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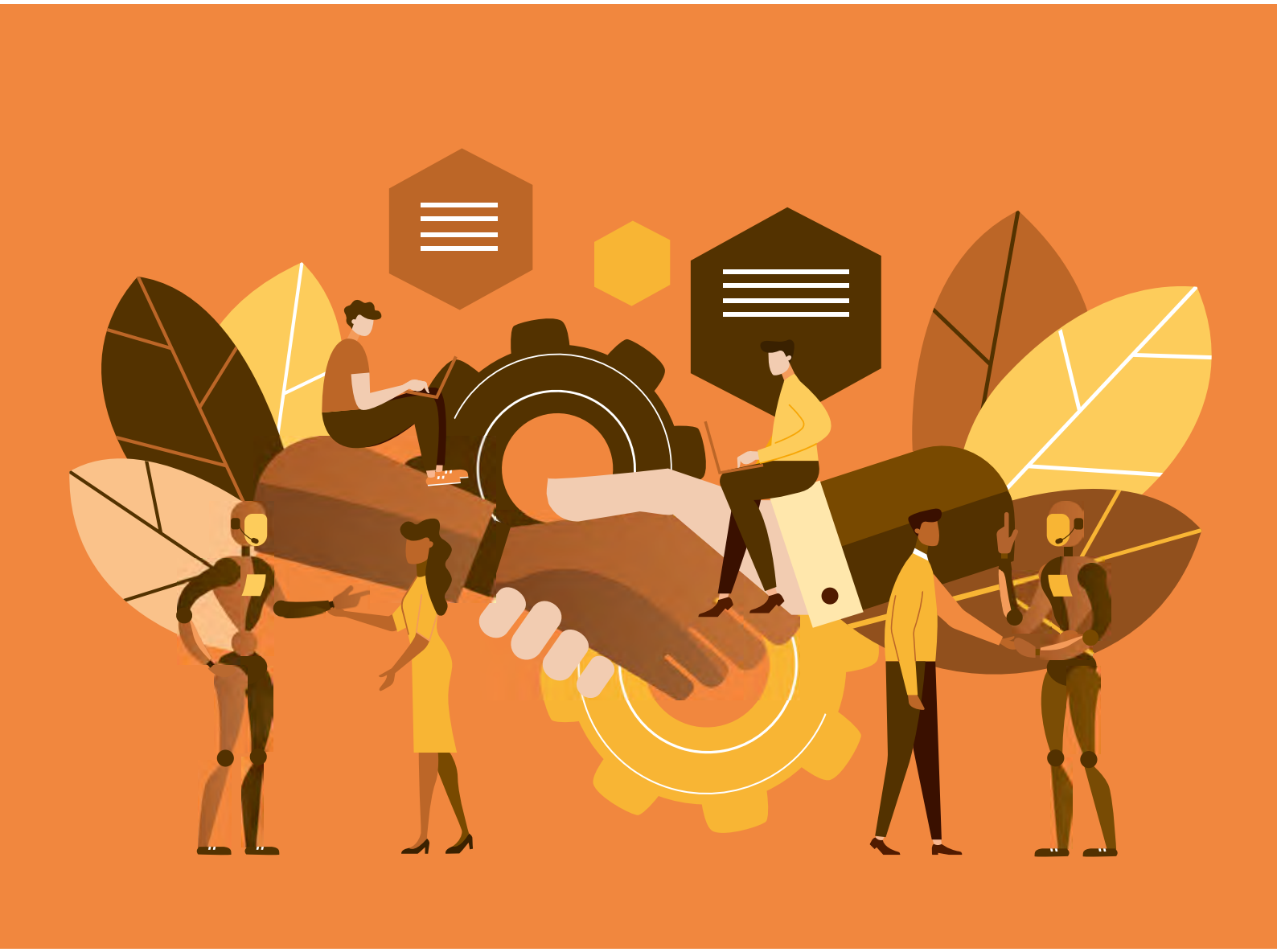
Can artificial intelligence learn to be a project professional?

Potential implications for the professional status of project management



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Executive summary

Association for Project Management (APM) became a Chartered body in 2017. Achieving 'chartered' status is highly desirable in any profession, indicating the status that project management as a profession has obtained in society. The status of a 'chartered' profession in the UK context is one of the most desired outcomes for occupations, granting workers authority and independence in the workplace and status in society. However, project management has a professionalisation that is unlike that of the doctor or lawyer. The highly 'situated' nature of project management, the history of 'solo-practice' in UK management practice and the dominance of concepts constructed by 'folk concepts'[1] around what profession actually means, creates distinctive threats and opportunities when it comes to considering the impact of artificial intelligence (AI) on the professional status of project management. AI is intelligence demonstrated by machines. There are folk concepts around this too. AI in its various forms is bringing change to every kind of work. This research considers the implications of folk concepts of AI in the project management profession from the perspective of the sociology of professions, which creates both a critical evaluation of the interaction of AI with the professionalisation of project management and a novel perspective for developing AI applications.

"It was revealed that project managers currently regard AI as having an assistive role in project management due to its ability to deal with big data and to simulate project performance, but ultimately a passive role"

From our combination of literature review and interviews with project professionals, the profession of project management is described here as the mastery of 'hard' tasks, 'soft' skills, professional principles and ethics, providing a sense of community and a career booster. From analysis of the opinions of project practitioners with experience of adopting new technologies, early adoption of AI appears to be augmenting the predictive analysis and data sorting functions of human project managers. However, these two roles lie in the hard tasks category. What separates project professionals from people who simply manage projects and the machines that might, are the principles and values which translate into project/business outcomes in their daily work. These are the most 'defensible' competences that cannot be easily replicated or substituted by AI.

