MAPPING THE WAY AHEAD BY DOUBLE-RANK APPRAISAL METHOD (DRAM) AGAINST SUBJECTIVE AND OBJECTIVE CONSTRAINTS IN DESIGN RESEARCH

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ABSTRACT:

Novel researchers, particularly those engaged with research in design; tend to put over-emphasis on the "product" than the "process" in a research undertaking. Where a systematic and objective appraisal is required for guiding the way ahead, many failed to acknowledge the comprehensiveness of the methods available from which the most desirable and appropriate one is chosen, with reasons, to validate their hypotheses, i.e., method"ology".

This paper deliberates a particular method termed as Double-Rank Appraisal Method (DRAM), which is used to guide researchers to map their research journey along the way. The paper cited one example of how the DR was deployed to help identify the most desirable materials/methods for in-depth exploration and experimentation in a practice-led PhD research in fashion design at the Royal College of Art, London.

In this research project, DRAM first appraised the 10 materials/methods identified for their respective favourablilities against fulfilling the primary research objective, i.e., creation of seamless fashion. DRAM then ranked the 9 subjective and objective research constraints for their relative importance in accomplishing the research task with a time constraint in mind. The rankings of the 10 materials/methods were then multiplied by that of the 9 constraints to calculate a total score of favourability of individual materials/methods with which their respective favourabilities for fulfilling the primary research objective could be compared directly. Results of the DRAM suggested thermoplastic polymers and elastomers being the most desirable materials and dip-coating being the most desirable method for further in-depth exploration and experimentation.

DRAM serves as one useful example for identifying an optimal research journey ahead through systematic evaluation and appraisal against different subjective and objective constraints, taking into account their relative importance and significances of the constraints. The appraisal has proved effective in guiding a research journey to map a desirable and realistic path.

Keywords: Design constraints, Double-Rank Appraisal Method, seamless fashion.

1. INTRODUCTION

Novel researchers, particularly those engaged with research in design; tend to put over-emphasis on the "product" than the "process" in a research undertaking. Where a systematic and objective appraisal is required for guiding the way ahead, many failed to acknowledge the comprehensiveness of the methods available from which the most desirable and appropriate one is chosen, with reasons, to validate their hypotheses, i.e., method"ology".

This paper deliberates a particular method termed as Double-Rank Appraisal Method (DRAM), which is used to guide researchers to map their research journey along the way. The paper cited one example to illustrate how the DR was deployed to help identify the most desirable materials/methods for in-depth exploration and experimentation in a practice-led PhD research in fashion design at the Royal College of Art, London.

The aforesaid research project was planned to investigate into past and present techniques for creating seamless objects and garments with an aim to identify, expand and invent techniques and procedures for creation and production of them. The final objective of this research project was to create a collection of seamless fashion using new technique, procedures and materials for innovative ends.

1.1 SEARCH FOR MATERIALS, TECHNIQUES AND PROCESSES ENABLING SEAMLESS FASHION CREATION

The search for materials, techniques and procedures enabling seamless fashion creation began very much by divination and presentiment. Interviews were conducted with experts and dialogues with people with similar interests or whose processed knowledge of possible relevance with the study proved to be insightful. A literature survey was conducted into various sources [1] during which one source of information often linked to various others. A network of contacts and information has been established.

The research began with a substantial world-wide literature survey of the past and present techniques and processes enabling the creation of seamless objects and clothing items. Although literature directly concerned with seamless clothing remains scarce and scattered, a few pieces of relevant information were discovered [2-14].

As the research developed, it was realised that the stages of development of different techniques possible for creating seamless fashion varied. On the one hand, there are techniques that are well developed and are already used in manufacturing, e.g., tubular knitting for hosiery[15-31] and rubber technology for clinical gloves [32-41]. On the other hand, there are conventional crafts and skills that have tremendous potential but are relatively undeveloped in this regard, e.g., basketry [42-46] and origami [47-52]. Some techniques involve sophisticated, and often costly, machinery and procedures, such as two-dimensional braiding [53] and spunlace technology [54], whereas others can be handily employed with a limited budget, such as crochet [55] and macramé [56].

1.2 IDENTIFICATION OF TECHNIQUES AND PROCESSES FOR SEAMLESS FASHION CREATION

Several techniques and processes were identified as possible for seamless fashion creation. Figure 1 shows the preliminary framework of which the various techniques were enlisted under generic headings with asterisks for appendages.

