An indoor tutorial for maintenance and production: case of textile Batna

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Abstract:

Communication and teamwork are among the most recurrent skills associated with knowledge of engineering sciences. However, their application is not straightforward due to the lack of a pedagogical approach that contributes to the development of knowledge. The problem in factories is the lack of daily self-learning to avoid the experts' essential presence in resolving problems.

In this work, we defined what a learning organization is, what a tutorial is, and why there are different forms and steps for developing personalized tutorials in a trade.

After we gave a presentation of the company that is Textile Batna, this article discusses how to design a personalized tutorial, oriented and aimed at learning and knowledge transfer in the industry. By developing this system, we aim to build an experimental database serving to preserve the knowledge of the Batna textile factory's production industry expertise.

We have designed a tutorial for the company in the form of a website. For this, the UML language was used. The tutorial features were presented. It helped employees to acquire specific skills without the assistance of experts.

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1. INTRODUCTION

In the objective to improve the methods of acquiring knowledge, tutorials have integrated all knowledge fields. They can be used for all the manufacturing skills as well as in the practice of service skills.

In a learning organization, employees continually create, acquire, and transfer knowledge, helping their business adapt to the unpredictable faster than their rivals.

The textile industry, for which we will create an activity learning tutorial, particularly in the maintenance and production department. This study's results are expected to be one of the model factory's teaching choices in machine engineering.

1.1 What is a learning organization?

For (Garwin, 1993) a learning organization is "an organization capable of creating, acquiring and transferring knowledge and modifying its behavior for new knowledge."

1.2 Defining a tutorial

A tutorial is a program that guides the user of the software. It can describe or explains the handling of hardware or a device. The term tutorial is used to design an informative brochure designed to teach data of any kind, even if the term is widely developed at the computer level.

In the industrial world that targets the process and learning outcomes, training educational institutions in the learning process should make the appropriate learning approach and accordance with the Industrial world. For any organization, the sustainable competitive advantage lies in learning faster than the competition; companies must integrate and adapt their way of operating according to changes in their environment. To achieve this flexibility, they can rely on a learning organization. In a learning organization, employees regularly create, acquire, and transfer knowledge, helping their business adapt to the unpredictable faster than their rivals (Russell, 2016).

E-learning is an educational and technological modality that concerns continuing training, higher education, and in-house training, i.e., adult learners with individual autonomy in their process for former people without constraints of place and time individualize active learning. These are the benefits of an online course. The online learning platform, sometimes called LMS (Learning Management System), is a website that hosts educational content and facilitates the implementation of educational strategies (Khereddine, 2012).

We will give some UML use case diagrams, class diagram, activity diagrams, and end implementation of the tutorial and conclusion.

We have thought about organizing his tutorial to make it easier for the reader to understand; then start implementing the tutorial on technical support (a website). Then, to make the tutorial understand the reader through a specific methodology; and finally applying know-how in the workplace.
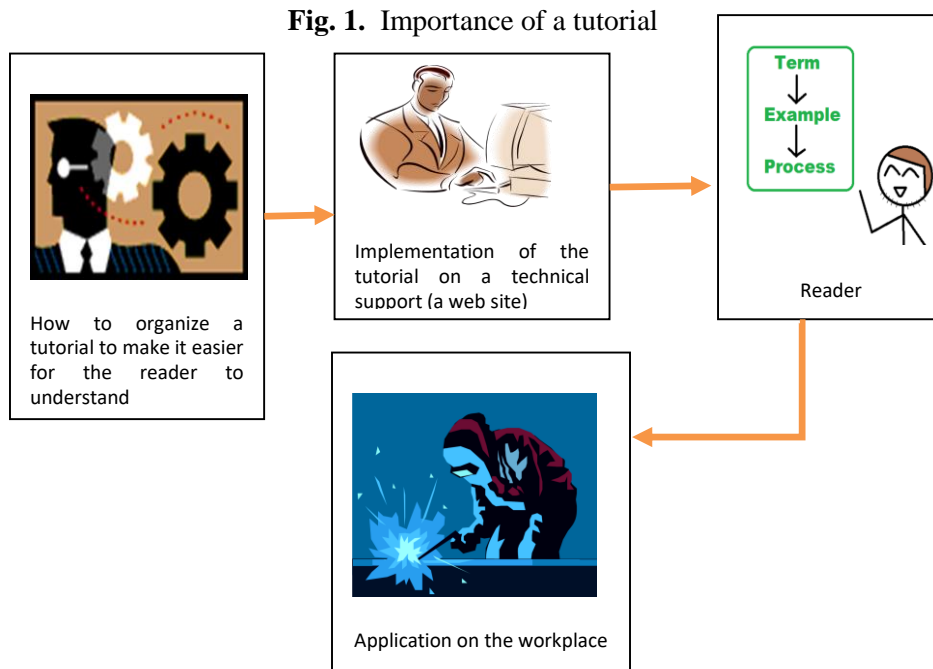
Fig. 1. Importance of a tutorial

Fig. 1. explains the different steps process of a tutorial from the editor to the reader (user).

