REVITALIZATION OF A SMALL TEXTILE FACTORY FROM THE XIX CENTURY

A. C. Alves[1], P. M. Arezes[1], M. L. Nunes[1], P. Afonso[1], M. M. Neves[2], S.F.C.F. Teixeira[1,3]

1. Department of Production and System Engineering, University of Minho, Guimarães, Portugal.

2. Department of Textile Engineering, University of Minho, Guimarães, Portugal.

3. Instituto Monsenhor Airosa (IMA), Braga, Portugal.

ABSTRACT

The cultural heritage of a region is a priceless asset in creating an identity and the definition of a unique future.

Craftsmanship particularly that concerned with textile has been a constant tradition in the Minho region. Such environment has led to the creation of a textile industrial museum: Museum of Textile Industry of Bacia do Ave.

Such heritage has been central to Father Airosa since the early days when, at the Instituto Monsenhor Airosa, by the end of 19th century, he decided to use the work in weaving as route for his rehabilitation project with girls from street. Even today his project endures and works as a school to form young girls that need help due to social reasons.

This paper describes a work developed in a collaboration project between the Minho University and Instituto Monsenhor Airosa (IMA), having the Museum of Textile Industry of "Bacia do Ave" as a consulting partner.

The objective is to reorganize the Institute weaving job-shop and create a museum with the XXI century Jacquard weavers loom brought from Lyon by Monsenhor Airosa. In this job-shop work, the fifty years Jacquard weavers loom still manufacture the famous industrial art.

This paper emphasis is put on the job-shop reorganization that makes to order bedspread, face towel and table-cloth, napkin and raw cloth. The diversity and complexity of these products is small but exclusive that the Institute wants to spread in handcraft fairs and shops adopting repetitive production.

KEYWORDS: Cultural heritage, work time and method analysis, repetitive production

1. INTRODUCTION

The Instituto Monsenhor Airosa (IMA) is a non profit private social institution. It was founded in 1869 by Father João Pedro Ferreira Airosa under the name "Casa d'Abrigo". Since those early days, its name has changed until by the time of its 1st Centenary, the current name was assumed in honour to its founder.

Since the XIX century the Instituto Monsenhor Airosa develops an important activity of weaving, using own designs, which is necessary to safeguard. The IMA prime objective is to support and help women in social need. Monsenhor Airosa understood that academic education should be combined with professional skills. Following a trip to France, he implemented in 1886 a small textile facility in the Instituto premises. Today, this is still in operation evolving to a weaver's job-shop and the craftsmanship is passed from generation to generation.

The case of Instituto Monsenhor Airosa, in which the products are not exactly of "popular" origin, provides a new set of questions that can be analyzed against this backdrop and also in relation to intellectual property rights issues such as they have been recently raised by social scientists [1]. The preservation of the one-of-a-kind linen products and the financial self-supporting of the Instituto are the main objectives of the developed work described in this paper. In order to reach these objectives and support the production of the IMA products, in particular, the bedspread, it is necessary to reorganize the production. The “as-is” situation of the production system is studied to know better how this system work in order to propose improvements for raising the productivity and to make possible repetitive production.

This paper is organized in more four sections, beyond this one. Section 2 presents the state of art of the industrial arts, the contextualization of this kind of production and the work time and methods study as a tool to improve the productivity. In Section 3 the present “as-is” production in the IMA is described. Section 4 presents the work done and improvements made and, finally, the section 5 presents some conclusions about the work done.

2. STATE OF ART

Social sciences, and especially anthropology, often give a rather critical view of activities aimed at revitalizing the production of traditional artefacts of all kinds, labelling them as "invention of traditions" and stressing the fact that they cannot avoid being part of the reification of culture. However, although aware of this critical stance, scholars are increasingly trying to reconcile it with an attempt at fostering the use of local knowledge and material culture in development projects, if only because the socio-economic impact can be real [2]. It also appears that the commoditization of culture does not necessarily preclude or limit all dynamics of cultural change [3].

Many studies have shown how important it is to identify the favourable technical milieus and socio-cultural networks which are necessary for technical and aesthetic innovations to "work" [4]. Craft activities have, nowadays, a huge importance, mainly because they constitute an important tourist resource. So, it is important, without industrialised them, support economically and revitalize the small production units that continues the work of generations. This implies walking to a different paradigm unaccustomed, the repetitive production, in order to participate actively in handcraft fairs and shops. Tools like the work time and methods study, a classical subject from Industrial Engineering, can be used to identify the more important products and its lead times. Below is described the production paradigms and the tool referred.