Through our research, it was revealed that project professionals currently regard AI as having an assistive role in project management due to its ability to deal with big data and to simulate project performance, but ultimately a passive role, rather than having ownership of any decision-making process or directly organising project team members. It will be unable to fully replicate the competencies of a professional, especially when it comes to ethics and responsibilities to the community of clients and peers. Human project managers observe professional conduct in their workplace and learn it from experience, a process which cannot be fully digitalised. As professionalism is a learned behaviour, anything that impacts the ways in which project managers learn to be professional will affect professionalisation and the status of human project managers. It is in project management's interests to determine what this impact will be, else other industry forces will.

[1] Popular understandings shared among a social group, as opposed to formal definitions

Why is this research important?

PwC reported that "Gartner forecasts that 80% of project management roles will be eliminated by 2030 as AI takes on traditional project management functions such as data collection, tracking and reporting."[2] What are the implications of this for human project professionals? On the one hand, it appears to be a loss of roles. On the other hand, association with AI could signal smartness and a future-facing attitude for an occupation and its practitioners. It may even increase demand for certain aspects of this class of expert labour. However, social scientists in the area of employment and the professions are cautious about a rush towards implementation of AI before we fully understand the interaction between occupations of expert labour and AI.

"Social scientists in the area of employment and the professions are cautious about a rush towards implementation of AI"

The history of technology in social systems such as work always tells of unintended outcomes for the social system. Although the 'future of work' is constantly debated in AI circles, in the discussion of AI and project management, the sociological aspect appears to be neglected in favour of technical questions of data – how to obtain it and how to apply it to work. We have no information from the future. We do not know for a fact how AI will transform our profession and its impacts on our professional status. It is important to enumerate and evaluate the possibilities. This increases the possibility that the actual future will be amongst them.

What are the aims and research questions?

Professionalisation is a process of becoming a profession and gaining enhanced status in society for practitioners who choose to be represented by the profession. 'Profession' is a most desired status of human occupations, conferring a degree of autonomy in defining job contents in the workplace. Such status and the dependence of clients can be created by 'blackboxing' the competence or knowledge of the profession, which means that outsiders cannot easily create, replicate or substitute the knowledge that is necessary to obtain the value proposed by the profession. However, to develop AI algorithms to replicate the actions of a professional, the knowledge of the profession needs to be 'un-blackboxed', so that the knowledge and skills can be learned by AI. If this un-blackboxing can occur, what does this do to the foundation of project management's claims to profession? This research aims to identify AI-aware project managers' beliefs, opinions and expectations regarding AI in the project management profession. Then, it aims to evaluate these, using the sociology of professions and AI expert opinion, as to how realistic those expectations are and the possible implications for the professional status of project management.

The main research question is: To what extent can we 'un-blackbox' project management as a profession – **Can AI learn to be a professional project manager?** To answer this question, three research objectives and associated questions can be posed:

1. **What does 'professional' mean to project managers?**
2. **What is the information in project management that cannot be digitalised as the input for AI to deliver project management professional practice?**
3. **What are the distinctive, defensible project management actions or competences fundamental to status as a profession that are beyond the output of an AI?**

[2] https://www.pwc.com/m1/en/publications/documents/virtual-partnership-artificial-intelligence-disrupt-project-management-change-role-project-managers-final.pdf

The intended audience and benefits

This research is the first time that a lens of the sociology of professions has been used to theorise the impact of AI on project management.

For organisations, the idea of an AI project manager that can learn from the past and find patterns and solutions to classic project problems is highly desirable. With AI, practitioners can better store, analyse and apply project data to enhance or predict project performance. For professional associations and project professionals themselves, association with AI could signal smartness and a future-facing attitude for an occupation and its practitioners. It could also indicate future training and professional development needs and whether there needs to be a change in priorities when developing project professionals. Also, assessing what separates the 'professional' project manager from a person who merely manages projects is of interest; in particular the question of whether there is a defensible competency that differentiates the most competent of the occupation from others, human or potentially digital.

"This research is the first time that a lens of the sociology of professions has been used to theorise the impact of AI on project management"

For AI technologists and service providers that want to extend applications towards the project management discipline, we argue that the learned behaviours of professional project management are what should set the development pathway and goal. This is an alternative approach to thinking about the impact of AI on project management which appears to involve obtaining lots of project data and then looking for applications for it. Also, the report provides a picture of how a sample of AI-aware project professionals perceive the development of such technology, which could be revealing to technologists and academic researchers in the area of AI, project management and sociology of professions.

Considering project management as a type of expert labour can lead to insight for governmental policy makers in regard to future employment patterns, labour relations, the provision of skills for future demands, health and safety, and equality and diversity. It is impossible to develop policy for national and international governance of AI technologies without a full appreciation of their effects on employment and society. This is in addition to governmental interests in the supply of project professionals for the successful performance of projects for the economy and delivery of governmental services through projects. The HM Government's National AI Strategy, '10 year plan to make the Britain a global AI superpower', puts a tight time frame on these issues.

Current research

"Technological change, big data and deep learning have caused AI research to prosper again, and project management researchers have begun to re-evaluate its application in project management"

Being considered a 'profession' is one of the most desired outcomes for an occupation. It shows it has authority and independence in the workplace as well as 'market shelter' (Evetts, 2003) and enhanced status in the eyes of the public (Greenwood, 1957). Long-term education, community, ethics and professional associations are the common defining characteristics summarised from studies of traditional professions, such as medicine and law (Greenwood, 1957; Burns, 2007). However, project management's practice is located in a workplace-oriented rather than public-oriented context (Morris, Pinto and Söderlund, 2011). It is a challenge to be specific about the defining characteristics of a profession that crosses workplaces and takes different forms in different contexts.

Analyses of AI in project management and other organisational expert labour such as accounting (e.g. Shim *et al*., 1988) appears to emerge in the mid-1980s. In the initial 'AI in project management' article from Levitt and Kunz (1985), AI was regarded as an 'expert system' with the function of managing a project schedule. Later, Levitt and Kunz (1987) discussed the utility of AI techniques in supporting project managers in planning project tasks by analysing decisions and applying network-based scheduling. Following disappointment with the speed of AI development, the research into AI and project management paused in the 1990s.