The remaining of the paper contains Section 2, giving some recent works on tutorials in the industry. Section 3 presents the followed method to develop the tutorial. Section 4 presents the Batna Textile factory and its process. Section 5 is devoted to the design of the tutorial using UML (Unified Modeling Language). Section 6 includes the implementation of the tutorial and its interfaces. We finish the article with a conclusion.

2. Related works

In (Gandhi , Jaiswal , Fadnis, & Mishra, 2020), As a toolkit and a guide for executives, managers, and practitioners, this paper describes why and how advanced analytics and machine learning (ML) is applied to help achieve significant breakthroughs in the process improvement for blast furnace operations, measured in terms of quantity and quality of output.

(Wang , Jiao, Weng, & Zhang, 2020) provide a tutorial for researchers to understand the basic principles of deep learning and its applications to manufacturing, using welding as an example, explaining the contributions of the tutorial to solve the problems of welding such as process monitoring and product quality prediction.

The research of (Noviyanta & Ngadiyono, 2019) aims to develop and examine the feasibility level of the video tutorials for the Manufacturing Drawing subject in state

vocational high school SMKN 2 Pengasih using the Inventor 2013 software. This research employs the research and development (R&D) model. The product assessment or validation was done by experts in the subject and the media, followed by initial and final testing by the research participants.

The purpose of the tutorial in (Sunday, Wu, Barton, & Kline, 2019) is to train the semiconductor industry on the NIST-developed critical dimension small-angle X-ray scattering (CDSAXS) method. It includes both data processing and instrumentation. It also provides an opportunity to discuss the requirements for CDSAXS and the necessary improvements in X-ray source technology.

We have done a compendium of some works on tutorials. In the work of (Paltrinieri, Massaiu, & Matteini, 2016), this is a step-by-step tutorial for the application of a human error quantification technique, applied to a semi-submersible drilling unit, to take into account interface problems man-machine, stress, lack of time and experience of rare events, which can lead the operator to a failure and increase the likelihood of an accident.

On the thin layer of the transistor manufacturing-liquid crystal screen, the work of (Fan-Tien, Kao, Chen, & Tsai, 2015), provided a tutorial on the application of VM (virtual metrology) for the Manufacture of the transistor in thin-layer liquid crystals. The objective of such research was to select the thin-layered liquid crystal screen transistor as examples of manufacturing processes and demonstrating the methodology of systematically scaled implementation of VM technology, in the monitoring the quality online on each piece under process and to ensure the stability of the process and improve the rate of return.

On the other hand, on the aspect of electronic product quality control and environmental regulations, the tutorial of (Kang , Kim, Kim , & Lee, 2015), presents information on how chemical metrology is applied to meet a variety of needs in the areas of electronic product quality control and environmental regulations closely related to the electronics industry in Korea, for the development of certified reference materials for gas fluorinated greenhouse gases and aptitude testing systems for heavy metals and chlorinated toxic gases to adequately address environmental problems in the electronics industry.

As for production lines, the work of (Miltenburg, 2001), is a tutorial that examines the research literature on one-piece streaming manufacturing, for the manufacture in a single step of manufacturing on production lines in U form.

3. Method
3.1 Developing a tutorial
The development of a tutorial is structured following several stages. The life cycle of educational software is usually in a three-phase sequence (Bessagnet & Canut, 1989).

Fig. 2. How to make Tutorial
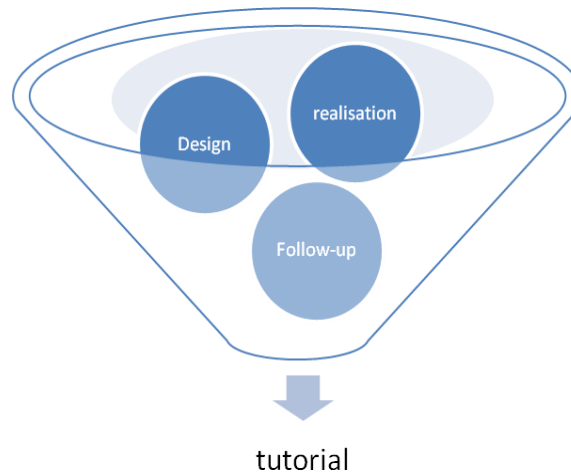
tutorial

We did interviews with employees to understand the process and have tutorials given by the supplier, because employees cannot explain well. Only a few employees understand the maintenance details because the process is new.

3.2 Why a personalized tutorial

The use of a personalized tutorial helps to have a positive effect on learning, i.e., to confront theory with practice through the didactic use of multimedia instruments to enroll a set of skills to learners, communicative, linguistic, especially the skill to learn.

