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Mission Overview

This report documents a three-day full-immersion mission carried out from Italy to Le Textile Lab in Lyon, centred on the use of the Kniterate digital knitting machine within a collaborative textile makerspace environment.

Context and Rationale

The mission was conceived as an opportunity to test how an advanced digital knitting machine such as Kniterate could support the work of artisan practitioners operating in rural areas, where production often depends on limited infrastructure, fragmented workflows, and strong reliance on manual expertise. The broader rationale of the initiative was to understand whether access to digital textile fabrication could help optimize certain phases of production, implement a strategic vision for renovated economic sustainability, and expand the range of possible applications for local and rustic fibres. The three-day agenda was structured as a project-based activity grounded in a learning-by-doing approach. Rather than organizing the mission as a sequence of theoretical training sessions, the work unfolded through a shared design challenge that provided a concrete framework for experimentation.

Team Composition and Roles

The working group involved four participants from Italy with complementary backgrounds that made the mission particularly relevant from both a technical and a cultural perspective. Zoe Romano acted as coordinator and scientific curator of Centro Consorzi, also specialised in digital fabrication for textiles and beginner user of Kniterate; Emilia Gordini contributed as a designer and invited specialist within the context of a design marathon, bringing an approach focused on prototyping, material interpretation, and design translation; Cristina Ferrarini contributed her expertise as an alpaca and Broгна sheep breeder, artisan, and specialist in natural dyeing, offering a deep understanding of fibre origin, processing, and the relationship between material quality and craft value; Milena Palla participated as a weaver and specialist in Lamon breed sheep wool, contributing practical knowledge of wool behaviour, textile structures, and local wool-based production practices. The local team was composed by 5 people directly involved in the 3-day experience. Pauline Gamore, founder of Le Textile Lab and the person with a practical knowledge on how to operate the Kniterate machine, Capucine Robert specialist in local wool and natural dyes, Marion Real systemic designer and consultant, Martina Muroli, engineer and Fabricademy student who was testing and experimenting with Suint Fermentation as an alternative to traditional scouring,

Diana Castillo designer and Fabricademy student who was developing new recipes to build acoustic panels. Both were using local breed Thônes & Marthod wool.

Objectives of the Mission

The first objective of the initiative was to use the Kniterate machine to explore the potential of integrating **digital knitting technology** into the workflows of artisans working in rural areas, with particular attention to process optimization, adaptability to small-scale production, and the possible impact on economic sustainability. The second objective was to create a meaningful exchange with the specialists working at Le Textile Lab and with the participants attending Fabricademy, especially in relation to their projects dedicated to **experimentation with coarse wool beyond traditional applications**. The third objective was to observe and make visible a context of **open innovation** within a textile-focused makerspace, where people collaborate across disciplines, share technical knowledge, and learn through direct experimentation. The challenge to address was brought by Emilia Gordini which needed to translate a handmade dog sweater prototype into a **computational pattern** version suitable for production with the Kniterate machine. This practical exercise, or work project, allowed the team to explore the learning curve of the software while working on a complex pattern, and to reflect on the process of transferring artisanal design knowledge into a digital knitting context which is often using oil-based fibers.

Methodology and Working Approach

The mission was conceived as an intensive full-immersion experience combining observation, technical experimentation, cultural exchange, and collaborative work. The methodology can be described by reconstructing the sequence of activities carried out during the three days, including machine familiarization, yarn testing, design adaptation, interaction with resident specialists, discussions with Fabricademy participants, and reflections on how shared infrastructures affect learning and production.

The methodology adopted during the mission was based on a collaborative and open innovation approach designed to support participants coming from predominantly artisanal backgrounds in engaging with digital fabrication technologies. Artisans are often highly skilled in material knowledge and manual techniques, yet may feel less confident when confronted with computational tools and software-driven workflows. Working within a shared laboratory environment played a crucial role in lowering this barrier. The possibility to observe others experimenting, making mistakes, and progressively achieving successful results fostered a climate of mutual learning and reduced the perceived complexity of the technology. This dynamic encouraged participants to ask questions, test hypotheses, and gradually build confidence in unfamiliar processes.

The open innovation ecosystem of the textile makerspace further supported this learning model by bringing together people with different expertise, including designers, fiber specialists, digital fabrication practitioners, and researchers. The coexistence of diverse competencies created opportunities for informal knowledge transfer, where technical insights, material experimentation, and design reasoning circulated across disciplines.

Rather than following a top-down training format, the activities evolved through peer learning, collective troubleshooting, and iterative experimentation. This approach proved particularly effective in engaging participants with heterogeneous backgrounds, as it allowed each contributor to both teach and learn, valuing existing artisanal knowledge while introducing computational thinking as an extension of established practices.