2.1. Production paradigms

The predictability of demand is critical to production systems design and organization because this has to best fit market demand requirements. Normally, stable demand calls for an approach to production usually referred as mass production, variable but predictable demand calls for repetitive production and unstable markets requiring different answers being the non-repetitive production the underlying approach. Normally, these three different productions are called production paradigms, suitably described and characterized in Carmo-Silva et al. [5].

It is common to refer as mass production the production paradigm that addresses a demand market where demand for a product is large and is kept so over long time periods. In mass production, production is continuous, at a flow rate which ideally should match product demand. Continuous production means that a product is repeatedly manufactured, unit by unit, from the first to the last stage of conversion. Production systems of the mass production paradigm have as a key performance objective meeting demand at low cost per unit manufactured. Thus, to take

advantage of scale economies not only the production system as a whole, but also their workstations, main equipment and tooling are dedicated to one product. Therefore, the life time of such a system is linked to the life time of the product to which it is dedicated.

Totally different and opposing paradigm is the non-repetitive production with a strong history that parallels the mass production but is, rapidly, gaining ground. Probably this paradigm will be the commonest paradigm in the near future. Non-repetitive production is mainly linked with unpredictable and turbulent demand markets for unique products and different from others previously manufactured, i.e. are not repeated in manufacturing. This means that a company cannot reasonably forecast or precisely identify manufacturing needs in advance of product demand. This is both the result of global competition and increased and varying customer needs.

In the middle of these two paradigms is the repetitive production. The market demand for this paradigm is a variable and less predictable demand in lower volumes and shorter product life cycles than in mass production. Therefore a dedicated system to each product is economically unacceptable. Thus, a variety of products, repeatedly required over time, with somewhat different production requirements, may have to be manufactured in the same production system with characteristics different from those of mass production systems. This paradigm requires either or both: flexible forms of production and of organizing production. Key performance objectives of repetitive production systems are the efficient use of manufacturing resources and good customer service measured mainly in two dimensions, namely timely delivery of products and product quality. In spite of the fact that repetitive production is loosing importance and rapidly giving place to the non-repetitive production paradigm, it is still a valid paradigm in today's market environment and is likely to continue to be for many years in environments like the one described in this paper.

2.2. Work time and method analysis

The main aim of the work time and method analysis is to optimize tasks carried out by workers. In practice, it refers to the study of each task and the way that might be used to optimize it, both in terms of human and material resources.

Work measurement is generally described as a set of analysis tools applied in order to quantify and describe the work carried out by workers. This analysis will imply a systematic study of all factors that can affect, or might affect, the effectiveness of the studied situation, having as last purpose the attainment of an improvement in workers' efficiency [6].

When analyzing the total duration of one given operation several times could be considered. However, the main goal of time measurement and method analysis is to minimize and, if possible, eliminate all unproductive times. There are several reasons associated with the existence of such times, most of them related with the ergonomics conditions of the workplaces [7]. In this particular project, the aim of the application of the work study was to identify and quantify the time spend for carried out each work task, and to identify and eliminate unproductive times whenever is possible. Some examples that may occur which leads (directly or indirectly) to unproductive times are the lack of normalization in the production process, tasks carried out wrongly or in bad conditions, inappropriate work methods and work sequence and orders bad planning.

Considering the specific type of product and process evaluated, the selected method for time measurement was the work sampling. This technique is one of the most used techniques in work measurement and methods analysis. The use of work sampling as a tool in work measurement is frequently done when companies need to assess data about the process without significant costs, or when the staff has relatively little experience in work measurement. This technique could be applied when the process is not repetitive or have a long cycle time, which is

the case of the analysed project. This particularly technique is also indicated for the study of work stations whose activities vary sufficiently throughout the day, and from one day to another.

Beyond other applications of the work sampling, such as the definition of the relative percentages of the productive and unproductive times of workers and machines and the establishment of an index of activity (or work rhythm), the main purpose of the application of this technique has consisted in measuring the work, which means establishing a standard time for each of the analysed operations. The application of this technique has included the consideration of the activity factor evaluation, the need to make pauses and all the applied corrections for the analysed work method.

3. HANDCRAFT PRODUCTION AT IMA

This section describes the "as-is" situation, emphasizing the production system and processes, the products and its demand.

3.1. Production system and products

To change production methods and organization, it is essential to observe what exists. The handcraft production at Instituto Monsenhor Airosa (IMA) is organized as a simple weave job-shop in a plan and ample space (Figure 1) with nine operational weavers loom and sixteen female operators, being only four of them salaried. The others live in the Instituto and the work they developed there is like an occupational therapy.