Headings	Examples of Appendages
[* braiding * / * composites *]	Japanese braiding, history of braiding, art of braiding
[* basket* * / * cane* *]	antique basketry, history of basketry, art of basketry, canework
[* crochet* *]	history of crochet, art of crochet, crocheting, crochet techniques
[* felt* *]	history of felted fabrics, art of felting, felting, felting techniques
[* knit* *]	3-D knitting, history of knitting, art of knitting, knitting technology
[* knot* * / * rope* * / * macramé *]	knotting, ropework, knots and ties
[* lace * / * embroider* *]	bobbin lace, Bohemian lace, history of lace, lacework, lace craft, embroidery
[* mould* *]	dip coating, rotational moulding
[* nonwoven* * / * spunlac* * / * spunbond* *]	nonwovens, nonwoven products, spunlacing, spunlaced products, spunbond
[* paper* * / * origami *]	history of papermaking, papermaking
[* plastic* * / * rubber * * / * latex *]	plastics, plastic technology, rubber technology, latex technology
[* PVA *]	PVA as an intermediate medium, multi-media textiles with PVA
[* wrap* *]	Shrink wrapping Mylar, shrink wrapping PVC
[* spray* *]	Fibre spraying, liquid spraying
[* thermoset* * / * heatset* *]	Thermosetting with bi-component fibres, thermosetting with mixed fibres
[* weav* * / * tapestry *]	3-D weaving, double weaving, figure weaving, card weaving
[* material* *]	formation of materials, materials science

* Appendages

Figure 1: Generic headings of techniques possible of seamless fashion creation with appendage examples.

2. APPRAISAL OF THE TECHNIQUES AND PROCESSES

2.1 APPRAISAL

The appraisal took into consideration nine factors most critical to the success of seamless fashion creation. They were 1) equipment availability and accessibility, 2) materials expenses, 3) industrial sponsorship, 4) personal knowledge, 5) supporting knowledge base and expertise, 6) commercial viability, 7) artistic innovation, 8) technological advancement, and 9) originality probability. The order of the factors was arranged according to the likely sequence in the course of employing the techniques. Originality probability is regarded as the most critical factor to fulfil the basic requirement of doctoral research work.

2.2 RESULTS OF THE APPRAISAL

The results of the appraisal served as a guideline to appreciate and analyse the various techniques for further in-depth studies. The symbols '+' and '-' stand for 'Suitability' and 'Unsuitability' respectively. Figures 2a-d show the results.

	3-D braiding	Basketry	Crochet	Dip Coating	Hand Felting
Equipment availability/accessibility	-	+	+	+	+
Material expenses	-	+	+	+	+
Industrial sponsorship	-	-	+	+	+
Personal Knowledge	-	-	-	-	-
Supporting knowledge base & expertise	+ -	+ -	+ -	+ +	+ -

Commercial viability					
Artistic innovation	+	+	+	+	+
Technological advancement	+	-	-	+	-
Originality probability	+	+	-	+	-

N.B. '+' stands for 'Suitability' whereas '-' stands for 'Unsuitability'.
Figure 2a: Results of the appraisal of the techniques enabling seamless fashion creation.

	Knitting	**Lacework**	**Macramé**	**Nonwovens**	**Latex**
Equipment availability/accessibility	-	+	+	+	+
Material expenses	+	+	+	+	+
Industrial sponsorship	-	+	-	+	+
Personal knowledge	-	-	-	-	-
Supportive knowledge base & expertise	+	+	+	+	+
Commercial viability	-	-	-	-	+
Artistic innovation	-	+	-	-	+
Technological advancement	+	-	-	-	-
Originality probability	-	-	-	-	-

N.B. '+' stands for 'Suitability' whereas '-' stands for 'Unsuitability'.
Figure 2b: Results of the appraisal of the techniques enabling seamless fashion creation.

	Origami	**PVA as Intermediate Medium**	**PVC**	**Rotational Moulding**
Equipment availability/accessibility	+	+	-	-
Material expenses	+	+	-	-
Industrial sponsorship	+	+	-	-
Personal knowledge	-	-	-	-
Supportive knowledge base & expertise	+	+	+	+
Commercial viability	-	+	+	-
Artistic innovation	+	+	+	-
Technological advancement	-	+	+	+
Originality probability	+	+	+	+

N.B. '+' stands for 'Suitability' whereas '-' stands for 'Unsuitability'.
Figure 2c: Results of the appraisal of the techniques enabling seamless fashion creation.

