn along with a group of commercial yarns. Here the researcher adopted a triangulation of the subjective and objective data collection methods and analysis (drawing on chapter 7).

Finally, the findings were combined to develop a conceptual framework for a worker cooperative that could be adapted in a real world situation. Studying the relationship between the principles of a cooperative along with the complexities involved (in the choice of technology and a marketing strategy for the recycled yarn) should happen simultaneously. It is an ongoing iterative process with active involvement of producers and consumers in order to sustain the cooperative. This is because introducing new: technology, products and services must be parallel to relative consumer demand. In order to attain this, there should be continuous interaction with the potential customers. Fig 8.2 outlines a scheme of how a worker cooperative could be developed through the combination of an appropriate choice of technology and marketing strategy.

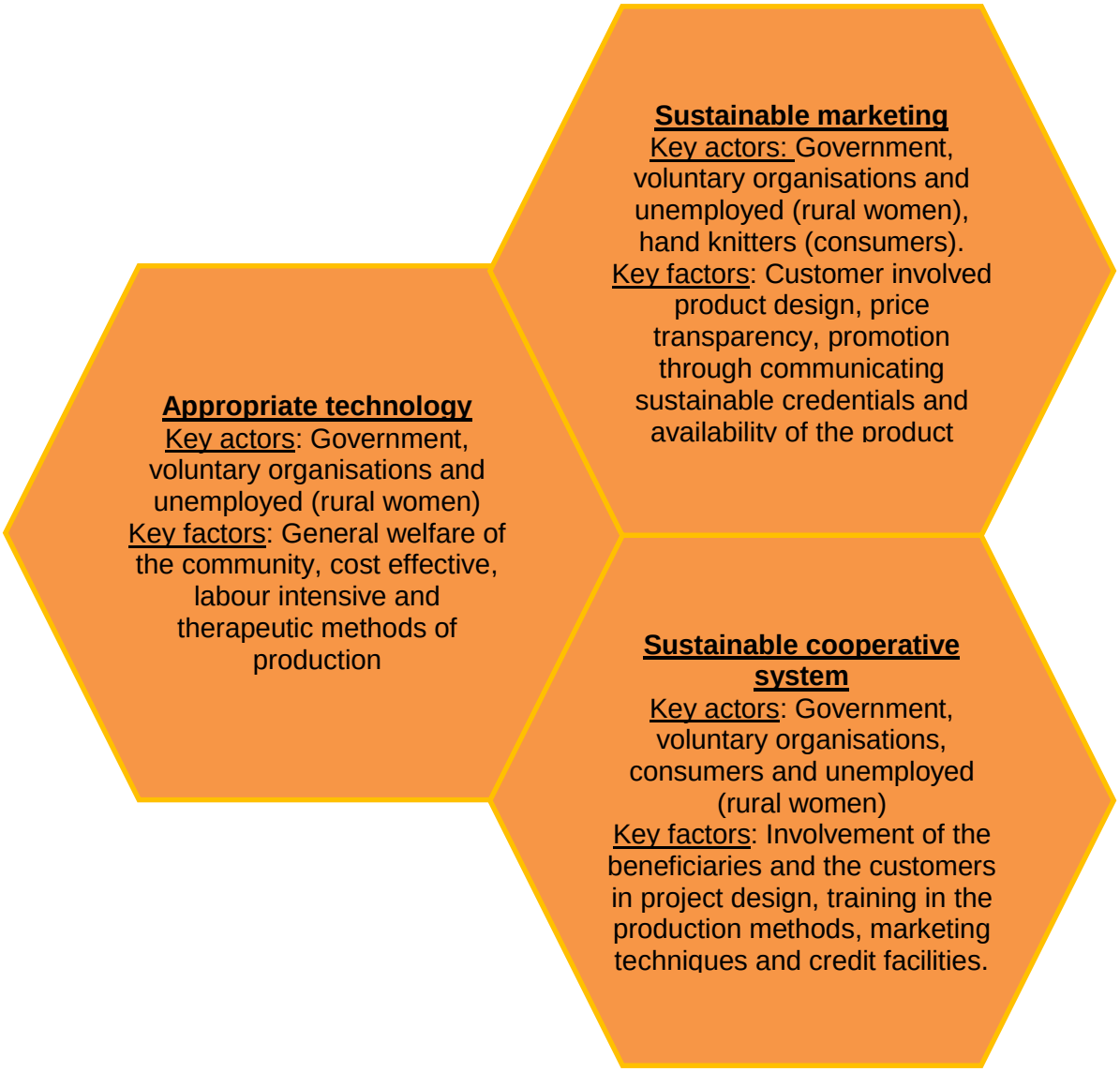



**Fig 8.2 A conceptual framework for sustainable cooperative**

All of the three elements discussed in fig 8.2 were not mutually exclusive but complementary and often overlapping concepts. Each of the models offered were interdependent: a marketing technique without the involvement of the producers and the consumers would not be sustainable. A technology that is appropriate for the community incorporating sustainable credentials is not only useful for the society – but also used for the promotion of the product. A worker cooperative set up with necessary credit facilities and training in the production methods is not enough to sustain the organisation. The workers should also be given regular training in order to market the products using modern technology that helps them to connect with the open world.