More recently, technological change, big data and deep learning have caused AI research to prosper again, and project management researchers have begun to re-evaluate its application in project management. Ko and Cheng (2007) suggested that by applying deep learning techniques, AI can help project managers to predict project success, hence acting in an effective decision support role. From this, researchers such as Nagendra and Rafi (2018), Cheng, Tsai and Liu (2009), Masoud *et al*., (2017) and Pospieszny, Czarnacka-Chrobot and Kobylinski (2018) have focused on the development of models and algorithms to estimate resources, predict project performance, monitor cost and time, validate safety and forecast demand, and enhance the efficiency and repeatability of decisions during construction project management. The focus is still very much on the 'hard' tasks of project management.

From the overview of the existing research in the area, there is a focus on algorithm development and model construction for AI in different project management activities. Little is available to understand its current roles and status in the profession or what the consequences of AI for the profession might be. To develop technology in human social activities such as work, we also need to understand how the technological system is "defined, talked about, modified, redefined, developed and implemented" in a certain context (Preston, Cooper and Coombs, 1992, pp.561). This research will contribute to this gap, in seeking to explore and evaluate the way that project practitioner folk conceptions of profession and AI construe the threats and opportunities presented by AI.

Research methods

Ideas of profession and professional are popular research themes in sociology, but they are also everyday terms, with common understandings that, over time, can become quite different to the use of the term by experts. This process develops 'folk concepts' (Spillman and Brophy, 2018). Such concepts also exist for AI. As these understandings become more meaningful to the people who use them, they therefore become real structuring forces to the uptake of technologies or policies, quite beyond the control of the promoters of these things. So, to research the interaction of a group of people with a new technology, theory at the level of 'folk' needs to be generated from the end users, to understand their expectations (Alizadeh, Stevens and Esau, 2021).

"To explore the initial definition of 'professional project manager' we conducted semi-structured interviews with 35 UK project managers"

To explore the initial definition of 'professional project manager' we conducted semi-structured interviews with 35 UK-based project managers, who were members of or certified by professional associations and ranged from junior project managers to senior project managers. Thematic analysis was applied to identify the differentiating roles and functions of professional project managers, rather than what simply defines the job of project manager. This helped us define the meaning and categories of project management professional competence and understand how it is obtained and propagated through the community of practitioners.

After identifying the competencies which differentiate project professionals, we scheduled two focus groups with project managers who had experience of or interest in AI. Before the discussions, we provided an overview of the literature about AI in project management to act as the basis for the discussions. As our research aimed to integrate sociology and technology to understand the 'folk concepts' of AI, we required research participants who were project managers with knowledge or experience of adopting new technologies. In each focus group 7-10 project practitioners were gathered to discuss their attitude towards AI in relation to the competencies identified in the first stage. Specifically, the focus groups had two main themes that led the discussions:

1. The 'input'/learning resource for practitioners to become professional project management practitioners
2. The roles of AI and concerns about new technologies related to the project management professional and roles in the profession

In parallel with this, in order to obtain a useful picture of project professionals' perceptions regarding AI, we developed a Q-methodology ranking structure to obtain a consensus-ranking of perceptions and beliefs, which made its debut at the focus group meetings and was distributed online.

The literature of the sociology of professions reveals certain competencies and processes or 'traits' that are fundamental to the obtaining and sustaining of professional status by an occupation, that can differentiate it and give it claims to being a profession. These include having strong professional communities, a discrete body of knowledge, bargaining power over clients and a code of ethics. Using concepts from the sociological study of professions and the distinctive competencies of the first set of interviews, statements representing possible impacts of AI were dressed in language and terms of these traits. This formed what is known as a 'concourse' of statements. Participants then sorted the concourse of statements into categories on a grid where -2 represents least possible and 2 represents the most possible. This way, unlike a questionnaire, participants were encouraged to go through all the statements before sorting them into a structure measuring agreements of statements. Due to the fixed structure of Q-sort (see Figure 1)[3], our participants were forced to make some arbitrary choices, as they had to compare the statements one by one and on the basis of an overview of all the traits of project management as a profession. Prioritisation was according to what they believed to be the impact of AI.

[3] This structure is automatically produced by Q Method Software based on the quantity of statements. A Q-method structure is usually a quasi normal distribution structure

