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Ingredients for digital transformation projects trainings

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Abstract

Organizations struggle to generate more value through embracing digital transformation but are often confronted with lack of skills in this growing area. For instance, managing (digital) transformation projects requires appropriate skills to holistically plan and implement transformations. This paper outlines a set of skills that can be acquired through training programs of digital transformation projects managers. These skills are built by a working group in academia based on defined persona and then evaluated by practitioners through interviews. The outcome of the interviews indicates a general acceptance of these skills and uncovered some improvement avenues. The results of this work are expected to pave the ground for structuring training programs and building teaching content meeting actual learners and business needs.

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1. Introduction and background

Volatile markets, evolving customer requirements and fast-growing technologies are among the main features of today's business environment. Under these circumstances, enterprises are confronted with deep transformations in order to keep up with the business environment changes [1 – 4]. Digital transformation can be defined as *a change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate*

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more value (...) [5]. Clearly, this topic spans across several disciplines and domains as highlighted by previous research works [4 – 6]. In this sense, it is important to revisit training programmes in order to align them with digital transformation challenges [7]. In literature, training has been emphasized upon within the context of digital transformation [8] [9] without providing specific guidelines, in particular in the field of engineering education. A literature stream started to examine both education and digitalisation but focusing on transforming education through digitalisation [10], this stream was fostered by the pandemic experienced in 2020 [11].

Several initiatives emerged at national and international levels in order to catch up with transformation requirements and (even) anticipate skills requirements within the next few years [12]. In France, Alliance for the Industry of the Future and Solutions for the Industry of the Future are among the myriad of initiatives in this area aiming to cover various aspects of the digital transformation and business transformation at large [13]. Complementarily, the German-French Academy for the Industry of the Future aims to support joint effort to support the digital transformation in the business sector while covering both research and education aspects [14]. Undoubtedly, these initiatives help and rely on higher education institutions to build knowledge and expertise for mastering digital transformation challenges.

This paper outlines a set of skills required for managing digital transformation projects based on the expertise acquired throughout last few years within a French Engineering School resulting from managing training programmes in the area of Industry 4.0 and from collaboration within the above-mentioned initiatives. This is expected to pave the ground for structuring training programmes and building teaching content meeting actual learners and business needs [15]. The remainder of the paper is organised as follows, Section 2 presents the methodology and used tools, Section 3 reports on and analyses the results, a discussion is presented in Section 4, the paper ends with a brief conclusion in Section 5.

2. Methodology and tools

The research reported on was conducted within the framework of a project at a research and teaching centre of Mines Saint-Etienne, one of the graduate schools of Institut Mines Télécom (IMT), a top group of graduate schools of engineering and management in France. After running a programme related to Industry 4.0 throughout last few years, the programme committee launched a project to refine the positioning of their offering and adapt to evolving needs at local and national levels from small and big companies. A Working Group (WG) was defined and project manager was assigned in order to conduct the reform project. The WG involves teaching delegate, head of the research centre and executive education responsible, an expert in the field of digitalisation (second author), head of the programme is also the reform project manager (first author).

The objective of the project covered by this paper is to outline the main skills required to be covered in teaching programmes in relation to digitalisation and Industry 4.0. To this end, persona were used to help identifying and refining the required skills. The concept of persona stems from the need for user-centred design and overcoming the problem of designing artefacts meeting only own or similar designers' needs [16]. It is important to have some knowledge of the identified persona in order to ensure alignment of the designed solutions and scenarios with their needs. In the case of the current work, the past years of experience in managing a training programme and the collaborations with companies helped the WG gain insights into the main profiles and needs of the trained persons. The persona can be summarized as follows:

- A fresh engineer who would like to be trained for the role of digital transformation project manager in a functional organization. This means that the learner has background in the field of engineering and will be involved in temporary missions related to digital transformation in addition to his usual tasks as an engineer in domains such as production, quality, mechanical, process, IT, etc.
- A fresh project manager who would like to improve his background in the field of digital transformation and be trained for a role in a project oriented organisation. The learner in this case has background in project management and will be involved in various digital transformation projects mainly within big corporations or consulting companies with a project-oriented organisation.

The persona was defined and then refined progressively during workshops involving the WG participants. In total four workshops were conducted, each of them lasted 2.5 hours in average. The aim of these workshops was to identify and classify the skills in light of the identified and refined persona.

The subsequent step consisted of conducting semi-structured interviews with practitioners who meet one of the following criteria i) interviewee belongs to a partner institution who expressed a need of skill reinforcement related to digital transformation projects, ii) interviewees belong to an organisation who hired fresh engineers trained to the subject matter under study, iii) interviewees are experts who gave courses, conferences or training in the subject matter under study, or iv) interviewee is one of the alumni of the programme.

The designed skills were shared with the interviewees who were asked to provide a feedback. To this end, a questionnaire was designed to guide the interviews. It consists of the following sections:

- Background: name, occupied position, company name, company size, sector, information about current digitalisation projects.
- Feedback on the skills: does the general orientation (persona) meet company or partners' current or future needs? Do the skills meet company needs? If not what aspects shall be reinforced or reduced? Would the company be interested in hiring persons trained to these skills? In case of interest, would it be within 6 months or between 6 months and 1 year or more than one year? Any other feedback?