## 8.1 Stages in setting a cooperative

The conceptual frame work developed for a sustainable cooperative is not complete without outlining the different stages of setting a worker cooperative. The researcher identifies three stages and in each stage the organisation has to collaborate with key actors mentioned in the framework (fig 8.2) including: government, voluntary organisations, consumers and cooperative members.

**Fig 8.3 Stages in setting a cooperative**

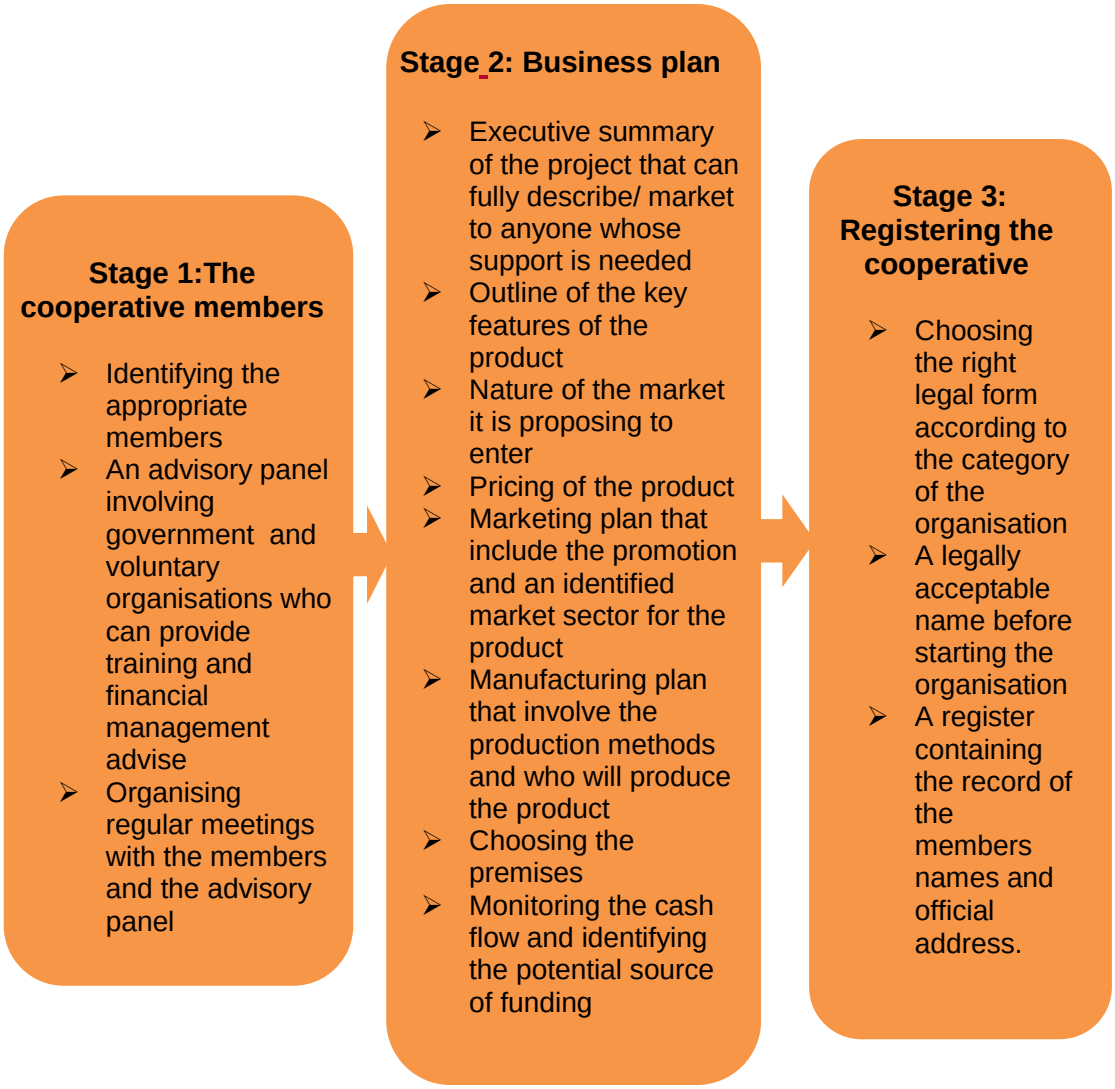


Fig 8.3 indicates that starting a cooperative is different from setting up a small-scale business. The key actors/stake holders have to work together and share responsibilities because the success of the worker cooperative depends on the people who are involved in it. The stake holders should be fully aware of the principles and values of the cooperatives and ready to compromise for the best interest of the organisation (www.radicalroutes.org.uk; Martin and Thompson, 2010).