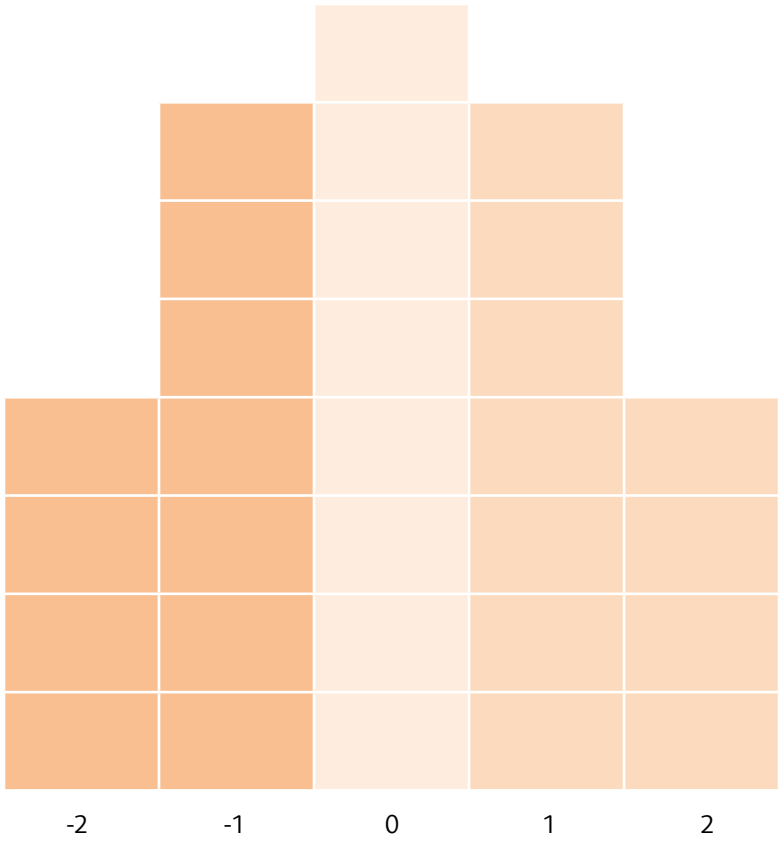

Figure 1: Structure of a Q methodology sorting

In a final move, this categorisation and ranked prioritisation was presented to select AI experts, who have experience of developing AI tools for project management. The subjective opinions of the body of project managers were critically evaluated, to determine how realistic they were and also the likely timing of encroachment by AI into the skilled work of project management. This enabled the identification of aspects that will, according to the AI experts, be the least likely to be taken by AI and so could be considered 'defensible' and those that were not, which are likely to see encroachment by AI. The implications of these findings for the status of project management were then drawn out using the literature of the sociology of professions.

Findings and discussion

Interview outcomes: What does 'professional' mean to project managers?

"Analysis of the interviews revealed seven main categories whereby the professional project manager is differentiated from a person who manages occasional projects"

Analysis of the interviews revealed seven main categories in which the professional project manager can be differentiated from a person who manages occasional projects.

1 **Mastering project management knowledge and the hard skills** of time management, risk management, cost management. Hard skills and codifiable knowledge are often developed into bodies of knowledge by professional associations, which act as guidelines to practice and a basis for certification. What distinguishes professional project managers is that they deliver these in specific industrial or business contexts, hence showing knowledge and skill modified by understanding the application to their context, demonstrating mastery, rather than just reproduction. Being innovative when solving problems according to the employers' needs further signals professional competence.

2 **Use of soft skills** when dealing with humans in projects is inevitable. These are hard to codify and exist as 'rules of thumb' and various esoteric practices that can enhance the performance of the individual project manager and are a basis for claims for status and making them distinctively different to others in their occupation.

3 **Principles and values** in terms of obeying workplace codes of ethics and conducting their practice in an ethical manner towards their clients, despite the often conflicted, profit-maximising basis for such relationships. They are also aware of their status as 'role model' and are willing to communicate the value of their profession to various publics and attract more into project management careers.

4 **Sense of community and awareness of the body of peers** was noteworthy, as most project managers highlighted that they learned project management via experience – their own and other people's. In networking activities of professional associations, project managers can see their colleagues from diverse industries and contexts and can discuss project management practice and possibly transfer it to their own practice. Reciprocity in community can also make project managers feel supported. Being able to have a strong identity shared with others in a professional community outside of their immediate context can be reassuring.

5 **Project management can serve as a career booster** and a route into management, especially in an engineering and construction context. Improved status in the workplace leads to more development opportunities provided by employers and access to more prestigious projects in which to demonstrate competence. In this sense, unlike in a 'traditional' profession, these professionals 'compete' against each other to a certain extent for such opportunities.

6 **Societal status as would accrue in traditional professions**. The status professions can own in society is attractive to skilful workers. Unlike traditional professions, project management does not have any real barriers to entry for legitimate practice. However, accreditation was viewed as helping project managers to create barriers to project management activities, making them independent from engineering activities. Furthermore, project managers also mentioned that being a 'chartered' professional puts them in a stronger position when bargaining with clients.

7 **The emotional value of being a project manager**. Modern project management has a history of being a secondary career of engineers or an 'accidental' profession. With increasing independence, project managers highlighted their feeling of ownership of the works they perform. When their status through accreditation or simply superior performance was recognised by others, they obtained emotional fulfilment. Thus, professional status gives an emotional benefit to practitioners, apart from the economic rewards.

The seven categories of professional status for project managers relate to distinct traits of profession. These are then used, along with 'trait theory', to develop the Q-methodology concourse of statements, as in Table 1.

Table 1: Potential impacts of AI on project management professionalisation

Category	Concourse statement
Mastering project management knowledge and hard skills – codifiable knowledge	Hard skills of project management (risk, time or cost management) can be replaced by AI
	AI will make a static body of knowledge pointless; it will have all the answers which will evolve for specific industries
	AI will make project management certification or chartership less important as individuals merely have to know how to operate the AI
	An AI will be able to contribute to the development of the professional discourse/body of knowledge
	AI will commoditise the expertise of project management, allowing other professions to take it over and use it
	AI will prevent teams from developing their own terminologies for unique practices, enforcing a common standard
Use of soft skills – uncodified/ uncodifiable knowledge	AI will prevent accrual of experience sufficient for chartership or qualification
	An AI will be able to motivate and encourage human beings in a project team
	Unified practice created by AI will reduce space for innovative project management
	An AI will be able to understand true meaning despite what is said
Principles and values	AI can take responsibility for misconduct and dishonesty
	AI can also provide project managers' manner to stakeholders
	AI will accept blame or responsibility for project failure
Sense of community and awareness of the body of peers	AI can earn respect as a 'peer'
	AI will lead to reduced opportunities for recognition of a project manager by the community or other project managers
	AI will impact on the network for learning, reducing availability of experienced project managers
	AI will reduce individuals' sense of belonging to the profession and there will be fewer practitioners in the network
	AI will 'give back' to the professional community
Career boost	AI will reduce employers' training and investment in project managers' professional development
	AI taking technical roles will remove stages of the project management career path – preventing junior learning
	AI will create new barriers to practice through complexity in use and management, creating new need for learning and new resources for status improvement of project managers
	AI will affect (reduce) the fees chargeable for human project managers from clients
	Clients want to know that project managers understand their business; an AI can also convince a client in this way
Societal status	An AI will be recognised by the public as a professional
	AI will be able to have sign-off power over designs, documentation or contracts
	AI will reduce the bargaining power of professional project managers in front of employers and clients
	AI will influence children and young people towards project management as a first career
	AI will make project management a more future-facing profession
Emotional value	AI will reduce sense of achievement in obtaining qualifications or obtaining successful project outcomes
	Mastery of AI makes an individual project manager look good

Focus group outcomes

Sources of learning for professional project managers

Associated with experience of the skills, experience of the situations in which to apply the skills is a key source of learning. It is difficult to obtain practical project management knowledge from generalised university education or a unified body of knowledge because project management success is very much determined by application of competencies to distinctive industrial challenges from which they also learn the capabilities of available resources. One of the most common learning resources identified by the focus group, unsurprisingly, **is practical experience**. Such experience is not only limited to their own time managing projects, **but learning from others' experience**.