The questionnaire was designed and tested by participants to the WG, before being shared with the respondents. In total 11 interviews were conducted during February – March 2023 and each of them lasted around 30 to 40 minutes.

3. Results analysis

3.1. Identified skills set

During the workshops, four main categories were identified for the skills, which will be referred to as *understanding*, *designing*, *implementing* and *sustaining*, which are consistent with the general project life cycle [2] and are also in line with the general business agility philosophy [5]. Future learners, described by the persona, are expected to acquire these skills in order to successfully manage transformation projects in functional and project oriented organisations. The identified skills are listed in the following.

- *Understanding* – build a comprehensive understanding of the context with respect to the technological and organisational transitions and their implications to agility, resilience, and sustainability in the socio-technical ecosystem in which the company evolves. This involves the following skills :
 - Identify and analyse the key challenges related to technological and organizational transitions according to a holistic approach integrating economic, environmental and social impacts.
 - Identify and analyse the constraints and opportunities arising from the company's ecosystem in its strategic orientation to ensure proactive adaptation to changes.
 - Co-develop a business case with the stakeholders of the industrial transformation project in line with a pre-established diagnosis.
- *Designing* – Design innovative systems to implement transformation projects using methods and tools towards agility, resilience and sustainability. This involves the following skills :
 - Co-construct technological and organizational solutions to improve business agility and global organisation's performance.
 - Plan transformation project activities and identify key performance indicators covering cost, time, risk and quality aspects.
 - Ensure active monitoring of new methods and emerging technologies and their areas of application in order to increase agility and global performance.
- *Implementing* – Organize and manage the implementation and deployment process and ensure the follow-up of newly designed systems towards agility, resilience and sustainability. This involves the following skills :
 - Manage multidisciplinary teams from several professions.
 - Monitor performance indicators to successfully conduct transformation project activities and manage changes.

- Analyse the performance of complex systems.
 - Implement experimental studies as part of performance improvement and interpret results.
 - Manage the alignment between business processes, organizational structure, information systems and IT applications of the organisation.
 - Take decisions under uncertainty to achieve the objectives of the transformation project.
- *Sustaining* – Build and sustain an approach combining agility, resilience and sustainability within the organisation. This involves the following skills :
 - Capitalize through feedback on the practices deployed during transformation projects.
 - Drive a shared corporate culture of agility and resilience.
 - Maintain a proactive approach to continuous improvement of overall performance.

3.2. Experts feedback analysis

Looking at the respondents profiles, it can be highlighted that 72.7 % of them belong to big enterprises and the remaining 27.3% belong to Small and Medium-sized Enterprises (in general up to 250 employees), which is quite representative of average demand for trained engineering following the programme by the engineering school partners. The respondents were selected also considering their companies sectors (Figure 1). In general, around 30% of the companies are in consultancy area, e.g. consultancies for manufacturing industries or service. The other covered sectors include information systems and information technologies, metallurgy (important activity in the region), and manufacturing services (a growing area at regional and national levels).

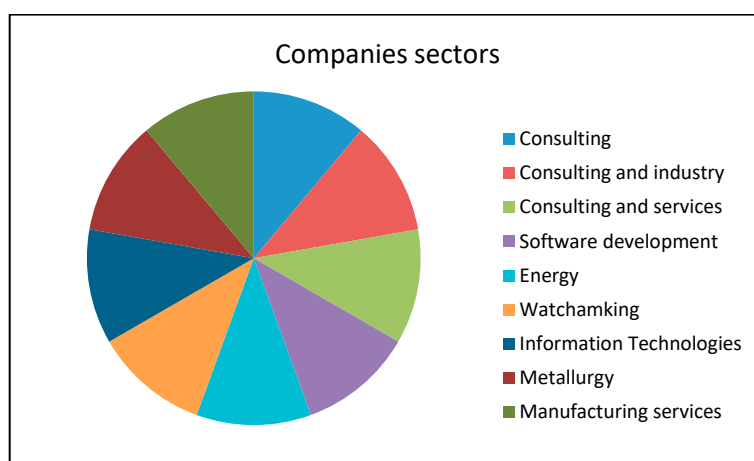


Fig. 1. Sectors of respondents' companies

The respondents indicated that there are ongoing projects and even programmes related to digitalisation and transformation of companies' processes and operations (Figure 2). Overall, 80% of these endeavours span across company and/or corporate level. Interestingly, only 20% of the respondents explicitly mentioned projects involving department and team level. This could reflect possible gap between strategic visions of the transformation and employees' perception of this transformation.