Fig. 3. Tutorial lens
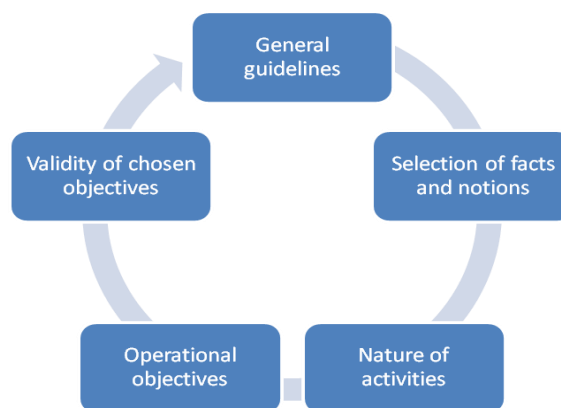
3.3 Requirements for the success of a tutorial

Developing tutorials requires the presence of a multidisciplinary team. Development tools are becoming more sophisticated for obtaining quality tutorials (both ergonomic and pedagogical ones). The tutorial adapts to the multidisciplinary public due to the nature of modern complex systems requiring reliability and security, developed in organizations beyond a nation's borders, and requiring compliance with various guidelines and standards.

4. Presentation of the factory
4.1   General presentation

In Batna, the Cotitex textile complex was established in June 1966 to promote cotton, wool, and local labor. Its contract for study and realization was signed in 1963. Located in the industrial zone, it covers an area of 204,520 m2 of which 81,184 m2 covered; it was received on July 22, 1966, by SONITEX.

The factory has 647 employees: 596 permanent employees, 51 contractors, and 14 apprentices (Ould Mohamed Sheikh, 2014).

4.2   Organization of the complex

The complex consists of eight (8) under directions as well as secretariat and security service, which are:

- Sub-direction spinning
- Sub-direction weaving
- Finishing sub direction
- Technical sub-direction
- Sub-direction maintenance
- Finance and Accounting Sub-directorate
- Human Resources Sub-directorate
- Sub-direction of supply and trade.

4.3   Spinning process

In spinning, we always try to transform a disordered mass of fibers into a long-length; low-section assemblage called wire or spun of fibers. All the operations leading to this result are called: spinning process.

The succession of operations on which the transformation of fibers into yarns is based is valid regardless of the raw material's nature. However, the characteristics of the used fibers and the wire type involved in producing have implications for the means used and executed. That is referred to as short-fiber spinning (cotton and blends), fiber-type spinning.

5   Design of the tutorial

The expression of needs gives rise to modeling by use cases, in this part, we will detail the upper branch regarding the modeling of use cases. By analyzing the needs expressed in the specifications, we deduced the actors and the cases of uses summarized in table 1. For the design, we will model the use cases using UML object-oriented modeling tool.