"One of the most common learning resources identified by the focus group, unsurprisingly, is practical experience"

Specifically, in the workplace, junior project managers benefit from the experience and stories told by more senior project managers as well as direct observation, especially where this is in mastery of the hard skills in support of the seniors. The seniors also learn here through self-reflection and teaching. The learning outcomes from experiential learning become a significant part of project managers' decision-making routines and how they recognise the different needs of people and communicate with them. Such experience also creates the foundation for stakeholders' and clients' experience of that project manager; hence project managers construct their professional reputation. Being able to identify and manage relationships becomes a significant part of professionalisation, as a profession requires practitioners who are perceived as exceptionally trustworthy.

A unique resource that can trigger more intense learning, motivation towards learning and motivation towards excellence is **failure experiences**. Such lessons often reveal things about the human condition of project participants *"lying or cheating or being over-optimistic or over committing or things like that..."* that can allow a project manager to behave with more awareness in the future and create a stock of practices and stories of practice.

Historical data is a learning resource for professional project managers. Effective learning from historical data requires the employing organisation to have knowledge management processes, in order to enable access to this kind of experience data. These are not only technical processes, they are also social, driven by project managers' willingness to share their practices and outcomes. The motivations for this can vary depending on the network of relationships a project manager finds themselves in and their feelings towards different types of organisational stakeholder.

Apart from intra-organisational willingness to share (and receive) knowledge, project managers in the focus group also mentioned the **obtaining training provided by companies** and other organisational activities, such as team-building exercises. Compared with university education, training provided directly by the employers is more connected to specific workplace needs.

Expectations regarding project management AI

There was widespread doubt regarding whether an AI could learn the human factors within project management, such as interpreting the emotional status of stakeholders and using this knowledge to adjust communication style, content or intention. Aligned to this, another capability of profession that AI cannot learn is how trust and reputation need to be constructed within project teams or with stakeholders, nor would an AI be motivated to sense opportunities to do this. Trust and reputation affect decision making and the receipt of decisions.

The flexibility and spontaneity of human response is also an advantage, in cases where a message has to be adjusted as the emotional reaction of the audience emerges. Empathy was emphasised. It is more than being able to predict reaction (besides, the sentiment expressed may not be the real feeling). It is about having a visceral awareness of what the reaction means and the changes that it will bring to the person receiving or having to make change, which will be the motivation and basis for their subsequent actions that may seem irrational on the surface. It was viewed as unlikely that AI could replicate this 'manner' of professional project managers.

One reason why AI cannot learn this process is that project managers themselves do not know how trust 'suddenly' evolves among human beings, let alone digitalise the process. What helps or harms trust is known in theory but how those factors interact with the environment of the project is unpredictable. Further, the changing contexts for different projects make it hard to record the process, and so make it harder to train an AI, or for it to transfer the social capital created by trust from project to project as a human can.

"AI can automate sorting, tracking and accessing data regarding changing requirements from clients"

When there is sufficient data, AI can perform certain data-based, rule-based clerical activities, such as formatting project information in a way that is suitable for different receivers. This is an example of an AI taking a project officer or assistant role. When dealing with repetitive situations, it is inevitable that human beings get tired and make mistakes and it is believed AI would be more effective in such situations. AI can automate sorting, tracking and accessing data regarding changing requirements from clients. Focused and useful applications in clerical areas, especially those involving hard skills, could develop some confidence towards AI and improve project managers' attitudes towards it. AI could also help by simulating a project before it starts. With a mixture of experience and imagination, a project manager can do this, but the tireless repeatability of a machine running millions of simulations and applying experience from more projects than a project manager could experience in a thousand careers offers huge potential.

Project managers are more likely to have confidence in an AI when the project is simple and where there is a sufficient source of data, which raised questions about how such a quantity can be obtained and who would own it, especially in a project supply chain or a situation where the AI is purchased as a service. There is an expectation that AI will eventually be able to deal with complex environments and different clients as more historical data becomes available and algorithms become more adept at correlation. However, project managers in the focus group were concerned about data availability and how that might be constrained by working environments – not all project organisations have a sufficient source of data. A large organisation dealing with multiple projects will be able to provide more data for AI to learn, which could give them a competitive advantage over smaller firms.

Finally, 'data poisoning' or 'model poisoning' is also a concern for AI learning. This is also a problem for human beings when senior project managers pass on incorrect information, lies or bad habits and practices to junior project managers, who may incorporate them into their model of 'professional project manager'. Humans can auto-correct to some extent and ethics and morals come into play to categorise some behaviours as wrong, although possible or even advantageous. An AI does not yet have that discernment. If AIs were able to attempt to predict human nature, they could face the same problems as human beings in predicting individual behaviour based on generalisations and surface regularities.

Consensus rank of Q methodology results

These are the results of the Q-sort of 30 statements regarding the possible positive or negative impacts of AI on the professionalisation of project management. Table 2 shows the full results of prioritisation of the Q concourse from most likely to least likely to be impacted.

