Redesign of the logo and design of a new ergonomic hand tool enabled by systemic analysis of the Serra da Estrela PDO cheese universe

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Abstract. The work reported on this paper was aimed at improving the efficiency of a semi-artisanal cheese production process. A systemic design analysis, presented in another paper (Carrola, Couvinhas & Coelho, 2014) triggered the development of design work. A discursive analysis aimed at creating alternative logos for the Serra da Estrela PDO (Protected Designation of Origin) cheese was developed. Observations following an ethnographic approach identified ergonomic risks in cheese making during the process of cutting excess chips, fostering the emergence of musculoskeletal disorders at the wrist. A tool that fits best to the task at hand was developed. A prototype of the new tool enabled collecting feedback from use in the work context, in order to feedback product development.

Keywords. Meta-design, ethnographic approach, hand tool, musculoskeletal disorders.

1. Introduction

The long history and symbolism assigned to the Serra da Estrela (SE) PDO cheese; make it more than just a simple cheese, turning it into a totem of a sector and a specific region of Portugal. It is one of the main results and may be considered the most important legacy of a way of life that is part of a system that was developed and gradually adapted to the adversity that was encountered in the slopes of the Serra da Estrela mountains.

This paper is the result of research work carried out during the course of the master's thesis in Industrial Design Engineering at the University of Beira Interior, entitled "Systemic Analysis of Manufacturing and Discursive of the Image of Serra da Estrela PDO cheese - Application of Design Methodologies to the Solution of Critical Points" during the year 2013. The results of the systemic analysis and critical points identified, which are the starting point for this paper, are presented in (Carrola, Couvinhas & Coelho, 2014).

2. Methods

The work reported in this paper was guided by two distinct methods. The redesign of the logo followed the meta-design approach presented by Bistagnino, Celaschi and Germak (2008), while the design of a hand tool followed the approach to ergonomic design structured by activity theory presented by Coelho and Dahlman (2006) and is also based on the design method presented by Figueiredo and Coelho (2010) and by Coelho (2010).

2.1 Meta-design approach

The process of logo redesign was developed based on a Meta-design methodology, based on scenarios (Tamborrini, 2012; Bistagnino, Celaschi & Germak, 2008), including the SE region's geographical, geomorphologic, and flora characterization and referencing the history of transhumance, current SE PDO cheese brands and their distribution. The process has been participatory in nature, with contributions collected from a focus group session with students of industrial design, most of whom were uninitiated in the theme of the SE PDO cheese. In addition, this process also received input from key stakeholders of the certification and production system of this specialty cheese, produced in a semi-artisan manner. While there was no consensus among the evaluation of proposals made by the students and the executive officer of the certification system, this led to open a new direction in the proposal of an evolution alternative for the logo of the SE PDO cheese.

2.2 Approach to hand tool design

The approach to design employed in the second part of the development work reported in this paper was presented by Coelho (2010) and Figueiredo and Coelho (2010), based on work by Lewis and Bonollo (2002) and early work by Hales (1991). The process embedded in this approach is comprised of five sub-ordinate processes (task clarification, concept generation, evaluation and refinement, detailed design of preferred concept and communication of results). In the particular case at hand, detailed design was fed by user trials, and is yet to be completed, at the time of writing this paper. Task clarification was developed during ethnographic observations carried out by the first author. Concepts were generated and evaluated and refined, leading to the detailed design of the preferred concept. This was then prototyped and used by cheese makers in a user trial. This provided information that will serve as input for the next iteration of the design of the new hand tool.

3. Redesign of the Serra da Estrela PDO Cheese Logo

3.1 Scenario Analysis

Due to reduced visibility and erroneous perception of the name Serra da Estrela PDO cheese, the consumer assumes similar products for the genuine product. The fact that no uniformity exists in some of the features of the label that identify the product as a certified Serra da Estrela PDO cheese prevents the consumer to develop a stronger recognition, regardless of the producer concerned, of the image of SE PDO cheese. The competition from similar products, in the eyes of consumers alternatives are considered the same product and the fact that alternatives are more affordable is the result of an inability to provide a communications strategy which stresses the Serra da Estrela cheese PDO as something unique that is.

A scenario analysis was completed, which included a geological and geomorphologic overview of the characteristics of the region, a survey of its endemic flora, a review of the production standards of the Serra da Estrela PDO cheese, as well as a study of transhumance routes. The scenario was also enriched by the characterization of the indigenous sheep breeds: *Churra Mondegueira* and *Bordaleira Serra da Estrela*. Brand management is carried out by Estrelacoop, giving each producer a number of certification label marks, in the form of stickers. Regarding the Serra da Estrela PDO cheese holograms (Fig. 1c), these are distributed for pasting on the cheese label, which is a matter of identifying and certifying the authenticity of the product and brands. Marks of casein are affixed to the bottom of the cheese during its production. Estrelacoop also provides

certification seals to each producer for Serra da Estrela PDO cottage cheese (Fig. 1d) in the form of a sticker to affix on the label of the cottage cheese, as well as for the Serra da Estrela PDO lamb meat (Fig. 1e). The latter take the form of a printed label which is added to the meat, and is supplied by the inspection and certification body.