According to Martin and Thompson, 2010 there are two main purposes that a business plan should serve:

- To access the financial side with respect to the proposed business
- To communicate the nature of the idea to the stake holders.

Stage 2 in fig 8.3 presents the structure of the business plan which can be adapted by a worker cooperative. The final stage is to register the cooperative according to a basic legal form suitable for a worker cooperative. The stakeholders do not necessarily understand the ins and outs of the legal procedure as they can seek advice from people who are familiar with the procedures.

## 8.2 Applications of the conceptual framework

As stated previously, the aim of the thesis is to create a framework for a sustainable cooperative model combining the socio-economic and political aspects for setting up a women's cooperative. This is to also include production technology and a marketing strategy. This section discusses the findings from one-to-one in-depth interviews with sustainable design experts. The interviews were done in a semi-structured manner and each lasted between one, to one-and-a-half hours according to the time availability of each interviewee. A PowerPoint presentation explaining the evolution of the conceptual framework was prepared for the interviews while some additional questions also raised during the interview according to the specific interests by the interviewees. The interviews were audio recorded and transcribed.

## 8.3 Biographical details and selection of interviewees

The number of participants for the interview was limited to three, as careful selection of interviewees was necessary. The criteria used for selecting participants to test the framework was their interest in academic research across a wide range of disciplines. This included: sustainable design, marketing and experience with international agencies concerned with community engagement and empowerment of women.

Participant 1 has undertaken a number of academic roles and has worked internationally with agencies such as OXFAM, Intermediate Technology Development Group and The British Council in the delivery and evaluation of development projects in India, Nepal and Zambia. In UK she continues to work with agencies concerned with community engagement and enhancement in the delivery of focused workshops exploring recycling, clothing manufacture and communication.

Participant 2's research interests focus on textile semantics and communication, exploring: multi-modality through visual and tactile communication on cloth, the textile artefact as a signifying object, and the influence of context on audience perception. She is involved in the aesthetic interface between textile materials and paper to create new surfaces for design applications. In addition to her academic work she undertakes commissioned design work and arts consultancy.

Participant 3's research practice involves exploration of amateur fashion making as a strategy for sustainability. More specifically, she investigated re-knitting: the use of knitting techniques to rework existing knitted garments. Her research activities explore the role of design in revitalising traditional and place-related designs, products and practices.

## 8.4 Coding of interview data

After the interviews were done, the records were analysed using grounded theory methodology where the interviews were broken down to discrete parts and the verbal data is broken down to independent sentences (Strauss

and Corbin, 1990; Mizuno, 1998). The author made an assumption from the start of the project that a cooperative as an organisational set up would help to empower the women in rural India. However, following the principles of realistic evaluation, the researcher has set out to answer the questions 'what works in a cooperative system, for whom and under what circumstances' (Pawson and Tilley, 1997).

In order to analyse the experts' opinion on the conceptual framework, the interview transcripts were broken down and assembled under four categories of the study which are: cooperative set up as an organisation for the production of the recycled yarn, marketing strategy of the yarn, technology choice for producing the yarn and the evaluation of the conceptual framework. The key phases were picked from the interviews recorded and the key findings of each category were as follows:

### 8.4.1 Co-operatives as an organisation

**Table 8.1 Descriptions of the cooperatives as organisation to empower women**

| Findings | Descriptions of the cooperatives as an organisation to empower women |
|---|---|
| **1** | • Cooperatives give the flexibility to work |
| **2** | • Main problem that lies with a cooperative set up is the vested interest within it |
| **3** | • In developing countries one of the main issue the women always faces is to get fair pricing for their product |
| **4** | • If you are looking at the empowerment of the women then it will be useful for the women to have a union that concern better working conditions and various other things |
| **5** | • Training for the cooperative members to understand the trends helps them to make informed and independent decisions which then strongly fit into the whole ethos of cooperative |
| **6** | • Along with the training to identify the skills and knowledge they would need to perform the job of marketing and innovation |
| **7** | • Part of the problem with the NGOs conducting training programs is that they do not connect in the same way even though they are dealing with different but sometimes |

| | |
|---|---|
| | similar issues |
| **8** | • The success and failure of the project is based often on one or two key people who have the determination to take it forward. What would be the mechanism of actually selecting them? |
| **9** | • Rural appraisal programme is about truly identifying what the people's aspirations are, where they want to go, what they want to do and how they use the activity |
| **10** | • There is an existing two way relationship between the fashion schools and craft people in villages. You can kind of analyses what's going on in order to potentially set up an organisation in an international level |

In order to make use of the findings, the researcher discusses each of the results in table 8.1 along with the literature related with the topic. One of the problems with the literature prior to the study was the lack of clarity as to how small-scale cooperative organisations can sustain. As discussed in the literature review (see 3.7.7) Meister (1984) examines four distinct phases of degeneration of cooperatives; where a period of transition happens when cooperatives lose their radical ideas and market values are accepted. Gradually managers take control because of their expertise in the organisation. The solution recommended (see 3.5.2) by Levi and Litwin (1986) is that the members have to be given proper training about the principles and values of cooperatives and democratic decision making in the organisation. Involvement of members taking turns in all forms of work can avoid expertise in a particular area. Democratic member control leaves the members in the cooperative to unanimously decide whether there is need for setting a union to ensure workers benefits and better working conditions.