The combination of shared space, visible experimentation, and interdisciplinary collaboration contributed to a progressive shift in attitude toward digital tools. Participants demonstrated increased curiosity, reduced hesitation in using software, and greater willingness to explore complex concepts. The experience highlighted how open innovation environments can function as enabling infrastructures for skill transfer, especially for practitioners from rural or craft-based contexts who are not typically exposed to collaborative digital fabrication settings.

Open Innovation and Shared Workspace Dynamics

A central dimension of the mission was the possibility of experiencing first-hand an open innovation environment inside a makerspace specialized in textile practices. In many rural contexts, artisans are used to working individually, often with limited opportunities to compare methods, tools, and production strategies with peers. By contrast, Le Textile Lab offered a setting in which technologies, competencies, and experimentation were shared within a common space. This made it possible not only to test a machine, but also to reflect on how collaborative environments can transform individual practice, accelerate problem solving, and generate new forms of learning.

The designer's challenge developed within the Woolshed design marathon served as the starting point for the activities, guiding both the technical exploration of the Kniterate machine and the collaborative development of samples. This project-oriented methodology allowed participants to engage directly with real design constraints, translating conceptual ideas into computational knitting workflows while simultaneously addressing material behavior, yarn variability, and pattern construction. The hands-on process encouraged iterative problem-solving and facilitated knowledge exchange across different areas of expertise, aligning artisanal experience with digital fabrication practices within a common experimental objective.

Activities and Results by Objective

During the first day, the team defined a series of samples to be developed in order to understand the most suitable machine settings for working with rustic wool yarns. Grey yarn produced by Lanificio Paoletti using Alpago breed wool (1/6000) was tested, followed by different thicknesses of Brogna yarn, also blended with alpaca and silk fibers (Romeo Slim, BAS), as well as Lamon wool. Several stitch structures were explored, including interlock,

rib, links, and Milano. The sampling process required almost the entire day, as each yarn reacted differently during knitting and required adjustments to tension, structure, and feeding. At the same time, significant attention was dedicated to transferring to the participants the logic and workflow of the Kniterate software, supporting a gradual understanding of how computational knitting parameters influence material behavior.

During the second day, two knowledge-sharing sessions were organized to present practical experiments developed at the lab. These included the process of washing wool using fermentation, the use of laser-cut stamps to decorate textiles with natural dyes thickened with agar agar in order to enable printing through pressure using wooden patterns impregnated with dye, and the application of a paper-making process based on shredding used fabrics, soaking them in water to separate the fibers, and drying a thin layer of the resulting pulp onto a paper screen to obtain a fragile textile paper. This material was then combined with felted wool layers using needle felting techniques. Additional experiments explored different recipes combining wool fibers with other ingredients to obtain rigid surfaces characterized by varying acoustic properties. In the second part of the day, the group resumed work with the Kniterate machine, scaling the most successful samples into more complex shapes and evaluating their structural behavior.

During the third day, the team focused on translating the selected samples into a functional prototype for the dog sweater. Calculations were carried out to determine the number of stitches required to achieve specific textile dimensions, and experiments with increases and decreases were initiated to define the pattern shape. This phase proved particularly complex, as the rib structure required for the design introduced technical challenges when implementing decreases. A gap in software-specific knowledge led to an extended process of trial and error, with multiple iterations needed to achieve a correct and stable knitting file. This iterative workflow occupied most of the day and provided valuable insight into both the computational design process and the technical constraints of shaping complex knitted garments using rustic yarns.

Preliminary Reflections and Next Steps

A preliminary reflection emerging from the mission concerns the spatial dimension of access to digital fabrication and collaborative innovation. In this case, rural artisans were brought into an urban makerspace, where most digital fabrication infrastructures are currently located. While this model proved effective for short-term immersion and knowledge exchange, it also highlighted the importance of developing decentralized environments capable of supporting similar dynamics within rural territories. The concept of a Woolshed Factory located in a rural area could function as a permanent social and technical device, enabling continuous access to digital tools, shared experimentation, and peer learning. Such a space would support the progressive development of digital competences while maintaining proximity to local fiber production, processing knowledge, and artisanal practices.

By embedding digital fabrication within rural contexts, the Woolshed Factory model could foster new forms of collaboration among breeders, fiber processors, designers, and makers, contributing to the reconstruction of optimized and localized supply chains. The integration of computational design and small-scale automated production with traditional artisanal techniques would enable flexible manufacturing approaches adapted to low-volume, high-value wool ecosystems. Beyond technical training, the space would also act as a social infrastructure encouraging collective problem-solving, knowledge circulation, and shared experimentation. This hybrid model, combining digital and artisanal fabrication, has the potential to strengthen territorial resilience, reduce fragmentation across the value chain, and support new economic opportunities rooted in local wool resources.