Figure 1. Weave job-shop

The production process includes three different groups of operations: preparation, weave and finish operations. The process begins with some operations to warp and weft preparation. These operations are handmade operations performed by the unsalaried operators. After this preparation begins the weave operation in the fifty years Jacquards looms (Figure 2) operated by the four salaried operators. Finally, in the third operation, finish operation, the product is hand embellished by the unsalaried operators.

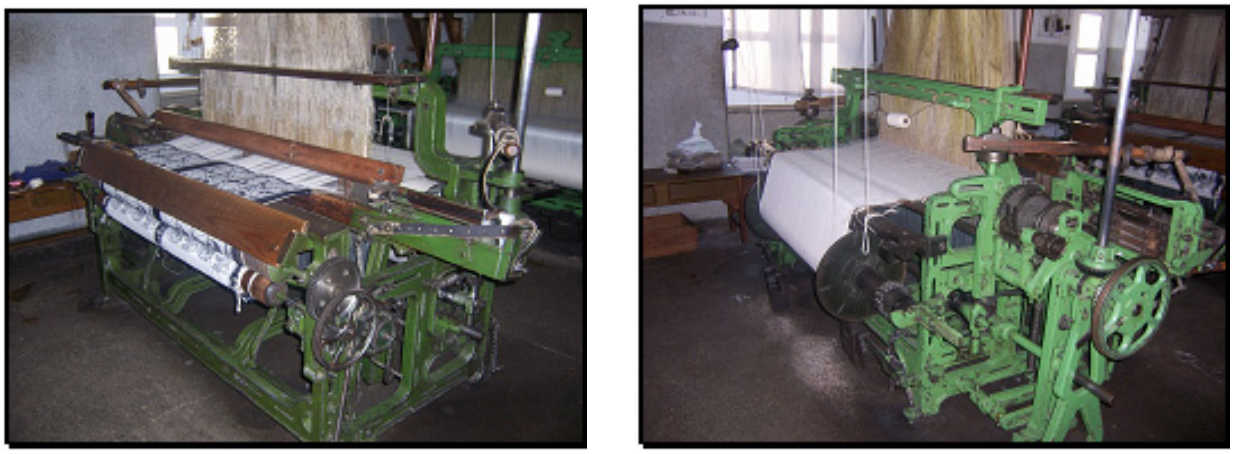

Figure 2. Jacquards looms of the system

The products are one-of-a-kind, exclusives products using the Monsignor Airosa Jacquard designs. Some examples can be seen in Figure 3. The products can be bedspreads, table towels with different dimensions, face towels with different dimensions, napkins and raw cloth also with different dimensions. These products can be made from different raw material like linen, wool, cotton or tow.

a) b) c)

Figure 3. IMA products: a) bedspread; b) table towel c) face towel

3.2. Make to order demand

The Institute depends totally of known clients that put orders, bringing, sometimes, theirs own home-made yarn to weave the linen products ordered. Beyond the problem of unpredictable demand, using the home-made linen yarn implies longer set-up times of linen because this is very fragile (break constantly in the preparation and, after, in the looms) and isn't very clean. It is possible to see the products demand in different raw-material in 2005 and 2006 in Tables 1 and 2, respectively.

Table 1. Products demand (units) for year 2005

Raw material / Products	Industrial linen	Home-made linen	Wool	Cotton	Tow	Total
Bedspread	20	34	11	3	1	69
Table towel (1,65)	67	42		1		110
Table towel (0,80)		30			12	42
Table towel (0,70)	8	17		7		32
Face towel (0,60)	102	46		6		154
Face towel (0,50)	26	24			2	52
Napkin (0,60*0,60)	94	12				106
Napkin (0,50*0,50)		12				12
Raw cloth (1,80)	5	10		3		18
Raw cloth (0,70)	1	9	1	1	1	13
Raw cloth (0,80)		8		1		9
Total	323	244	12	22	16	617

Table 2. Products demand (units) for year 2006 (1º semester)

Raw material / Products	Industrial linen	Home-made linen	Wool	Cotton	Tow	Total
Bedspread	9	9	2	2		22
Table towel (1,65)	19	9				28
Table towel (0,80)		16				16
Table towel (0,70)		7		1		8
Face towel (0,60)	16	26		2		44
Face towel (0,50)	4	4				8
Napkin (0,60*0,60)	54	26				80
Napkin (0,50*0,50)						0
Raw cloth (1,80)		2		2		4
Raw cloth (0,70)		3				3
Raw cloth (0,80)		2				2
Total	102	104	2	7	0	215

The industrial linen was the raw-material more utilised in 2004 and 2005 and is desirable that it continues because the problems with the home-made linen already referred. However, facing the data for the first semester of 2006, this didn't happen. The products with more demand were the napkin in 2004 (not present), the face towel in 2005 and the napkin, again, in the first semester of 2006. It is notorious the bias for using only the linen as raw-material.