Mascarenhas *et al.,* (1991) describes the Participatory Rural Appraisal (PRA) as a growing family of approaches and methods that enables local people to: share, enhance and analyse their knowledge of life and conditions to plan and act. The Participatory Rural Appraisal is mainly adapted by the NGOs and the Governmental organisations to incorporate the knowledge and opinions of the rural people in the planning and management of development programmes (Chambers, 1992). In the case of this project, for academic research purposes, the researcher adopted the Participatory

Action Methodology which is an iterative process where each section of the study explores and reflects views of the participants from the village in India, and the potential consumers in UK through their active engagement in the process (see 2.2.2). Explaining the role of the NGOs and voluntary organisations that can provide training facilities, Sen (1999) argues that there is always conflict in ideas between government bureaucrats and NGOs in implementing the training and development programmes. The National institute of Fashion Technology (NIFT) and the National Institute of Design (NID) under the Central Ministry of Textiles conduct voluntary work with traditional arts and crafts artisans providing design ideas. These collages can be encouraged to collaborate with NGOs and voluntary organisations to provide artisans with the training necessary to sustain a cooperative *(*www.nift.ac.in/chennai/cluster.html*).* It can be a learning curve for the design students to practically implement their skills in design and management for the upliftment of rural artisans – and provide a window for their product in the export market. This can also ensure fair pricing for their products without being exploited by middlemen (see 3.3). Furthermore, maximum linkage between the development authorities and the participants can be achieved through an appropriate sharing of power and training.

### 8.4.2 Marketing strategy

**Table 8.2 Descriptions of the marketing strategy for the conceptual framework**

| Findings | Descriptions of marketing strategy for the conceptual framework |
|---|---|
| **1** | • The consumers are very sophisticated, you can't just say it is an environment friendly yarn. You have to tell them why and how it is? |
| **2** | • Workers are not being able to innovate if they do not know where the products are marketed |
| **3** | • The workers should develop a relationship with the product |
| **4** | • The supplier should be able to meet the demand |
| **5** | • The producer has very little understanding about the culture of the consumers and they don't know how to innovate and develop the product to suit the needs of |

| | |
|---|---|
| | the consumers |
| **6** | • The greater the distance between the producer and the consumers the more problems there are in this situation |
| **7** | • Export market open up a range of risk like fashion, trend, innovation and familiarity with the product |
| **8** | • A middle man can create a chain of disadvantages for the producer and what you have done is to cut out the middle man. But the question is how to achieve the two way link and knowledge |
| **9** | • The threat of competition through other organisations setting up once the recycled yarn becomes visible and available in the export market. Then that will be a treat to your cooperative and the social sustainability idea |
| **10** | • The ways of lessening that distance between the producer and customers whether that could be the internet offering new opportunities of interaction |
| **11** | • If the gap between the producer and customers can be bridged then it will actually give an appropriate product for an export market |

The recycled yarn developed by the researcher is targeted for the export market mainly because of the lack of demand in the domestic market. South India is warm and humid throughout the year and the winters in North India are short. As a knitwear designer, the author is familiar with the hand knitting yarn industry in India. This has not flourished that makes it difficult for the producers to attain a sufficient remuneration to sustain the cooperative. Finding (6) in table 8.2 raises the fact that the distance between the producer and consumers can create problems in the innovation, quality control and marketing of the yarn. Here the author proposes the promotion of the yarn through international exhibitions, online marketing and selling.

The researcher has visited exhibitions in UK to review the price, quality and display of the hand spun yarns. It is proven in the primary research that the recycled yarn can compete with the quality and price of the hand spun yarn that are market available. The estimated price of the recycled yarn including the freight charges is below £10 (price break up of the yarn put in the appendix) where the price of hand spun yarn displayed in the exhibitions was between £12-15 (fig 8.4).

**Fig 8.4 Exhibition display and pricing of the hand spun knitting yarn**

**Fig 8.5 Recycled yarn developed for the project**

Kancheepuram saris are rich in colours and it is the traditional attire of the South Indian women for weddings and festivals. Initially the plan of developing the recycled yarn (fig 8.5) was the author's idea to contemporise the traditional Indian colours which can adapt to a western context. This is achieved by mixing the vibrant colours by adding scoured lamb's wool that makes it appropriate for a winter collection. The colours are unisex and the variation in the texture is attained through the uneven feeding of the fibres while hand spinning. These unique features of the yarn were noticed and appreciated by the participants in the study.