5.1 General presentation of the project

Our project aims to create a website for an online tutorial (to help employees in their tasks at Batna textile factory) addressed to readers bringing together multimedia content from different sources (videos, photos, articles, files, etc.) theme.
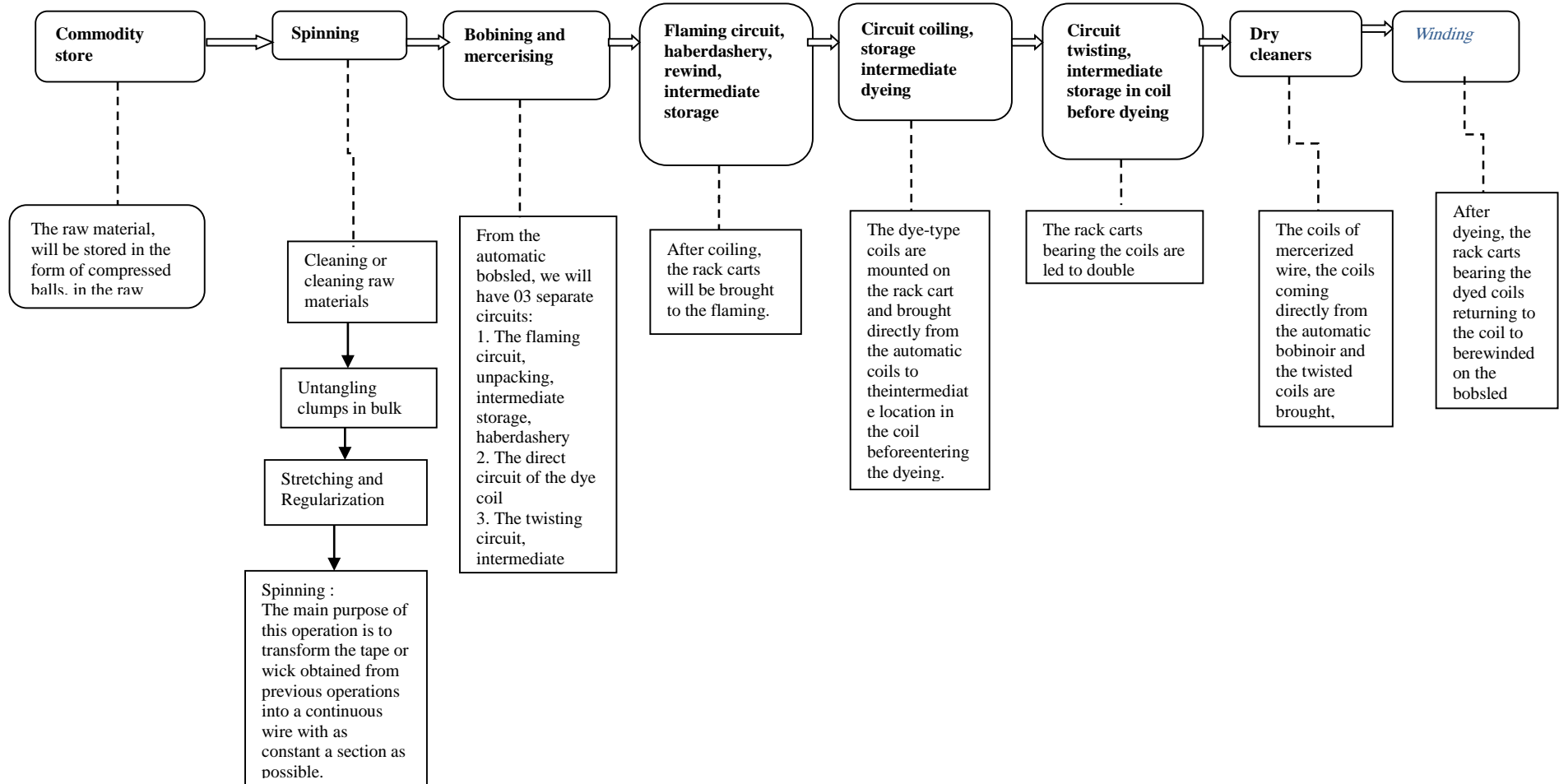
5.2 Some possibilities of the developed tutorial

Any Reader (user) has the opportunity to view the tutorial (show a tutorial list in a given topic, open a tutorial), contact the administrator, export tutorials in PDF and media format, share links on networks (Facebook, Twitter…etc.), post comment.

Any Internet user Editor (tutorial editor) may be a factory employee or a student intern; it can fill out the registration form and manage the tutorials (create, edit or delete its tutorials), as it can handle comments, authentication.

The administrator is responsible for maintaining the site, hosting the software, and updating programs (templates, applications, etc.). He can also manage editors (add editor, edit their information, reset their passwords, or delete them), manage sub-directions, manages departments, manages services, manages sections (for and also manage tutorials, users, and contacts, through authentication.

The tutorials should include videos, power points, documents, images, etc., for each sub-director, department, department, and section.

Fig. 5. Production process of spinning section A

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┌──────────────┐   ┌──────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────┐   ┌──────────┐
│ Commodity    │──▶│ Spinning │──▶│ Bobining and │──▶│ Flaming      │──▶│ Circuit      │──▶│ Circuit      │──▶│ Dry      │──▶│ Winding  │
│ store        │   │          │   │ mercerising  │   │ circuit,     │   │ coiling,     │   │ twisting,    │   │ cleaners │   │          │
└──────────────┘   └──────────┘   └──────────────┘   │ haberdashery,│   │ storage      │   │ intermediate │   └──────────┘   └──────────┘
                                                      │ rewind,      │   │ intermediate │   │ storage in   │
                                                      │ intermediate │   │ dyeing       │   │ coil before  │
                                                      │ storage      │   └──────────────┘   │ dyeing       │
                                                      └──────────────┘                      └──────────────┘
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The raw material, will be stored in the form of compressed balls, in the raw

Cleaning or cleaning raw materials

Untangling clumps in bulk

Stretching and Regularization

Spinning :
The main purpose of this operation is to transform the tape or wick obtained from previous operations into a continuous wire with as constant a section as possible.

From the automatic bobsled, we will have 03 separate circuits:
1. The flaming circuit, unpacking, intermediate storage, haberdashery
2. The direct circuit of the dye coil
3. The twisting circuit, intermediate

After coiling, the rack carts will be brought to the flaming.

The dye-type coils are mounted on the rack cart and brought directly from the automatic coils to theintermediate location in the coil beforeentering the dyeing.