The lead times for the products are unknown and, mostly all the time, very long. Normally, in make to order environment this isn't an important objective because the client wait the time necessary for the product. The operators know that the longest operation of the products is on the loom when they utilized the industrial linen. So, they always, try to avoid interrupt the operations there. The other operations can be done in simultaneous with this, having more operators to do them.

4. DEVELOPED WORK AND IMPROVEMENTS

As mentioned, previously, a work sampling technique was used for standard time assessment for each individual operation or task carried out at the weave job-shop. The final results of the application of the mentioned technique are presented in Table 3. For the computation of the statistically significant sample size, a confidence interval of 95% and a 5% error were considered.

After obtaining the weave (W), preparation (P) and finishing (F) operation times and the production time for each product that is the sum of these three times, the following task is to calculate the costs associated at each product. The calculation of unit cost for each product attended to the raw-material cost and the transformation costs (including the fixed and variable costs). When the client bring his own raw-material, e.g. the home-made linen, the corresponding parcel is considered zero but, due to the significant difference between home-made linen products preparation times and industrial linen products preparation times, both costs are calculated.

The Table 3 also presents the unit costs for each product. All times and products unit costs are in hours and in euros, respectively. It is interesting to note that the rising home-made linen products unit cost is only very significant when the difference between the preparation times is very large. There are three reasons for this fact: 1) the parcel of raw-material costs is zero when the client brings his own raw-material; 2) the preparation operation is done by unsalaried operators so the cost from this operation it is irrelevant and 3) the linen price is expensive. So, the preparation times are diluted, revel only a superior cost when the difference between the preparation times is large like in the case of the bedspread.

Table 3. Production times and costs for the products

Raw material / Products	Industrial linen times (h)				Home-made linen times (h)				Industrial linen cost (€)	Home-made linen cost (€)
Operations	P	W	F	PT	P	W	F	PT	--------	----------
Bedspread	9,80	8,00	2,00	19,80	20,00	8,00	2,00	30,00	127,94	132,68
Table towel (1,65)	3,43	2,66	2,00	8,09	7,00	2,66	2,00	11,66	59,85	55,25
Table towel (0,80)	1,47	3,37	0,30	5,14	3,00	3,37	0,30	6,67	17,24	15,27
Table towel (0,70)	1,22	3,00	0,30	4,52	2,50	3,00	0,30	5,80	16,89	15,24
Face towel (0,60)	1,59	2,27	0,30	4,16	6,50	2,27	0,30	9,07	44,19	42,05
Face towel (0,50)	1,47	2,00	0,30	3,77	6,00	2,00	0,30	8,30	21,83	19,86
Napkin (0,60*0,60)	0,61	0,93	0,30	1,84	0,91	0,93	0,30	2,14	25,08	24,26
Napkin (0,50*0,50)	0,44	0,90	0,30	1,64	0,90	0,90	0,30	2,10	15,76	15,15
Raw cloth (1,80)	2,94	2,26	0,15	5,35	6,00	2,26	0,15	8,41	39,16	35,22
Raw cloth (0,70)	1,22	0,97	0,15	2,34	2,50	0,97	0,15	3,62	14,59	12,95
Raw cloth (0,80)	1,47	1,00	0,15	2,62	3,00	1,00	0,15	4,15	14,95	12,98

Knowing these production times and unit costs, IMA can establish the suitable prices for their products. The knowledge of the production times make possible give a probable due date for an order because it can be calculated how much time one specific order needs, considering the capacity of the system limited by the man-hours of the salaried operators (7,5 hours/day). The production can be organized having to respond to two different environments: 1) continuing respond to make to order (MTO) demand and 2) participate in handcraft fairs and shops.

The participation in handcraft fairs implies knowing the fairs dates for planning production. These orders can be aggregated period a period with the orders from known clients

that has to be done in the less demand periods. The IMA has to decide how many and which products will put in the fairs, depending this decision on the actual and foreseen load on system.

5. CONCLUSIONS

The collaboration between the university and this handcraft factory from the XIX century brought new hope in preserving old traditions. After this reorganization, work will be done in order to innovate some products.

A museum creation will follow. The city of Braga has a long tradition of handcraft manufacture to satisfy the needs of the religious activities. This tradition suffers the risk of disappeared, reason why it is important create a museum with the purpose of its safeguard. Conjugating these aspects, the creation of a small museum in the Institute Monsenhor Airosa has an important meaning, which will be able to contribute for the economic development of the region.

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