	Shrink Wrapping	**Spraying**	**Thermosetting**	**Weaving**
Equipment availability/accessibility	+	-	+	+
Material expenses	+	-	+	+
Industrial sponsorship	+	-	+	-
Personal knowledge	-	-	-	-
Supportive knowledge base & expertise	+	+	+	+
Commercial viability	+	+	+	-
Artistic innovation	+	+	+	-
Technological advancement	+	+	+	+
Originality probability	+	+	+	-

N.B. '+' stands for 'Suitability' whereas '-' stands for 'Unsuitability'.
Figure 2d: Results of the appraisal of the techniques enabling seamless fashion creation.

It is interesting to note that those techniques which were generally more favourable ranked as unfavourable for the factor of originality probability. It can be explained that the favourable conditions of those techniques had naturally attracted considerable interest, prior research and industrial development. Thus it would be relatively more difficult to achieve ground-breaking results in these areas within the period of the proposed research. Two-dimensional braiding, basketry, dip coating, origami, plasticised polyvinyl chloride (PVC) with rotational moulding or dip coating polyvinyl alcohol (PVA) as an intermediate medium, rotational moulding, shrink wrapping, spraying, and thermosetting

were considered favourable from the point of view of originality probability. It should be noted that some techniques had been in existence and employed by industry for some time, however, this did not necessarily suggest their lack of potential for future development. For example, the use of an existing technique with new materials, and vice versa, could result in original and exciting products.

3. EVALUATION OF THE SUITABILITY OF THE SELECTED TECHNIQUES

3.1 INTRODUCTION

An evaluation of the ten techniques [57] was carried out for the purpose of identifying a most desirable technique for further in-depth study. Only those techniques that were regarded as favourable from the point of view of originality probability in the previous appraisal were evaluated since the originality was the most critical criterion for doctoral research work.

3.2 RANKING AND WEIGHTING OF THE FACTORS MOST CRITICAL TO THE CREATION OF SEAMLESS FASHION

The nine factors most critical to the success of seamless fashion creation were ranked according to the overall Suitability to create seamless fashion. One weighting from 1 to 9 was assigned to each factor, with 9 being the most important and 1 being the least. Figure 3 shows the result of the ranking.

Ranking in Order of Importance	Weighting	Factors
1st	9	Originality Probability
2nd	8	Technological Advancement
3rd	7	Artistic Innovation
4th	6	Equipment Availability/Accessibility
5th	5	Industrial/Institutional Sponsorship
6th	4	Personal Knowledge
7th	3	Supporting Knowledge and Expertise
8th	2	Commercial Viability
9th	1	Materials Cost

Figure 3: Results of the ranking of the nine factors most critical to the success of seamless fashion creation.

3.3 RANKING AND WEIGHTING OF THE SELECTED TECHNIQUES AND PROCESSES

The ten techniques were then ranked for each factor. A weighting from 1 to 10 was assigned to each technique in terms of its relative Suitability in each factor, with 10 being the most favourable and 1 being the least. The weighting of the techniques was then multiplied by the weighting of the factors to obtain the average weighting of the techniques for each factor. Figures 4a-b show the results of the weightings.

	Originality Probability	Technological Advancement	Artistic Innovation	Equipment Availability/ Accessibility	Industrial/ institutional Sponsorship
3-D Braiding	10 (90)	4 (32)	1 (7)	1 (6)	1 (5)
Basketry	3 (27)	2 (16)	6 (42)	8 (48)	5 (25)
Dip Coating	9 (81)	10 (80)	7 (49)	4 (24)	4 (20)
Origami	2 (18)	1 (8)	10 (70)	10 (60)	10 (50)
PVA	6 (54)	3 (24)	9 (63)	9 (54)	9 (45)
Thermoplastic polymers/ elastomers	7 (63)	9 (72)	5 (35)	7 (42)	8 (40)
Rotational Moulding	8 (72)	8 (64)	3 (21)	2 (12)	2 (10)
Shrink Wrapping	4 (36)	7 (56)	8 (56)	6 (36)	7 (35)
Spraying	1 (9)	6 (48)	2 (14)	3 (18)	3 (15)

Thermosetting	5 (45)	5 (40)	4 (28)	5 (30)	6 (30)

n = weighting, (n) = average weighting.
Figure 4a: Results of the ranking of the factors for the selected techniques and processes.