Table 2: Full results of prioritisation of Q concourse from most likely to least likely, with categorisation by professional value[4]

Statements based on Table 1	Category	Rank
An AI will be able to contribute to the development of the professional discourse/body of knowledge	Codifiable knowledge	1
AI will commoditise the expertise of project management, allowing other professions to take it over and use it	Codifiable knowledge	2
Hard skills of project management (risk, time or cost management) can be replaced by AI	Codifiable knowledge	3
AI will make project management a more future-facing profession	Societal status	4
AI will affect (reduce) the fees chargeable for human project managers from clients	Career boost	5
AI taking technical roles will remove stages of the project management career path – preventing junior learning	Career boost	6
AI will make a static BoK pointless; it will have all the answers which will evolve for specific industries	Codifiable knowledge	7
Mastery of AI makes an individual project manager look good	Emotional value	8
AI will create new barriers to practice through complexity in use and management, creating new need for learning and new resources for status improvement of project managers	Career boost	9
AI will prevent teams from developing their own terminologies for unique practices, enforcing a common standard	Codifiable knowledge	10
AI will reduce individuals' sense of belonging to the profession and there will be fewer practitioners in the network	Sense of community and awareness of the body of peers	11
AI will lead to reduced opportunities for recognition of a PM by the community or other project managers	Sense of community and awareness of the body of peers	12
AI will 'give back' to the professional community	Sense of community and awareness of the body of peers	13
Unified practice created by AI will reduce space for innovative project management	Use of soft skills – uncodified/uncodifiable knowledge	14

[4] Q methodology has released four major perspectives of viewing AI and project management as a profession. Due to the research aim of this report, we present a concourse rank of these four perspectives to show a collective view of our participants

Statements based on Table 1	Category	Rank
AI will reduce sense of achievement in obtaining qualifications or obtaining successful project outcomes	Emotional value	15
AI will impact on the network for learning, reducing availability of experienced project managers	Sense of community and awareness of the body of peers	16
AI can also provide project managers' manner to stakeholders	Principles and values	17
Clients want to know that project managers understand their business; an AI can also convince a client in this way	Career boost	18
AI can earn respect as a 'peer'	Sense of community and awareness of the body of peers	19
AI will prevent accrual of experience sufficient for chartership or qualification	Use of soft skills – uncodified/uncodifiable knowledge	20
AI will make project management certification or chartership less important as individuals merely have to know how to operate the AI	Codifiable knowledge	21
AI will reduce employers' training and investment in project managers' professional development	Career boost	22
AI will be able to have sign-off power over designs, documentation or contracts	Societal status	23
AI will influence children and young people towards project management as a first career	Societal status	24
An AI will be able to understand true meaning despite what is said	Use of soft skills – uncodified/uncodifiable knowledge	25
An AI will be able to motivate and encourage human beings in a project team	Use of soft skills – uncodified/uncodifiable knowledge	26
AI can take responsibility for misconduct and dishonesty	Principles and values	27
An AI will be recognised by the public as a professional	Societal status	28
AI will reduce the bargaining power of professional project managers in front of employers and clients	Societal status	29
AI will accept blame or responsibility for project failure	Principles and values	30

Discussion

AI and factors in project management professionalisation

Unsurprisingly, in the Q ranking, participants ranked codified knowledge as the most likely to be impacted among the competences and traits of professional project managers. Within this category, the participants agreed that having AI in project management is going to contribute an important new section to the body of knowledge. This might be because project managers recognise the need to master the AI tool to cope with the development trend as per the second 'most likely'. However, this also has a significant impact on the professional associations as well as the developers of the body of the knowledge, because the value of codified knowledge could be reduced by AI, perhaps commoditising it. The hard skills delivered by project managers, with their rule-like application can be imitated, augmented and ultimately replaced by AI.

In project management professionalisation, project managers voluntarily engage with professional associations, which are not able to enforce standards (Morris et al., 2006; Hodgson, Paton and Muzio, 2015). In the current stage of project management professionalisation, even though project management does not seek or value standardisation, project managers and their employers still take certification as a signal of good working attitude, the commitment of the practitioner to the identity of being a project manager and a general guide to the requirements of professional project work (Wang, 2019). Thus, even though codified knowledge is tightly embedded in the accreditation process for both the PMI and APM, project managers see AI as unlikely to impact the usefulness of certification – there will still be a sense of achievement in obtaining it and social uses for it. Therefore, value of certification in the mind of project managers was the least impacted factor in the codified knowledge category.

"AI might reduce this sense of achievement in project work if solutions to its distinctive problems become automated"

The feelings towards professional status and career status were considered likely to be impacted by AI. It was mentioned that obtaining certain skills related to AI will likely bring a greater sense of achievement, that it could make the profession, and therefore the professional, look better. Also, project managers said being a 'professional' project manager made them feel respected. AI might reduce this sense of achievement in project work if solutions to its distinctive problems become automated. As discussed in the focus group, AI can simulate project performance in some situations, thereby reducing the emotional rewards of snatching victory from imminent failure or any other demonstration of mastery. AI is more likely to lead to lower fees in the workplace than to a reduced bargaining position in front of clients, which seems contradictory. This might be because research participants did not attach status in the workplace tightly to economic factors.

As a typical 'corporate' profession, the professionalisation process of project management operates within an organisation-oriented context (Paton, Hodgson and Muzio, 2013). Thus, career development in the workplace context is another key consideration of the project professional. Having the power to define the work content is a factor that project management as a profession is continue to struggle for. Employers and clients still determine the full degree of ownership of the project.

One of the most important activities for project managers in their career workplaces is to deal with employers' and clients' requirements and obtain their trust for the benefit of the project. Morris et al. (2006) stated that codifying knowledge can reduce barriers to getting access to the solutions of project professionals. In this research, the participants also considered whether the hard skill functions of project professionals can be replaced by AI. However, one of the most important activities of project managers in their workplace is to deal with employers' and clients' requirements. According to Konstantinou (2015), project work is highly situated. Even though it is likely AI can accumulate diverse data input from different working environments, which over time could enable insight into the concerns of diverse stakeholders, it is still considered that clients would not believe AI could understand them like a human project manager does. Thus, our research participants do not consider AI has a huge influence on their career status.