The rack carts bearing the coils are led to double

The coils of mercerized wire, the coils coming directly from the automatic bobinoir and the twisted coils are brought,

After dyeing, the rack carts bearing the dyed coils returning to the coil to berewinded on the bobsled

5.3 Specification requirements based on use cases

The expression of needs gives rise to modeling by use cases; in this part we will detail the upper branch regarding the modeling of use cases. By analyzing the needs expressed in the specifications, we deduced the actors and the cases of uses summarized in table 1.

Table 1. List of actors and their use cases

Actor	Use cases
Reader	Check out the online tutorial
	Export tutorial
	Share a link
	Post a comment
Editor	Manage tutorials
	Fill out the registration form
	Manage comments
	Authenticate (secondary case)
	Perform the same operations as the
Administrator	Manage editors
	Manage sub-direction
	Manage department
	Manage service
	Manage section
	Manage contact
	Authenticate (secondary case)
	Maintaining the site
	Perform the same operations as
	editors

5.4 Use case diagrams

The use case diagram will be divided into three parts according to the actors (reader part; editor and administrator). In this part, we will use the case diagram of users part "reader" to view tutorials, open them, post comments, and share links on social networks.
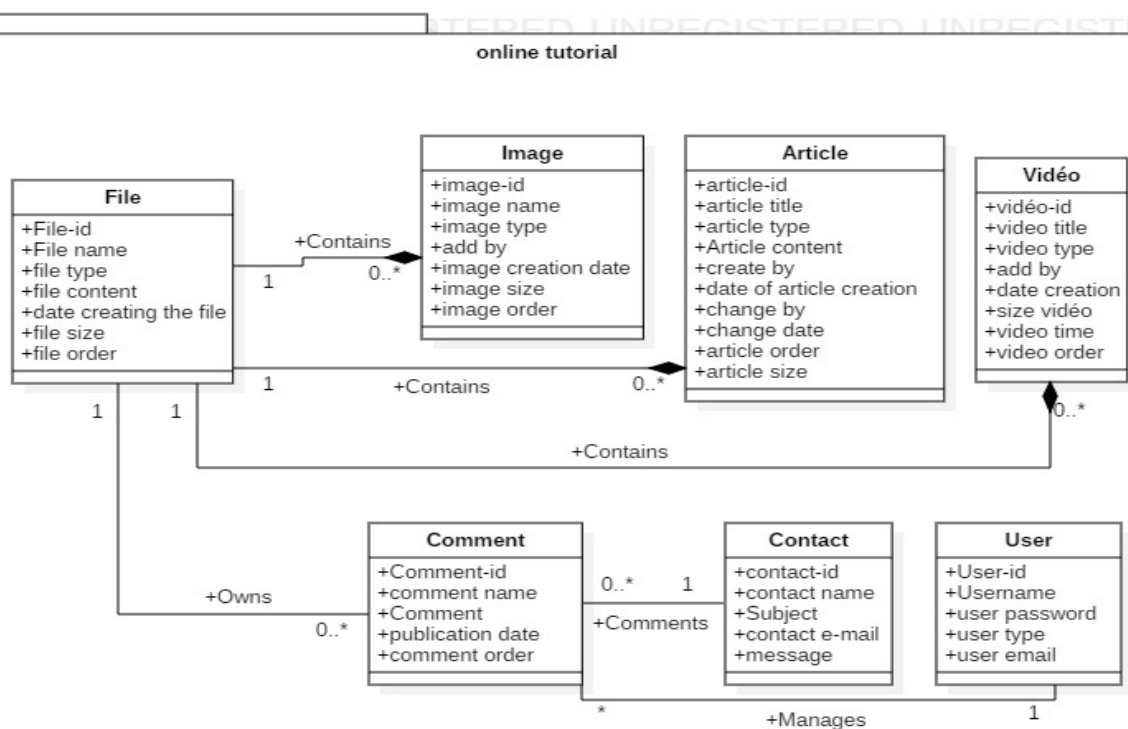
Fig.6. "Reader" Use Case Diagram
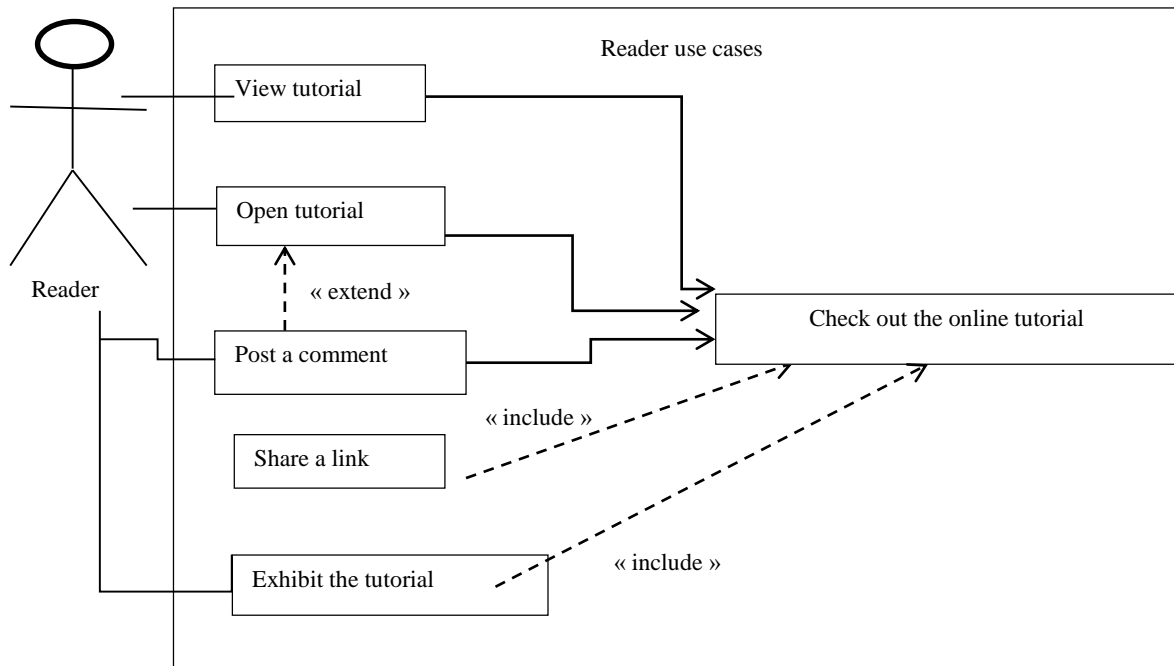
5.5 Class Diagram