	Personal Knowledge	**Supporting Knowledge Base and Expertise**	**Commercial Viability**	**Materials Cost**
2-D Braiding	2 (8)	6 (18)	1 (2)	1 (1)
Basketry	1 (4)	7 (21)	3 (6)	9 (9)
Dip Coating	9 (36)	5 (15)	9 (18)	5 (5)
Origami	4 (16)	8 (24)	4 (8)	10 (10)
PVA	10 (40)	4 (12)	5 (10)	6 (6)
Thermoplastic Polymers & Elastomers	3 (12)	10 (30)	8 (16)	4 (4)
Rotational Moulding	8 (32)	9 (27)	2 (4)	2 (2)
Shrink Wrapping	6 (24)	1 (3)	6 (12)	8 (8)
Spraying	5 (20)	3 (9)	10 (20)	3 (3)
Thermosetting	7 (28)	2 (6)	7 (14)	7 (7)

n = weighting, (n) = average weight.
Figure 4b: Results of the ranking of the factors for the selected techniques and processes.

3.4 RANKING AND WEIGHTING OF THE OVERALL SUITABILITY OF THE SELECTED TECHNIQUES AND PROCESSES

The sums of the average weightings of each of the ten techniques were obtained. They were then divided by the weighting sum, i.e., 450, to obtain the average sums of weighting. The results suggested the overall Suitability of each technique for seamless fashion creation. Figure 5 shows the results.

Sum of the Average Weightings	**Average Sum**	**Techniques**
328	72.9	Dip Coating
314	69.8	Thermoplastic Polymers and Elastomers
308	68.4	PVA as an Intermediate Medium
266	59.1	Shrink Wrapping
264	58.7	Origami
228	50.7	Rotational Moulding
244	54.2	Thermosetting
198	44.0	Basketry
156	34.7	Spraying
141	31.3	Three Dimensional Braiding

Figure 5: Results of the ranking of the overall suitability of the ten techniques for seamless fashion creation.

4. PROPOSITION OF THE TECHNIQUE FOR SEAMLESS FASHION CREATION

The result of the ranking of the ten techniques for seamless fashion creation in order of Overall Suitability were 1) Dip Coating, 2) Thermoplastic Polymers and Elastomers, 3) Polyvinyl Alcohol as an Intermediate Medium, 4) Shrink Wrapping, 5) Origami, 6) Thermosetting, 7) Rotational Moulding, 8) Basketry, 9) Spraying, and 10) Three Dimensional Braiding.

It was realised that the top two ranked techniques, i.e., dip coating and thermoplastic polymers and elastomers were complementary. Dip coating is a process of dipping a mould of desirable configuration into a fluid substance and allows the substance to set to the configuration whereas thermoplastic polymers and elastomers are substances that can either be dipped or painted subject to their viscosity. Theoretically, any materials that have a liquid stage viscous enough to be either dipped or painted and a flexible set stage offered possibilities of creation of seamless garments. For these reasons, it was

proposed that dip coating (or brush-on when appropriate) and thermoplastic polymers and elastomers were used for creating seamless fashion.

5. CONCLUSION

This paper introduces and deliberates a particular method termed as Double-Rank Appraisal Method (DRAM) deployed to guide researchers to map their research journey along the way. The paper cited an example of how the DR could be deployed to help identify the optimal solution systemically and objectively for the way ahead.

In this particular research project towards seamless fashion creation undertaken at the Royal College of Art, London, DRAM first appraised the 10 materials/methods identified for their respective favourablilities against fulfilling the primary research objective, i.e., creation of seamless fashion. DRAM then ranked the 9 subjective and objective research constraints for their relative importance in accomplishing the research task with a time constraint in mind. The rankings of the 10 materials/methods were then multiplied by that of the 9 constraints to calculate a total score of favourability of individual materials/methods with which their respective favourabilities for fulfilling the primary research objective could be compared directly. Results of the DRAM suggested thermoplastic polymers and elastomers being the most desirable materials and dip-coating being the most desirable method for further in-depth exploration and experimentation2.