Following on from this, the human factors such as societal status and uncodified soft skills are also considered less easy to replace with AI. Focus group participants thought that influencing and persuasion are necessary skills for managing a team, as were finding the 'problem person' or the personality that does not do well in a particular situation, making the client adjust their view of reality and preventing scope creep. Human project managers know that it is a good idea to 'underpromise and overdeliver', that people like it when you appear to go the 'extra mile' and that it is important to show the client that 'everything I have done shows that I care for you'. It was viewed as unlikely that a rule-based AI could interpret the habits and manners of clients, irrational decisions, the emotional status of stakeholders, especially when something is said but not meant.

"AI is a knowledge-based platform, so in terms of enhancing the knowledge communication, AI can make a difference and contribute to the idea of 'best practice'"

In terms of contributing to the community, AI was considered able to make contributions of some kind, such as using standardised tools and practices that might enhance how clients and the public perceive the community of practitioners. AI is a knowledge-based platform, so it can make a difference in terms of enhancing knowledge communication and it can contribute to the idea of 'best practice'. However, because of this human beings may shift to AI platforms to communicate project management knowledge rather than using the human community, and this may reduce project managers' sense of belonging. What is believed to be irreplaceable by AI is the respect and recognition of one peer for another and the ego needs that are satisfied by this.

According to the research participants, the 'principles and values' of the profession are the least likely to be impacted by AI, especially when talking about taking the blame and the responsibility of project management. As for any other chartered professional, AI cannot replace the role of being where 'the buck stops'. This is considered by the participants as the competence that AI will have the least impact on. According to Table 2, societal status of project managers and the power to sign off documents cannot be easily impacted by AI. This might be because such power is seen as human-owned, while AI is still considered a tool rather than a peer in project teams.

Learning to be a professional project manager

Through the discussion with the focus group participants, it was highlighted that no matter whether human project managers or an AI tool are considered, there is no conflict in terms of the targets of human project manager learning and AI learning – the fundamental target is to enhance project management performance and successfully deliver project outcomes. Of course, who owns that learning and the uses it is put to are another matter. To deliver professional project management, project professionals need to master both hard skills and soft skills to deal with clients' requirements and dynamic business contexts (Pant and Baroudi, 2008). Since the soft skills of dealing with team members and stakeholders were considered an important competence a professional project practitioner should have, one of the main learning inputs of project managers is the experience of interacting with peers and stakeholders. This situated, 'word-of-mouth' learning resource of the project professional would be difficult for an AI to replicate in terms of obtaining the input data as a prerequisite to developing the behaviour. Hence this creates a certain protection for the career status of project managers versus an AI, provided that the practices being passed on are still of value to clients or employers.

Current AI mainly uses historical data to predict future performance. However, when dealing with human beings, project professionals' irrationality based on subjective experience is too unpredictable to be digitalised within an algorithm as input for AI's learning. Trust and reputation based on emotional reliability cannot be earned by an AI as it can with human beings. However, with its learning ability and a suitable database, AI can collect changing requirements and characteristics of different clients and generalise data from different projects. Therefore, it could support a human project manager in predicting the behaviour or preferences of a client.

Data availability and quality are the main concerns in developing project management AI, which is a significant barrier for AI. The participants anticipate that AI will have an active role in simulating project performance when there is sufficient data available. This aligns with current research into the functions of project management AI in predicting project success, monitoring cost and time, validating safety and forecasting demand, hence acting in an effective, but passive, decision-support role.

The opinion of select AI experts on project managers' views

- **Short term** – AI is a passive assistant, focused on hard techniques and project controls
- **Medium term** – AI will be predictive, exerting some control over managerial decisions, could be a source of competitive advantage for a project provider if clients are sensitive to it
- **Long term** – AI will accurately interpret and use human factors, automated decision making will be allowed

"As AIs learn and historical data on project manager performance accumulates, forensic insights into team performance are possible"

In terms of learning, there are possible impacts on the transfer of practices from senior to junior. As AIs learn and historical data on project manager performance accumulates, forensic insights into team performance are possible. However, based on this, a predictive recruitment AI may decide which projects a worker gets to participate in or who is considered effective in what context. This will have serious consequences for learning and the kinds of high-cost but potentially high-value learning that comes from failure. Although, conversely, it could raise barriers against poor performance which might improve the reputation of the profession in a company or in society. Impacts on codifiable knowledge of the 'most likely' category are correct. Bodies of knowledge will be, and need to be, more dynamic as AIs contribute to the development of industry-specific practice. There will be challenges for professional associations in coordinating this fracturing and making up for gaps in project practitioner learning opportunities.

Some of the negative impacts to profession could have upsides depending on whose perspective is taken. For example, although it is unlikely that an AI will be able to understand a client business and use this to convince the client, clients might prefer a project manager who is unable to convince them of things beyond their own perception of their requirements. The idea of AI reducing the scope for project manager innovation might not be a bad thing. Predictions could be based on good practice and therefore there is less need for innovation to cover gaps in performance. Advantages could come from taking out the parts of the project process that can lie, be lied to or confused. The impact on the fee chargeable for professionals is agreed – automation and AI will certainly 'blow up the day rate model'. However, organisations might pay more for a service that delivers certainty.

Automation will remove the burden of repetitive work and release capacity for higher value-added work. Negotiation and upfront commercial activity will be unlikely to be substituted. For now, people buy from people. The project practitioner using AI could become the most important person on a project, providing a 'sixth sense and superpowers' to avoid variance and identify which activities and WBS components are more predisposed to variance. Leadership can have earlier warnings of emergent issues, providing time to fix small problems before they escalate. Model poisoning is not likely to be intentional; it is more likely to arise from pessimistic or optimistic personalities informing potential scheduling or cost estimates. In the short term, there will be a need for humans to audit these models, which could become another competence of a project professional.

Conclusion

Seeking the core, defensible human competence of project management professionals is an important mission of professionalisation. Identifying these will enable the better use of the human and AI resource. As has been seen, AI potentially impacts many of the learning experiences of the project manager and, hence, as profession is a learned behaviour, it can be expected to impact project management professionalisation. At the moment, however, only a partial 'unboxing' is possible. In the benign model of AI as a supporting tool and with current availability of data and performance of the associated technologies, human professionals will still own project management competencies related to the human factors in projects. As long as AI has a clear design goal to assist successful project delivery and is under the control of project managers, it will likely create new resources and capabilities to enhance the status of project management. The project managers in our sample have confident expectations of AI to assist them in the short-term. Clients may come to desire this as well. Changes at this end of the project will also ripple out into project supply chains and in commercial and contracting processes also.