However, to commercialise the yarn, the producer should be well informed about the export market and hand knitting trends. The design schools can provide assistance and help for the cooperative workers by training them to use the internet explorer to access trend websites and review international textile exhibitions. Also, the voluntary organisations can help the members to

travel abroad and participate in craft exhibitions and gradually develop a rapport with the consumers.

According to Orwall (2001) websites has gained momentum as an entertainment medium and consumers have been using websites for entertainment and online shopping. Alba *et al.,* (1997) argues that efficiency of online shopping can be increased by improving the availability of product information, enabling direct multi-attribute comparisons and reducing the buyer search cost. In this context, Lynch and Ariely (2000) in their article highlight the fact that when the information on the product quality is easier to navigate, consumers were less price-sensitive and purchased more expensive products. A properly designed website can provide a virtual retail store context by understanding the logic used to organise, categorise and arrange merchandise where the consumers can navigate for desired products. Evans *et al.* (2001), found that experienced internet users are likely to participate in virtual communications for information. This is tested by the researcher in an informal blog in the Ravelry.com where pictures of the recycled yarn were posted leading to an online discussion. The promotion of the recycled yarn would work effectively through online word-of-mouth; where the consumers can transmit the unique features of the yarn along with the social credentials behind the development of the yarn through emails, blogs and other mobile phone application like Viber and WhatsApp. These applications keep the consumer constantly in contact with the producer where they can exchange the photographs and videos instantly. An important limitation discussed by (Steward and Zhao, 2000) is that the current state of internet technologies precludes the sensory aspects of shopping such as the smell, touch, taste. In this case, it can be argued that a customer base for the recycled yarn can be obtained through exhibitions which will gradually lead to word-of-mouth promotion. The proposed cooperative is a small scale organisation involving the unpaid labour in the handloom sector (rural woman) who are intended to produce small quantity of yarn, and this is mainly because of the limited quantities of the silk remnants available from the hand loom. The story behind the organisation and environmental considerations in the production process are

communicated to the consumer through a brand name and label. These attributes can be projected through setting up a website and participating in exhibitions. Obtaining a copyright for the product can help to restrict the duplication of the yarn by other organisations.

### 8.4.3 Appropriate technology

**Table 8.3 Descriptions of technology choice for the conceptual framework**

| Findings | Descriptions of technology choice for the conceptual framework |
|---|---|
| **1** | • A technology that becomes appropriate for the social, political and economic values |
| **2** | • A technology choice that can balance between what they have in the village rather than importing something that is not appropriate in that situation |
| **3** | • It should be more refined about the understanding of the therapeutic benefits of hand spinning |
| **4** | • Any craft process can feel like an extreme pleasure to drudgery depending upon the conditions, depending on motivations and other things |
| **5** | • It is hard to say in advance whether the work is therapeutic. The women have to say it for themselves after doing it for a while |

Table 8.3 discusses the findings related with the technology choice for the production of the recycled yarn. Considering the social values of the region, the author had chosen the appropriate technology for the production of the recycled yarn where social values are prioritised along with the economic circumstances. It was identified in the initial field trip to the village that the women were voluntarily involved in reeling silk yarn using the hand spinning wheel. This encouraged the researcher to develop the yarn using the hand spinning technique (see 4.3). It is pointed out in the testing interviews that the hand spinning as a method of production for commercial purpose may lead to stress for the producer. However, analysing the literature (and other social media for the hand knitters and spinners like Ravelry.com, UK Hand Knitters Association, handspinning.org.UK), it is clearly mentioned that these activities are therapeutic mainly because the producer involved in the hand

spinning needs patience and focus. It can be argued that these factors might be a reason why the women in the village were voluntarily involved in silk reeling which provide them time to relax their mind and body keeping aside the stress of managing their family affairs and daily household work.

### 8.4.4 Conceptual framework

**Table 8.4 Descriptions of the sustainable cooperative conceptual framework**

| Findings | Descriptions of the sustainable cooperative conceptual framework |
|---|---|
| **1** | • How do you monitor the key needs of the people (producers) and where doses the key elements like therapeutic effect, income generation and empowerment add in the framework? These are some of the key elements potentially missing in the framework |
| **2** | • The ins and outs of the framework are the constant engagement with the needs of the beneficiaries |
| **3** | • Identifying the key players in an organisation should have affinity towards what they are doing and it is not something which is a quick fix |
| **4** | • There should be some projections based on how long it will take to produce ‘x’ amount of yarn? The number of women you would have in the cooperative with the given facilities and how much yarn could be made by the women in the cooperative in a week or in a year and so on |
| **5** | • The framework needs more details. The key actors are the producers who eventually have to produce and market the product to sustain the cooperative |
| **6** | • The framework should adapt to different context presumably the marketing section can apply to domestic as well |
| **7** | • The framework is not enough to explain the intricacies of the research |
| **8** | • The sustainable cooperative is about the economic, social and political factors and they might split into a honeycomb subsection. It is the same for the marketing and technology section |
| **9** | • The framework in a visual representation could be more like a spider diagram or some kind of flow chart because the key actors in all the three elements are the same and that has to be brought together |
| **10** | • It should be clear in the thesis about what is going to happen after you left the project. How do they market |