For making a class diagram articles and media embed a file, and images and videos are in the media. The class diagram's realization consists of representing all possible classes for the tutorial development, namely (directions; services; departments; contacts; comments; users).
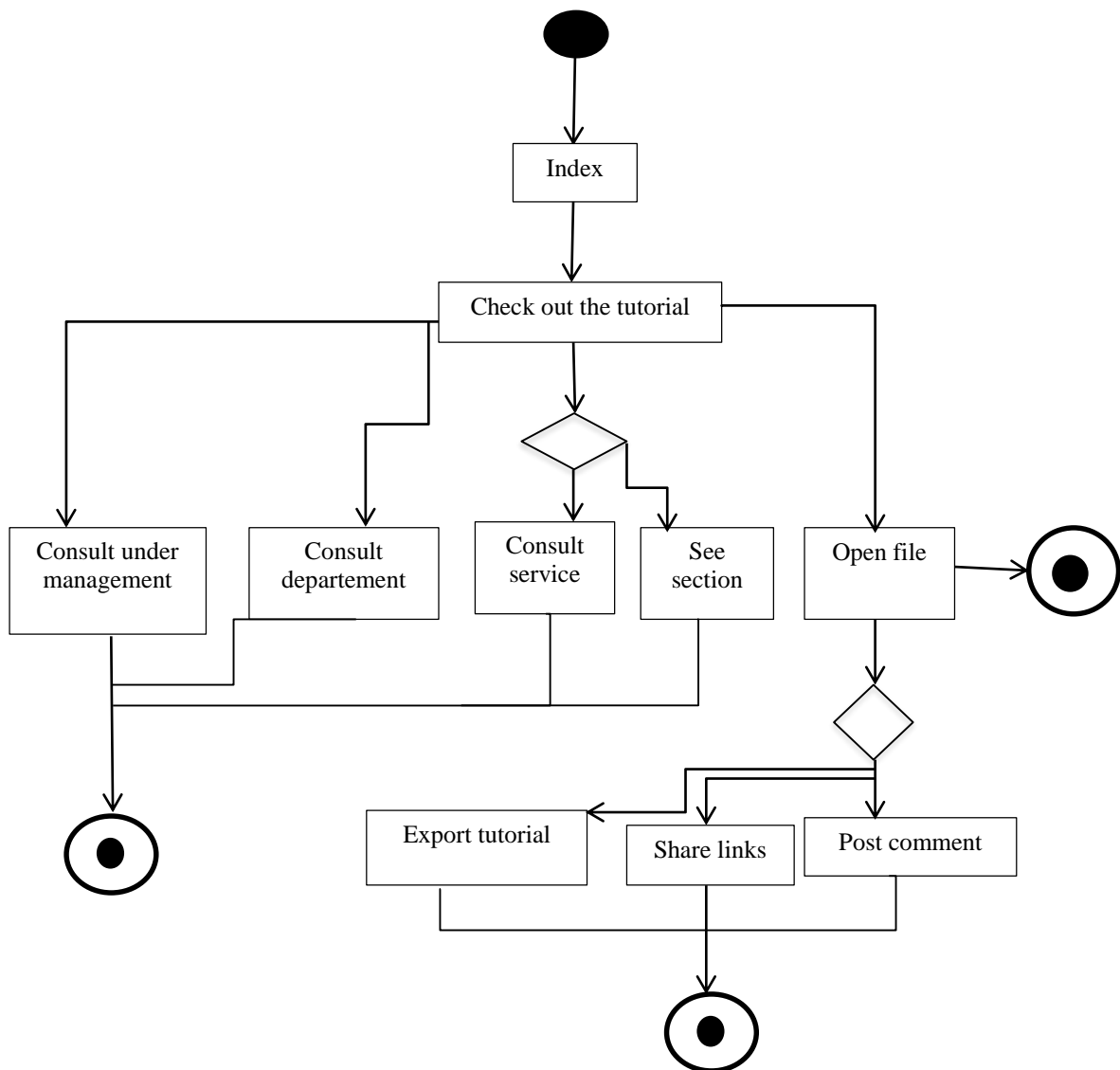
Fig. 7. Class Diagram