"There is an expectation that the learning required for AI and its mastery can make a project manager look good, especially when related symbols of accreditation are made available"

The question of how a project manager learns to be professional presents an alternative pathway to develop project AI, rather than focusing on specific, disjointed parts of the project process for which sufficient quantity of data is available. In Table 2, we summarised the impacts of AI from our Q-rank outcome, showed the professional competences that can be impacted the most from the bottom, and the irreplaceable/non-substitutable ones at the top. 'Emotional value' holds an interesting position. The perception is that it is highly susceptible to impact, but in a positive way. The emotional value of the profession is a function of the utility for making status claims of holding the knowledge base or symbols of it. There is an expectation that the learning required for AI and its mastery can make a project manager look good, especially when related symbols of accreditation are made available. The participants were neutral on a changing sense of commitment to the profession, so there is no evidence of expectation of the profession meaning less to practitioners, despite the impact of AI on the tasks of the profession.

When dealing with human beings, irrational human factors cannot be predicted and digitalised easily. The principles and values of the project management profession that are vital for successful delivery, such as ethics and daily workplace manners, are less likely to be impacted by AI, especially while these are valued by clients. This also suggests a focus for developing project professionals faced with encroaching AI development, which is to focus on principles and values of professional service we can provide and the uncodifiable, esoteric knowledge which supports these behaviours and which can only be passed on person-to-person. Much of project manager learning and motivation to learn and what separates the professional from the person who merely manages a project is driven by individual experience and it is difficult for AI to encroach upon this. The experience of interacting with peers and stakeholders is the core input of project manager learning. The main threat of AI to the professional status of project professionals is where it impacts, affects or modifies this social learning processes.

The output of this research and the idea of critiquing the impact of AI on the professional status of project professionals may be viewed as provocative, especially by those with enthusiasm for AI. However, this is the voice of a representative sample of project professionals and the literature on the sociology of professions. We have sought to be balanced, seeking the opportunity as well as the threat to the status of project professionals. We welcome debate on the findings; indeed, it is only through resolving contrasting current views of possible futures that we can prepare for different eventualities and ensure the best outcome for the profession.

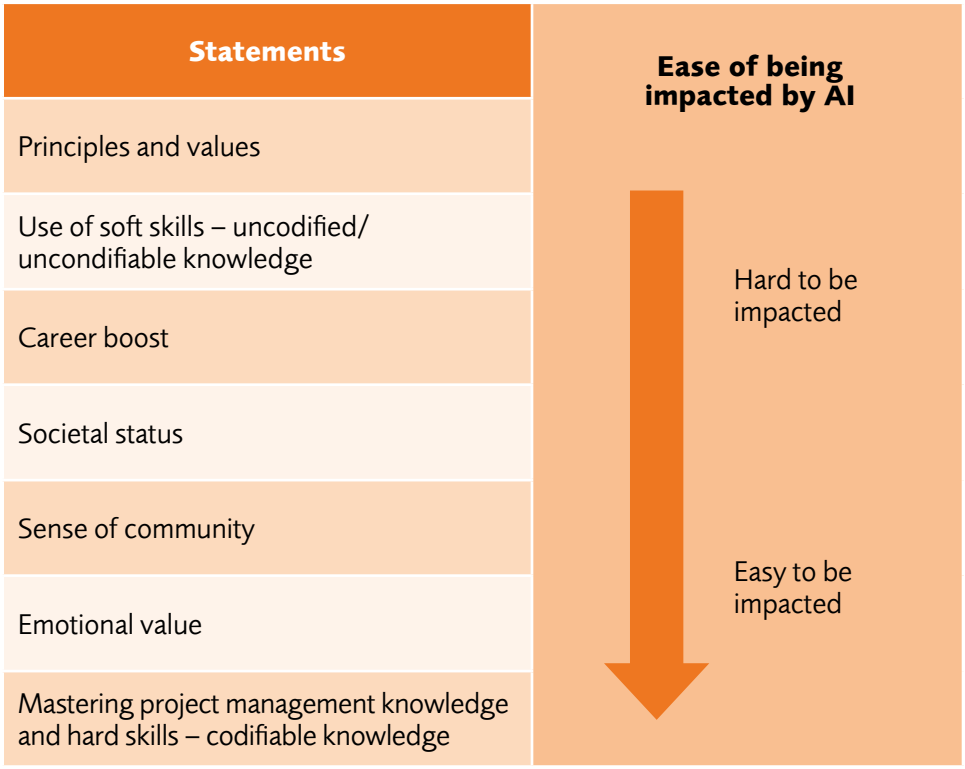

Figure 2: Strength of AI impact on project management professional status

Recommendations

In order to obtain the benefits of AI for the professionalisation of project management and defend against the threat of encroachment that is not on professionals' terms, human project professionals and their professional associations should:

- Demonstrate and develop codes of ethics, particularly around negotiation and convincing of clients
- Motivate project professionals towards ethical conduct and soft skill development
- Develop and reward the use of soft skills in the workplace, particularly motivation and recognition of peer excellence
- Master data management skills to create better data sources as data quality can impact both human and AI development
- Master basic AI knowledge in order to maintain control of and work with AI and deliver successful projects
- Strengthen senior–junior relationships and peer-learning approaches, building mentorship between senior and junior project managers within an organisation
- Promote new learning opportunities for juniors, especially if the more routine activities become digitalised

Areas for further research

- The revision of project management competence frameworks to include AI-related techniques
- Production of a blueprint for project managers on what and how to learn about the operation of AI in project management
- Since project management practice and habits of implementation vary according to industries and companies, such impacts on developing AI need to be explored.

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