| | |
|---|---|
| | the product and sustain the business? |

The findings in table 8.4 underline the fact that all the three elements in the conceptual framework (fig 8.2) are interrelated. However, it points out that the honeycomb representation lacks information related with its subsections. The author argues that the subsections were potential solutions to some of the challenges around developing a sustainable cooperative model. A combination of the marketing strategy and an appropriate technology reveal the opportunities for developing a sustainable cooperative framework which is outlined in fig 8.2.

In order to keep the organisation running, a marketing strategy that encapsulates the story behind the organisation and environmental friendly methods of production should be conveyed to the customers. To convince the customers about the sustainable credentials of the yarn, they should be in contact with the producer. Also innovation and quality control of the yarn are necessary aspects to sustain the product in the market and that can further help to sustain the cooperative. Here the role of key actors are crucial: the producers, consumers, the government and voluntary organisations. All the four actors should engage with each other and cooperate in a strategic manner. The study proposes two elements that have to be considered to set up the cooperative:

- Government agencies and international organisations to provide funding for developing technology, ensure setting up and running of the organisation
- A combined effort by voluntary organisations and the government agencies to provide: training in the fair running of the cooperative, the production methods, and marketing of the product with direct contact with the customers

From the above discussion it is relevant that the key actors and the key factors in each section of the honeycomb structure in fig 8.2 are essential for a sustainable cooperative framework. In the long-term the framework can be tested to setup a worker corporative and the Participatory Action

Methodology could be applied to evaluate the action plan by combining the qualitative and qualitative data collection methods – collaborating with the key actors.

## 8.5 Summary

In this chapter the author has summarised the contribution of this thesis to understanding by outlining the main findings from testing of the conceptual framework with the sustainable design experts and relating them back to the literature. The more general literature related with the online retail shopping is included to discuss the marketing opportunities for the recycled yarn. Finally, the author has framed a conceptual framework, discussing the merits and short falls of various ways of looking at setting up a sustainable worker cooperative in the light of the data, and proposes a broader focus for research in the future.

# Chapter 9
# Conclusion

In this thesis there were three academic contributions; the first consisted of a study of literature related to the topic adding to the understanding of the importance of economic empowerment of rural women in India, and the social, cultural and practical requirements for this. The second amounted to an extended research into the development of the recycled yarn, analysis of the yarn quality using subjective and objective experiments. The final contribution of the research proposed the development of a conceptual framework for a sustainable cooperative combining the socio-economic and political aspects with cooperative principles and values. This also factored in use of appropriate technology for recycled yarn production and sustainable marketing strategy. The framework highlights the importance of the collaboration between key actors who are crucial for setting up a cooperative system for the empowerment of the rural women.

## 9.1 Meeting the aim and objectives

The aim of the research is to create a framework for a sustainable cooperative model. This would combine the socio-economic and political aspects for setting up a women's cooperative; including technology for production and a marketing strategy. This aim was established through a set of research objectives presented in the introduction chapter of this thesis. The extent to which these objectives were met through the research activity are described below.

*Objective 1*: *To critically review the literature related to the empowerment of women and community development, sustainable methods of production and marketing strategy.*

The literature review (chapter 3, 4 and 6) explored current knowledge related with different fields including: design, sociology, management, marketing and technology. Reviewing the literature related with: empowerment of women and community development; underlined the importance of

considering socio-cultural and political values of society as key factors in setting up an organisation that would provide sustainable employment. The study considered appropriate technology that best suits the requirements and resources for setting up a small-scale organisation, and a marketing strategy for the recycled yarn that clearly conveys the sustainable credentials of the yarn to the consumers to ensure the best outcomes for all stakeholders.

*Objective 2*: *To investigate the possibility of producing the yarn in a workers cooperative involving unpaid labour in the handloom sector (women) in Vellanchery village.*

The literature in chapter 3 underlines the importance of involving the stakeholders from the grassroots of the project. In fulfilment of objective 2 the researcher visited the village at the initial stage of the project to test whether the target group of women were interested in the project idea. The women were visited in their houses and shown: the samples of the recycled yarn, a hand knitted sweater using the yarn, and a colour printout of a power point presentation that explained the production process. Their enthusiasm and willingness towards the project encouraged the researcher to determine the quality requirements of the recycled yarn, along with a marketing strategy to promote the product in an export market.