5.6 Activity Diagrams

For the realization of the activity diagram, one will represent only the reader part. This part shows the website's activity process (the black dot corresponds to the beginning and the black dot in the circle corresponds to the end).

Fig. 8. "Reader Part" Activity Diagram

Nb: The completion of the diagrams requires a complete study of the production system.

5.7 Sequence diagram (export tutorial/share link)

This case allows any visitor to export tutorials as PDF, PowerPoint, text, or media; and share the link of a tutorial in social networks (Facebook, Twiter,…etc.).
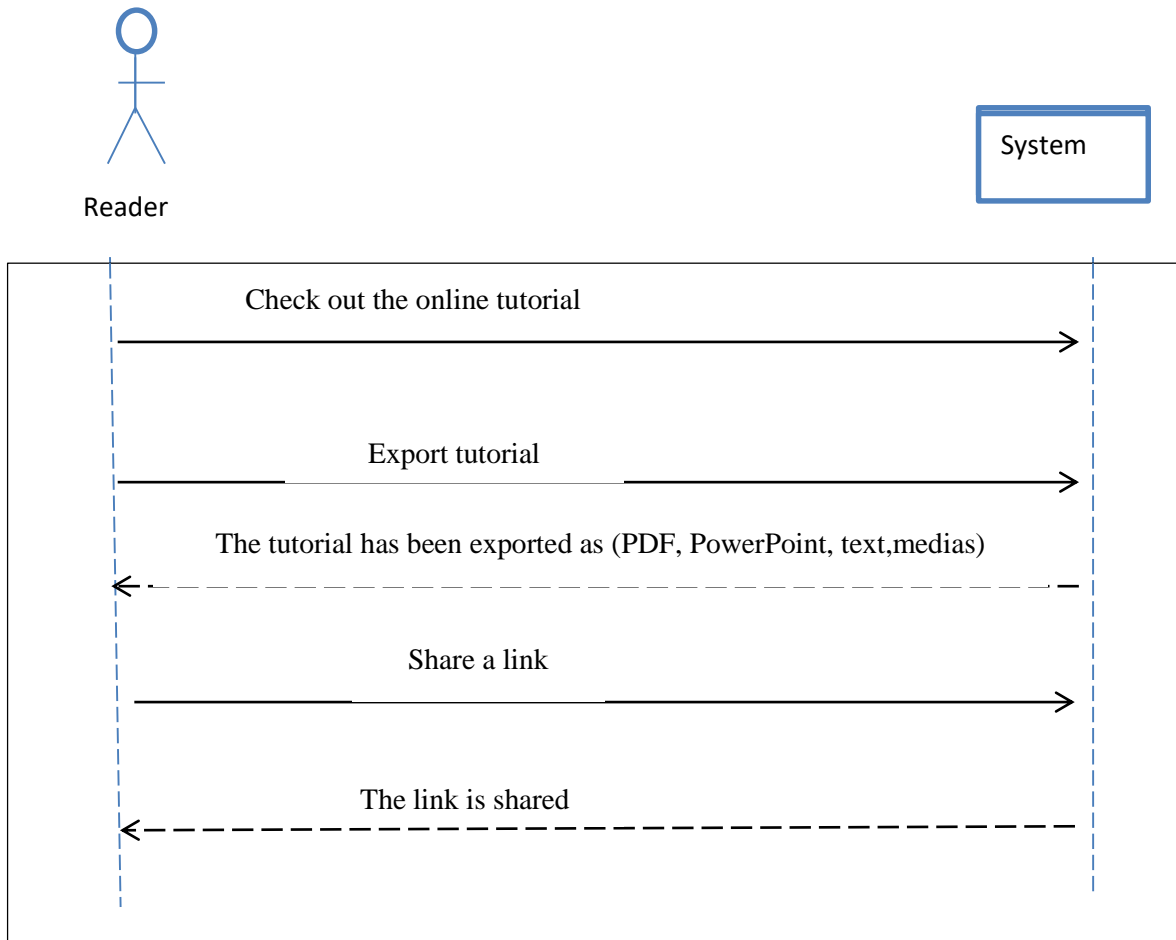
Figure 9. Sequence diagram (export tutorial/share link)

6 Implementation of the tutorial

A tutorial needs an interface such as a dynamic website, and the development of a such a dynamic website requires scripts to guarantee this dynamism in linking with the database. To make the site, we used Joomla, which is a free open source and free content management system (CMS).