Figure 1: a) Current Estrelacoop logo; b) Old Estrelacoop logo, still in use in some materials; c) Hologram certification for Serra da Estrela PDO cheese; d) Seal of certification for Serra da Estrela PDO cottage cheese; e) Seal of accreditation of Serra da Estrela PDO lamb meat (© Estrelacoop and Beira Tradição).

The brand manager (Estrelacoop) had an image that it uses in the majority of its communications (Fig. 1a). However, traces still exist of the original version (Fig. 1b) in the office stationary, and, more importantly, as a basis for the design of the hologram (Fig. 1d), although with some differences. Regarding the certification of Serra da Estrela PDO cheese there are several aspects that the consumer needs to take into account to develop the capacity for identifying the authentic product.

3.2 Development of a New Concept and Proposal

The target audience consists of a consumer profile that defines the characteristics and typology of the end user / consumer, for whom the product or service is designed. This may represent the sales target, the range of potential consumers (of a product, service, etc.), to whom the design strategy and / or advertising campaign is directed (Bistagnino, Celaschi & Germak, 2008: 167).

In this particular case, although at the outset, one can consider a broad audience, including any consumer of this type of cheese, the same is not true in practice. Factors such as the final price of sale to the public prevent an extended reach to all kinds of consumers. Thus, the profile of the target audience can be defined broadly by a consumer belonging to a middle class with material resources available, with a level of education that oscillates between reasonable and high, fond of products that are differentiated by high quality. This consumer may have acquired the habit of consuming the product through family traditions, and as such its use is somewhat scarce, or linked to specific events and celebrations during the year when extended family gathers, and therefore contributing to create a space for nostalgic associations from past times.

To develop proposals three base concepts were explored that gave rise to various proposals. The first concept focused and was defined by craft elements and rituals, a second one concerned the Serra da Estrela theme (the wool and granite) and finally a third concept explored the sheep, their indigenous specificity and insertion in the surroundings.

Subsequently proposals were evaluated during a focus group session within an industrial design class, with the results shown in Figure 2, for concepts and proposals.

Figure 2: Total score for each concept; Total score for each proposed logo symbol.

After presenting these results to stakeholders of the SE PDO cheese tier it was decided to pursue a different direction in the development proposal for the logo, in addition to the ones that had already been developed. After analysis, reflection and refinement of the details, a direction for the evolution of the logo for the Serra da Estrela PDO cheese was proposed, as shown in Fig. 3.

Figure 3: Proposed new logo for the Serra da Estrela PDO cheese (original in color): a) Estrela (star), b) Round cheese; c) Serra da Estrela silhouette. © Tiago Carrola.

4. Design of a New Ergonomic Hand Tool

4.1 Design Requirements

As a consequence of the fieldwork carried out in the form of observations and interviews to a myriad of actors in the SE PDO cheese universe, as well as visits to several cheese making facilities, systemic analysis was performed and the critical points emphasized (Carrola, Couvinhas & Coelho, 2014). This led to the consideration of the need for a device or utensil that is better suited to the task at hand was to be designed, to better support the cheese chip cutting process shown in Photographs in Figure 4. The need to trim the cheese barb that is formed as a consequence of the cheese pressing, to remove excess whey, has not only aesthetic grounds, but also functional ones. During the cheese ripening process, molds form on the outer surface of the cheese. As part of this process, washing of the cheeses is done regularly. This process is more efficient once the trimming is made. Task clarification yielded the following goals for the new hand tool: Cutting cheese chips

in the upper face of the cheese in a hygienic manner; enabling easy repair, maintenance and cleaning of the hand tool; preventing the development of musculoskeletal disorders in the upper limbs of the cheese makers.

Figure 4: Cheese chip cutting process using a regular knife and supporting the full weight of the cheese.

4.2 Alternative Concepts and User trials of Prototype

Several design concepts were generated (Figure 5) and these were rated against evaluation criteria derived from the initial goals set for the project. Upon the first iteration of evaluation, the alternative concepts were crossed with one another, producing a new design that combined the best features of each of the original concepts generated by the first author. This concept was then designed in detail and prototyped in order to undergo user trials (Figure 6). The trials showed the need for an improvement in the prototype, in order to make the cheese cutting blades more versatile by angling them in relation to the disc shaped part of the design. Alternative handle designs are also to be developed in order to enable a more neutral posture of the wrist, when using the tool for cheese chip cutting. At the time of writing the project is awaiting funding to proceed to the next iteration of redesign of the hand tool and user trials.