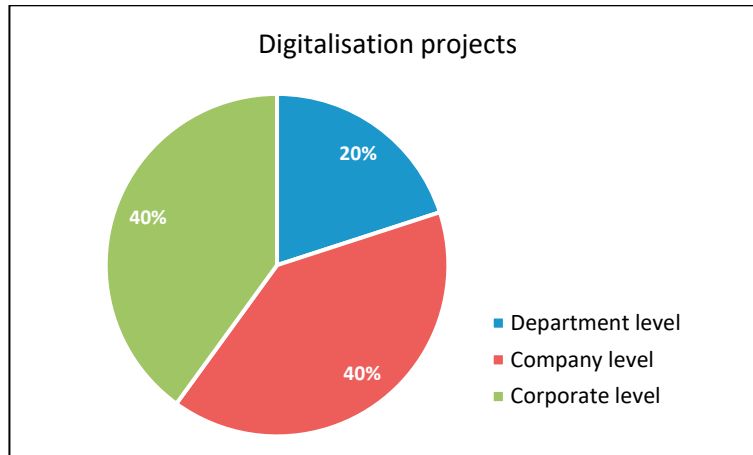


Fig.2. Ongoing digitalisation projects

There is a general agreement on the relevance of the general orientation of the skills set to companies' needs. Some of them highlighted a *real need* in terms of transformation projects management skills on the side of their customers as well. They appreciated the comprehensiveness of the skills covering transformation, digitalisation and sustainability. Some of the respondents emphasized the need for reinforcing *innovation and business intelligence* as key features of *tomorrows engineering profession*.

Respondents highlighted also that some technical skills need to be reinforced such as design, software development. Interestingly, for at least three of the respondents from different companies, cybersecurity is an inevitable topic that should be addressed. Furthermore, more than one respondent indicated the importance of (further) addressing change management as it is very important in transformation projects.

Regarding what might be reduced, the respondents generally concur on the comprehensiveness and relevance of the skill set. However, some argued that the first category (*understanding*) should be limited to understanding business context including risks and opportunities, and not necessarily being involved in defining strategy roadmap. They consider second and third and to some extent fourth categories as more relevant to the defined persona.

In order to derive further insights based on open-ended questions covering feedback on the skills set, a word cloud was generated using the *R* software package [17] (Figure 3). Unsurprisingly, it can be seen that the most discussed topics include transformation, projects and management. This shows also that the positioning is quite relevant to the companies. Other keywords were also mentioned such as *intelligence, agility, change, sense* that witness the importance of addressing priority topics such as business agility when defining elaborating the skills. The word cloud does not bring further value since the questions were open-ended and the respondents may use completely different vocabularies.



Fig. 3. Word cloud of the respondents' qualitative feedback

The respondents indicated that digitalisation is not an objective per se but a means to meet other objectives related to agility, resilience among others. They also highlighted to carefully address agility and customize the use of its related methods to the company context. It was also underlined that environmental aspects are important to consider but the programme *should not necessarily be emphasising these skills*. This is in line with the WG idea that for the considered persona, the aim is to increase awareness of sustainability issues and integrate them while working with specialists in this field. In the same line, the respondents also explained that the role of the potentially trained project managers will be focused on *defining the specifications* for technological solutions and aligning them with the business needs but less on *developing them*.

4. Discussion

This paper provides valuable insights to engineering education and vocational training institutions into how to adapt training programmes of project management to digital transformation context. Generally, the interviews outcome is very encouraging and helps moving forward for designing training programmes adapted to the identified persona. The feedback from the respondents will be used to refine the skills and during the design of programmes syllabus. The paper is consistent with the idea that programme structure, teaching content and learning modes depend on the identified needs and resulting learning outcomes [18][19]. In this sense, the skills set will help aligning teaching content with business needs in terms of digital transformation. Moreover, existing guidelines in the literature can be used to design programmes with a view of accreditation by recognised institutions [15][19]. The design of the teaching content should also consider learners' backgrounds and learning styles in order to increase retention rate and prepare well-trained engineers and project managers of the digital transformation. Research works of Kolb and Kolb [20] as well as experiential learning principles are one excellent means to meet these requirements. These have been tested in various contexts and their effectiveness is recognised [21][22].

The paper provides also insights to practitioners in the field of project management and organisational transformation into how to support early career development. This is in line with the endeavours of professional bodies such as the Project Management Institute [23]. In fact, trainings in-situ delivered by companies to their employees can be structured according to the general requirements derived from the current study.

It is worthy note that the current paper provides only an initial overview of the skills set required for managing transformation projects with a specific scope, i.e. project managers in a French context. Therefore, beyond the refinement of the skills set itself, other areas involved by the transformation need be explored. These include other professions within organizations such as top management, speciality engineers, technicians and operators who are all influenced by and influence the transformation efforts. Furthermore, the covered sectors and targeted companies reflect only part of the industrial realms in a French context, further investigation could involve specific sectors. One promising avenue to address these challenges is to extend the study through a massive survey after defining a priority objective. This will also help overcome the limitation of the limited sample size considered for this initial study.

5. Conclusions

The digital transformation is embracing business sector and daily lives, which requires careful consideration of its implications to training programs. It is important to prepare well-trained managers of digital transformation projects and make sure the transformation process aligns with changes occurring in business and societies. This paper report on the design of a set of skills and provides a feedback on their relevance to practitioners, as a basis for building training programs meeting the previously mentioned requirements.

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