6.1 Description of site interfaces

The application is a website (in French and some contained video are in Arabic) for the understanding of staff; in which there are tutorials to improve the learning of the factory staff as well as any reader; the execution after access to the main page, to the home page that is reserved for visitors, it contains interfaces easy to Handle.

6.1.1 Homepage
❖ It contains the graphic charter and a search engine.
❖ The menu bar contains menus and sub-menus (sub-directions, department, and service)
❖ The body of the site contains tutorials (articles, power points and media, etc.).

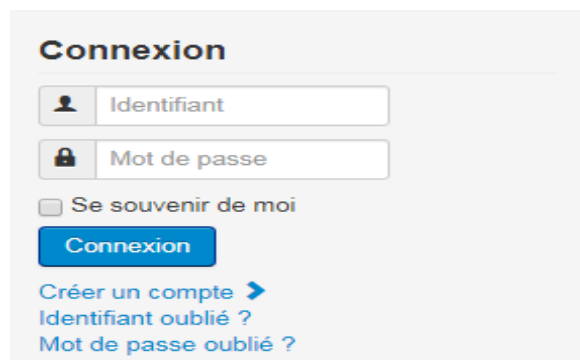**Fig. 9.** Homepage of the tutorial

6.1.2 Authentication

This page is used for authentication to access the site's settings and create articles reserved for administrators and editors the user (Administrator/Editor) should authenticate to perform operations.
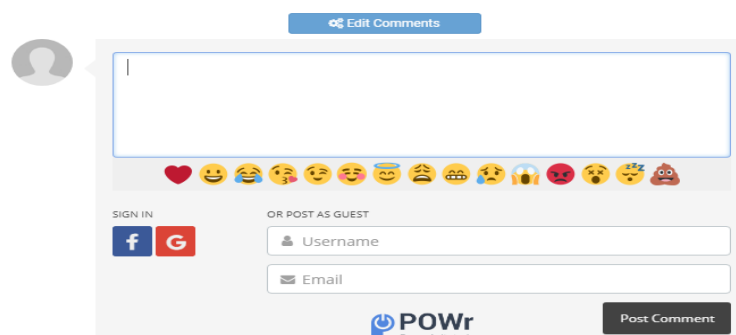
Fig. 10. Authentication page

6.1.3 Post comment

The comment poster option can be found on each article and media at the bottom of the page to post its comment.

Fig. 11. Comment post option

There are tutorials (video) explaining producing cotton fiber mixed with polyester (from the raw material until obtaining the yarn).

Moreover, video tutorials showing:

- The opening of the bulletproofs and the threshing to clean the fibers.
- Carding process for fiber parallelization.
- I am Stretching to obtain a more regular fiber ribbon.
- The bench-to-pin process in the production processes to further stretch the tape and twisted it to make a match.
- The comber's settings.

6.2 Tutorial contribution

The goal to be achieved in this project is the creation of a website for an online tutorial (to help employees in their tasks at the Batna textile factory) addressed to readers bringing together multi-media content from different sources (videos , photos, articles, files,…etc.) on a specific theme ;

interactive multimedia products are motivating products, thanks to the variety of media (sound, image, text), their combination and coexistence on the same digital medium. These reinforce the messages and promote memorization.

7 Conclusion

In light of this work, the tutorial offered to the Batna textile factory yielded relevant results. In the above case, and by way of example, the equipment maintenance process, the spinning production process, and quality controls will serve as the basis for the tutorial construction.

Developing tutorials requires a multidisciplinary team and a strong commitment from its top executives to carry out an ambitious learning policy.

Modern organizational and learning concepts cannot be implemented within companies without great difficulty in adapting and measuring their impacts. Considering these industrial realities, the study presented in this work, proposes an application that can help employees improve their performance within Batna's textile company, based on information transfer methodology. That can give us a general view of the different structures of the factory.

We had the idea of using the only trace of the interventions; we could arrive throughout 2019 to have a general vision of the plant and the learning process.

In light of this work, the proposed tutorial has yielded encouraging results. In the case mentioned above, and as an example, the equipment maintenance process, the spinning production process, and quality controls will serve as the basis for the tutorial's construction.

Modern organizational and learning concepts cannot be implanted within companies without great difficulty in adapting and measuring their impacts. This policy must be based on a very structured organization, known and recognized by all. Everyone's goals are clear, measured monthly.

Acknowledgement

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