DRAM serves as one useful example for identifying an optimal research journey ahead through systematic evaluation and appraisal against different subjective and objective constraints, taking into account their relative importance and significances of the constraints. The appraisal has proved effective in guiding a research journey3 to map a desirable and realistic path.

REFERENCES:

1. Examples of the electronic sources - Dissertation Abstracts, Citations Indexes, Textile and Clothing Art (TCA), ArtBibliographes Modern, Art Index, Design and Applied Arts Index, Current Technology Index (CTI), Technical Information Service (TIS), Textile Technology Digest (TTD), Alison Research Index of Art & Design, etc.. Examples of the non-printed sources - videorecording; printed sources: journals, directories, reference books, archives, slides, etc.; others: lectures, seminars, conferences, exhibitions, etc.

2. Bezemek, V., Development of a Technology for the Production of Seamless and Conventional Knitted Trousers from Single-jersey. Melliand Textilberichte International, 1975. 56(12): pp. 983-986.

3. Fregeolle, O., Seamless Garment with Partial and Full Course Fashioning and Method, 1996, Pilot: USA.

4. Goadby, D.R., Full Fashioned to Seamless - Productivity and Fashion. Knitting International, op.cit.

5. Janda, R.M. and K.C. Williams, Seamless Garment Including Method of and Machine for Knitting the Same, 1996, Rockwell International: USA.
6. Johnson, M.R., Manufacture of One-Piece Seamless Briefs on Circular Hosiery Machine, 1978, Ridley, Spriggs & Johnson Ltd.
7. Krowatschek, F., Seamless Moulding of Garment Parts. Melliand Textilberichte International (English Edition), 1981(10, November): pp. 1144-1147.

8. Norgate, M. and H. Bennett, Scottish Seamless Shirts. Costume, 1976(10): pp. 53-67.

9. Picaza Azpiroz, J.M., Process for Knitting a Seamless Garment on Flat Knitting Machines, 1993: Spain.

10. Seiki, S., (Shima Seiki Knitting Machines for Seamless Knitted Garment Production).

11. Silvain, A.H., Form-fitting Seamless Garment and Method, 1996, Pilot Research: USA.

12. Vickrey, A.E., Hand-felted Jackets for Kids. Threads, 1990. 30(August): pp. 52-55.

13. Wilisch, S., Shape 3 - Seamless Shapes, in Bekleidung/Wear. 1996, Crosby Lockwood: London. p. 45.

14. Zimmermann, E., Knitting a Seamless Sweater: It's Easy with Circular Needles. Threads, 1986. 7(October): pp. 47-49.
15. Anon, Integral Tights. Knitting International, 1994. 101(1210): p. 18.
16. Bentley Engineering Co. Ltd., Circular Knitting Machine for Seamless Tights. Textil-Praxis International (Foreign Edition), 1981(XIII, March): p. 256.
17. Bezemek, V., op.cit.
18. Ceriani, L., Innovation in Seamless Hosiery Machines. Maglie Calze Indsutria, 1990. 24(2): pp. 89-95.
19. Dostal, S., Czechoslovak Seamless Knitting Machines. Strojimport, 1984. 1(1): pp. 19-28.
20. Goadby, D.R., Conti-Panty: A New Method of Producing One-piece Pantyhose. Knitting International, 1980. 87(October): p. 54.
21. Janda, R.M. and K.C. Williams, op.cit.
22. Johnson, M.R., op.cit.
23. Koncern Textilniho Stroj, E., Method for Knitting One-Piece Pantyhose on Seamless Hosiery, 1980, Elitex Koncern Textilniho Stroj: Czechoslovakia.
24. Lasch, G., C. Hahn, and K. Arnold, Totally Seamless Pantyhose - A New Product Based on New Technology. Bekleidung und Maschenware, 1980. 19(5, September/October): pp. 225-228.
25. Negri, E., New Methods for Producing Pantyhose. Knitting Times, 1977. 46(11, 14 March): pp. 56-60.
26. Picaza Azpiroz, J.M., op.cit.
27. Polsky, B., Seamless Crotch, 1983: USA.
28. Seiki, S., op.cit.
29. Spencer, D.J., Patent Describes Method for Knitting Integral Fashion Shaped Tubular Garments on Conventional V-Bed Flat Machine. Knitting International, 1995(January): pp. 16-7.
30. Widdowson, B., Brief Excursion into Seamless Hosiery Nostalgia. Knitting International, 1989. 96(September): pp. 40-42.
31. Zawacki, B.A., Pantlike Apparel Having Seamless Crotch-Inner Panel, 1981: USA.
32. ---, Lovytex Aims for One Billion Gloves. Rubber Developments, 1989. 42(1): pp. 13-14.
33. ---, Respiratory Latex. Rubber Developments, 1991. 44(1): p. 10.
34. Berend, F.T., Protective Glove and Its Method of Manufacture, 1981, Parinter SA: USA.
35. Chatterjee, C., From Latex to Thread. Indian Textile Journal, 1997. 107(12, September): pp. 18-19.
36. Gelbert, C.H. and M.C. Grady, Latex Technology. pp. 51-68.
37. Hawkins, J., Neoprene is 50. Du Pont Context, 1981. 10(1): pp. 18-21.
38. Miller, C.W., L.C. Vandenberg, and W.H. Statt, Manufacturing Textured Gloves of Silicone Rubber, 1977, Dow Corning Corporation: USA.
39. Rategan, C., Handle Hand Protection with Care. Textile Rental, 1993. 76(10, June): pp. 50-51.
40. Regent Medical, Notes on the Introduction, Manufacturing and Biogel Surgical Gloves. 1998, Regent Medical: Hertfordshire.
41. Weber, J. and M. France, The Gloves Come off over Latex. Business Week, 1997(June 16): pp. 85-86.
42. Daugherty, R.T., Splint Woven Basketry. 1986: Interweave Press, Inc.