*Objective 3*: *To develop an appropriate technique of production and marketing strategy for the recycled yarn.*

Chapters 4 and 6 illustrate the considerations for selecting an appropriate technology and sustainable marketing strategy for the yarn. Accordingly the selection of appropriate technology is mainly due to the following factors:

- Small capital investment
- Desired volume of production (the research establishes that quantity of production is critically dependent on silk remnant availability)
- The handspun nature of the yarn product; which when hand-knitted provides unique features, including: colour combinations and texture

achieved through combination of (30%) recycled silk remnants with (70%) scoured lamb's wool

- The choice of manufacturing strategy considering an environmentally friendly method of production (chapter 4) that involves desizing of silk remnants, cutting the remnants to staple form, carding of silk and lamb's wool fibres, and finally hand spun to recycled yarn
- Technological evaluation that considers a labour intensive method of production alongside one that is more cost-effective and easy to understand (hand spinning)
- The philosophy of social considerations including: therapeutic value of hand-spinning, environmental, and cultural aspects.

Recycled yarn is clearly positioned for the hand knitting yarn market segment, mainly due to the restricted amount of yarn that can be produced in each colour combination. The yarn offers a unique selling propositions. Most notably, unique colour mixtures that are impossible to duplicate as the colours depend on the availability of sari silk remnants from the handloom. Secondly, a desirable texture in the yarn is attained through the character of the silk remnants (e.g. uneven opening and mixing of fibres while carding) resulting in a notably soft handle.

*Objective 4*: *To test the consumer response to a group of yarns and hand knitting fabrics.*

A group of five yarns were commercially sourced along with the recycled yarn to conduct the objective and subjective experiments. Subjective experiments involved both qualitative and quantitative methods, including: (1) focus groups with hand spinning and knitting experts; (2) a semantic differentiation test to analyse the handle of the yarns and fabric; (3) surveys to determine the overall appearance of the yarn; and, (4) wearer test for eight months to evaluate the recycled yarn in the garment stage. Objective experiments included: (1) yarn twist constant; (2) calculation of fabric shrinkage under different cleaning methods; and, (3) a fabric pilling test. The findings from all the objective and subjective experiments were triangulated and compared as a means of developing the ideal character of the yarn.

*Objective 5: To formulate a framework which would facilitate the organisation of this cooperative.*

The testing of the conceptual framework reported in chapter 8 fulfils objective 5. This is realised by conducting three in depth interviews with sustainable design experts. Testing of the conceptual framework was done to investigate the interviewee's review of the framework and to evaluate its shortcomings. These interviews have offered evidence to support the feasibility of using the framework to set up a sustainable cooperative for the empowerment of women.

## 9.2 Conclusions from the thesis

This study involved both theoretical and practical measures to verify the viability of establishing a cooperative as an organisation to help empower rural women. At the theoretical level, the researcher addressed the gap in empowerment policies implemented in rural India by international agencies and the domestic government. It was identified in the literature that the social and cultural aspects of the community should be considered alongside the participation of key stakeholders while designing the programme. Marketing the product is an essential aspect to achieve; where the producer must be well informed about the needs of the customers through innovation. Thus customer satisfaction could be attained only through facilities that connect customers with producers. The research proposes that a combined effort from governmental agencies and voluntary organisations could provide necessary training and facilities for the producers to achieve this.

The conceptual framework developed as an outcome of the research gives a snapshot of the key actors who drive the concept of a sustainable cooperative. The key actors in each of the three segments in the conceptual framework were: government, voluntary organisations, producer and consumers. Coordination between these key actors will contribute to sustain the organisation by strictly following the ethical values and principles of the cooperatives.

On the practical level, the findings from the initial visit at the village accounted for a holistic understanding about unpaid labour in the handloom industry and their interest to participate in the production of recycled yarn under a cooperative set up. The informal interviews with the UK yarn retailers highlighted key issues of producing quantity for retailing the yarn. Objective and subjective experiments were conducted to analyse the quality and physical properties of the recycled yarn compared to a commercially available group of yarns. The potential of promoting the recycled yarn through international exhibitions and website was identified and discussed in Chapters 6 and 8. Here it was noticed that campaigns could achieve the most success focusing upon communicating the unique aspect of the yarn, both in terms of material feel – as well as its status as a uniquely sustainable product.

Research techniques were adopted to gain insight about the hand knitter's choice of selecting their yarn. The evidence that supports the choice of the recycled yarn from competitors was outlined in chapter 7. Furthermore, these experiments have enabled the researcher to have an estimate of the consumers acceptance of the recycled yarn compared to similar market available ones.

Finally a conceptual framework for a sustainable cooperative system was synthesised from primary and secondary data. The framework is meant to help researchers and designers in undertaking studies related with small craft sectors, that could flourish and be sustained as an organisation. The framework indicates the general understanding of combining the values of the organisation, with an appropriate technology for production, and a sustainable marketing strategy.