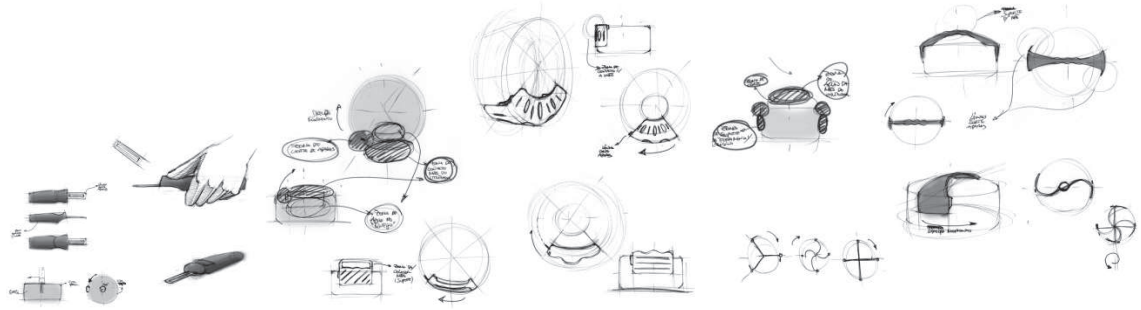

Figure 5: Alternative conceptual sketches. © Tiago Carrola.

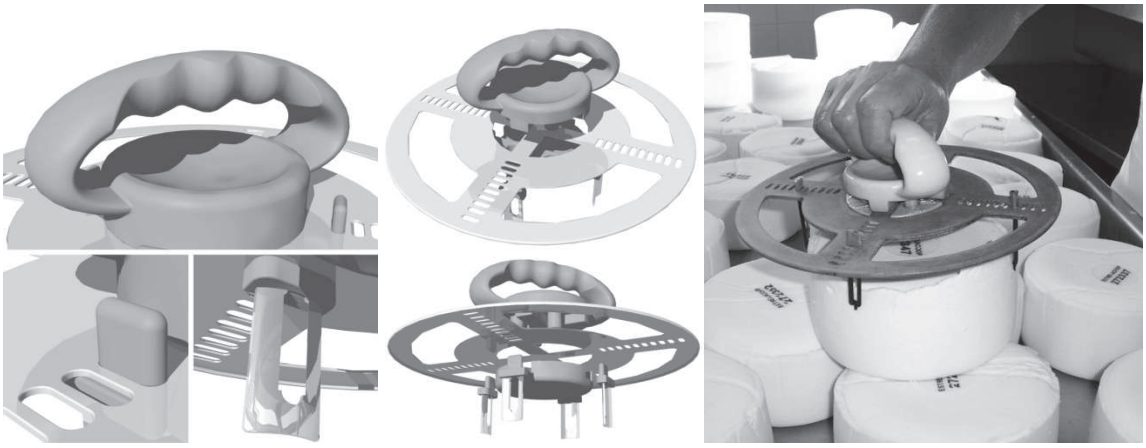

Figure 6: Detailed design and user trials of the new hand tool. © Tiago Carrola.

5. Discussion

The sustained and informed development of the proposals carried out, as well as the possibility of highlighting other opportunities for action, was in good part only possible due to the intersection points that arose during the process of observation, research and project-development. The latter sprang from approaching the production process of the semi-artisanal cheese from a systems design perspective, carrying out a systemic analysis of a manufacturing system, demonstrating a macroergonomics approach (Coelho et al., 2012), while the logo redesign and the hand tool design projects demonstrate micro-ergonomics approaches. These two design contributions may assist directly attaining the aim of increased efficiency for the SE PDO cheese production process.

References

Bistagnino, L. Celaschi F. & Germak, C. (Ed.) (2008). Uomo al centro del progetto, per un nuovo umanesimo [Design / Man at the center of the project, Design for a new humanism] Torino, Italy: Allemandi & C.

Carrola, T.E.P., Couvinhas, A.F. & Coelho, D.A. (2014). Manufacturing Analysis of the Serra da Estrela PDO cheese under the Perspective of Systemic Design. Proceedings of Human Factors in Organizational Design And Management – XI & Nordic Ergonomics Society Annual Conference – 46; O. Broberg, N. Fallentin, P. Hasle, P.L. Jensen, A. Kabel, M.E. Larsen, T.Weller (Eds), IEA.

Coelho, D. A. (2010). A Method for User Centering Systematic Product Development Aimed at Industrial Design Students. Design and Technology Education: an International Journal, 15(2).

Coelho, D. A. & Dahlman, S., (2006). Ergonomic Design Structured through Activity Theory. In Fischer, Xavier; Coutellier, Daniel (Eds.), 'Research in Interactive Design' – Vol. 2, Paris: Springer Verlag.

Coelho, D.A., Ferrara, P.R., Couvinhas, A.F., Lima, T.M., & Walter, J.K. (2012). Macro-ergonomic aspects in the design of development programs in IDCs. Work, 41, 2651-55.

Figueiredo, J. F., & Coelho, D. A. (2010). Semiotic Analysis in Perspective: A Frame of Reference to Inform Industrial Design Practice. Design Principles and Practice: An International Journal, 4(1), 333-346.

Hales, C., (1991), Analysis of the Engineering Design Process in an Industrial Context, Eastleigh, UK: Gants Hill Publications.

Lewis, W. P. & Bonollo, E. (2002). An analysis of professional skills in design: implications for education and research. Design Studies, 23(4), 385-406.

Tamborrini, P. (2012). Il Processo Progettuale, Module 1 Communication Design, Corso Design Della Comunicazione 1. Politecnico di Torino, Italy.