43. Harvey, V.I., The Techniques of Basketry. 1975, London: B.T. Batsford Ltd.

44. Malarcher, P., The Vessel Form. Fiberarts, 1992. 19(Summer): pp. 25-29.

45. Thompson, F., Antique Baskets and Basketry: A Collectors' Guide. 1977, New Jersey: A.S. Barnes and Co., Inc.

46. Wright, D., A Caneworker's Book for the Senior Basket Maker. 1970, Leicester: The Dryad Press.

47. Beech, R., Discover Origami: 40 Original Projects to Build Your Paper Crafting Skills. 1995, London: Hamlyn.

48. Kenneway, E., Origami in Action. 1972, Leicester: The Dryad Press.

49. Shannon, F., The Art and Craft of Paper. 1994, San Francisco: Chronicle Books.

50. Tofts, H., 3-D Paper. 1990, UK: Franklin Watts.

51. Williams, N., Paperwork. 1993, London: Phaidon Press Ltd.

52. Ziegert, B., Origami, the Game of Garments. ACPTC Proceedings, 1985: p. 150.

53. For example, see Pastore, C.M. and F.K. Ko, Modelling of Textile Structural Composite - Pt.1: Processing - Science Model for Three-dimensional Braiding. Journal of Textile Institute, 1990. 81(4): pp. 480-90 and Wulfhorst, B., et al., Application of Braiding Technology for 3-D Reinforced Composite Materials. Textil Praxis International, 1993. 48(5): pp. 394-400.

54. For example, see Pastore, C.M. and F.K. Ko, Modelling of Textile Structural Composite - Pt.1: Processing - Science Model for Three-dimensional Braiding. Journal of Textile Institute, 1990. 81(4): pp. 480-90 and Wulfhorst, B., et al., Application of Braiding Technology for 3-D Reinforced Composite Materials. Textil Praxis International, 1993. 48(5): pp. 394-400.

55. For example, see ---, Nonwovens: Sophisticated Process Technique. Nord. Cellul., 1987. 4(8, October): pp. 70, 72 and Albrecht, W., Nonwoven Fabrics - State of the Art and Trends of Development. Cotton and Allied Textile Industries, 1971. 1971(12): pp. 49-57.

56. For example, see Horne, C., Fashion Crochet. 1970, New York: Hearhside Press, in which it gives detailed procedures on how to make a handbag, pants, hat, stockings, tailored suit with raglan sleeves, three quarter length coat with raglan sleeves, car coat, two coloured dress, classic teenager's dress, coat and dress, an evening shawl, gold slippers, blazer, a cape, an overblouse by the technique of crochet.

57. The ten techniques that were considered as having favourable original probability were three-dimensional braiding, basketry, origami, polyvinyl alcohol as an intermediate medium, plasticised polyvinyl chloride with dip coating, rotational moulding, shrink wrapping, shrink wrapping, spraying, and thermosetting.