## 9.3 Limitations of this research

This section discusses the limitations of the research data and findings which lead to further recommendations for future work in section 9.5.

- Recognising the benefits of testing the conceptual framework in the village, it would be possible to identify the applicability of a worker

cooperative for empowering women. This will further help to determine the drawbacks in the first attempt, and improve the framework accordingly. Ideally, the conceptual framework should be developed further and related to work towards a complete and practical model for setting up a cooperative

- The limited time available for the research makes it impossible to study in detail the lifecycle of the recycled yarn. The problems related with the distribution and disposal of the yarn would have made the study more comprehensive
- The marketing of the yarn through exhibitions and online are considered with the possible effects of using modern technology to reduce the distance between the consumer and the producer. Because of the time constraints the possible effects and feasibility of using modern technology to promote the yarn was not yet tried or tested
- It is mentioned in the study that the role of fashion schools under the control of the Government of India plays an important role in helping artisans with design and management ideas. The practical significance of involving them in training the cooperative workers to maintain the quality requirements for an export market is clear. Expertise concerning innovation and promotion of the products through direct contact with customers, and instructions to use modern technology which could result from a collaboration has not been analysed in detail
- The research project focused mainly on collecting data to examine the quality of the yarn. This is considered acceptable for the outcomes within the scope of the research project. Further details of the yarn such as: the quantity that could be produced in a given amount of time, and quantity in each colour combinations were not examined in the study – mainly due to the limited amount of the silk remnants available for product development.

## 9.4 Contribution to knowledge

The cooperative as an organisation dates back to 1761, starting out as small organisations in Europe, North America and Japan. The previous literature related to cooperatives (Battilani and Schroter, 2012; Conforth, 1983; Conforth *et al.,* 1988) has commonly investigated cooperatives as enterprises suitable for sustaining economic growth – also including discussions within the organisational setting, and debates about the development of this area.

The research project is unique because of the practice elements involved in the designing and marketing of the product. The worker cooperative is chosen as an organisational concept for the production because of its beneficial social aspects. The researcher (as a practitioner) has undertaken a design project, and recommends the practice of developing a recycled yarn using the silk remnants under a cooperative system – as a means of allowing the producer to have complete authority of the system. This study has helped the researcher as a designer to identify complex situations and solve unforeseen problems involved in the process. In order to actualise the recycled yarn for commercial purposes a production method that is cost effective was developed along with a strong branding and packaging strategy. Theoretical and practical experiences have also been been integrated. This has been done to address the difficulties and opportunities that may arise in establishing a cooperative system for the production of the yarn, that would further lead to employment for the women in the village. The conceptual framework for a sustainable cooperative has bridged the gap in the current knowledge about a cooperative as an organisation, incorporating: the social values of the community, along with a technology that is appropriate and acceptable for beneficiaries, and finally a marketing strategy to promote the product.

## 9.5 Recommendation for future work

This section proposes some recommendations for future work, which have emerged from the research study:

### 9.5.1 Training for the cooperative members

One of the questions arising from this research is 'how significant and continuous training can be provided for the cooperative members'. This question emerged from the conceptual framework testing, as the participants regularly pointed out this limitation because of the distance between the producer and the consumers. Again the framework developed would be a useful starting point. There is potential for future research on 'how to provide training facilities with regard to the values and principles of cooperatives, such as: credit availability, production techniques and marketing strategy; using modern technology for the cooperative members to sustain the institution.

### 9.5.2 Testing the conceptual framework in real life situation

The research provides an evidence base for the role of cooperatives in providing employment opportunity for the rural women. The cooperative as an organisational setup for the empowerment of women is still an emerging area of interest in research terms. In empirical terms, there is room for research that looks at the context to deliver a practical outcome. For this study, the researcher has looked extensively at the micro-level of the proposed initiatives. However, it would be interesting to take a macro approach by examining the key actors and factors of each section of the conceptual framework in a real-life situation – potentially using the Participatory Action Methodology as a starting point for the enquiry.

### 9.5.3 Investigating the validity of the conceptual framework under different conditions

The framework for a sustainable cooperative evolved based on the production of the recycled yarn. To expand, future work could take findings from this research and apply them to a wider range of product groups under different circumstances. This would enable validation of the strength of the

conceptual framework, as well as areas which would be impacted by different contexts of application.

### 9.5.4 Quantifying the life cycle of the recycled yarn

Little research has been carried out to quantify the life cycle of recycled yarn. This could include collection of measurable data on the behavioural impact and usage of the yarn. A quantitative assessment of the behaviour of the product from: the raw material stage, to production, distribution, use and disposal – would offer interesting additional insights. A complete life-cycle analysis of the yarn would provide a profile of the behaviour of the yarn at different stages and would encourage efficiency in product use.

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