Analysis of Agile Project Manager Competencies from Recruitment Signals

Kamrul Ahsan, Marcus Ho

Abstract—As Agile project management has become increasingly popular as a project management methodology, Agile project managers (AgPM) are important in leading and managing Agile projects. However, professional project management bodies and the academic literature lag behind industry practices in articulating competency frameworks for understanding the requirements of AgPM. This study examines the organisational expectations for AgPM competencies as signaled to the job market through advertisements. Using an integrated framework of Agile project competencies, we conduct a content analysis of AgPM job advertisements from the Australian and New Zealand job market. Our results identified the frequently signaled personal, practice and perspective competencies, including the co-occurrences of these competencies, for recruiting AgPM. Additionally, we identified the more frequently utilized individual personal and project-related practice competencies, as well as the less utilized Agile-focused perspective competencies. The findings of this study will help the Agile movement consider the competencies that are more important for organizations to learn; allow employers to articulate their competency requirements for potential jobs; and enable job seekers to understand and develop the required competencies for successful application to AgPM roles. Overall, this study provides an empirical grounding in the specific competencies required for the AgPM role in industry.

Index Terms—Agile project management, Agile project manager, competencies, job advertisements, signaling theory.

I. INTRODUCTION

Agile project management (APM) is a management approach that emphasizes flexibility and response. The advent of APM reflects the increasingly dynamic and high-demand environments project managers face. The ability to cope with high uncertainty, short development cycles, lack of physical deliverables, incremental product release, continuous customer involvement and responsiveness to change characterizes APM approaches, making APM increasingly popular in diverse environments and industries [1-3].

Organizations increasingly use APM as their preferred project management approach [4]. A recent survey in the software development sector demonstrated that even during the COVID-19 pandemic, organizations had increased their dependency on APM [5]. Studies suggest that APM approaches have greater success rates in software and information technology projects than the traditional waterfall approaches [6-8]. Additionally, others have found that APM implementation requires careful attention to human resource management competencies [9]. For example, studies have found that successful APM implementation is associated with the project manager role and team communication [10], individual and team competencies [11], and individual and organizational well-being [12].

APM is a cultural shift focused on collaboration, people, tools and processes, and can significantly impact the project manager's role and place in the team or organization [10, 13]. There is strong demand for competent professionals to lead and manage Agile projects in organizations [14]. APM requires a facilitative approach, in contrast to the traditional waterfall method, where the project manager has a 'command and control' role [15]. As such, scholars note that the competencies required for managing Agile projects may differ from traditional project management competencies [11].

In APM, the role of a project manager is more strategic and requires more effort to manage teams and stakeholders [13]. Despite this, the role of the AgPM is yet to be defined and investigated in the academic literature and by project management professional bodies. Scholars suggest that the AgPM title and role is new in the market, and many APM practicing organizations still utilize the project manager job title in Agile projects [4, 16]. Others suggest that in an Agile project, the project manager has a hybrid management role, and must strike a balance between providing autonomy versus structure [15]. For example, an AgPM is responsible to the team and the organization, and will take on risk management without asking the team [15]. Additionally, Shastri et al. [17] conclude that the role of the project manager is still crucial in APM, as they carry out traditional project management activities, but also have a dual role in dealing with development teams and stakeholders.

Due to the importance of this role in APM, a more granular understanding of the competencies required by organizations is necessary.

To date, research into AgPM competency is sparse and fragmented, making it difficult to understand the market need [18]. As organizations recruit a growing number of project management professionals to manage Agile projects, the AgPM role will evolve in response to changing market requirements. Scholars have suggested that how organizations communicate their competency needs can profoundly impact their strategy and performance [19, 20]. Thus far, there is scant research into what organizations communicate about their competency requirements for AgPM. Greater insight in this area is necessary to understand how APM is utilized in organizations, including how they select the right competencies and the people required to meet the challenges of APM. Therefore, this study aims to examine the organizational signals of competencies for AgPM in APM with the following research question: *What do Australian and New Zealand job advertisements signal about AgPM competencies?*

To answer the above-mentioned research question, this study set its objectives to: (i) explore the market signals of AgPM from job advertisements; and (ii) examine the criticality of in-demand competency signals expected of/from an 'agile project manager'. To fulfil the research objectives, we conduct an empirical investigation of job advertisements and utilize qualitative and quantitative content analysis [19, 21, 22]. Qualitative content analysis allows us to explore the insights of job advertisement contents and to develop a market focus competency dictionary. Quantitative content analysis of job advertisements examines the criticality of demand of competencies from these market signals. This study's contribution is to identify and integrate a competency framework for the critical competencies of AgPM to better understand the market demands of the AgPM role. This study first builds a higher-level competency framework by identifying competencies through the International Project Management Association (IPMA) lens and PMBOK 7th edition. Secondly, we utilize content analysis [21, 23] to analyze job advertisements to build a picture of the job market demands for AgPM competencies. Using signaling theory as theoretical framework, we examine job advertisements as the primary source of organization's signals of recruiting or information about the organization's requirements for AgPM competencies. Organizations' signals about these competencies underline their APM imperatives and influence the quality and quantity of their applicant pool [24].

The rest of the paper is organized as follows: Section 2 presents a literature review of APM. Section 3 discusses the research methodology, while Section 4 provides results and analysis of Agile project manager competencies. Section 5 provides a discussion of the results. Section 6 concludes the study, summarizes the study implications, and outlines future research directions.

II. LITERATURE REVIEW

A. Agile Project Management

'Agile' generally means a quick response to change within the boundaries of a project. Academic research has defined APM as 'an approach based on a set of principles, whose goal is to render the process of project management simpler, more flexible and iterative in order to achieve better performance (cost, time and quality), with less management effort and higher levels of innovation and added value for the customer' [25]. APM traces its origins primarily from the software industry, where it has seen great application and success [25]. However, it has seen increasing application in other industries and environments, including oil and gas [26] and the public sector [27]. APM is a mindset defined by values, guided by principles and manifested through many different practices [1]. It is a philosophy covering four value statements and 12 principles [1]. When contrasted with more traditional project management methods such as the waterfall model (a linear sequence of well-defined activities), APM is better able to deal with uncertainty, be flexible and adapt to change [28]. APM is an umbrella term with diverse approaches and methodologies, such as lean software development [29], Scrum [30], and extreme programming (XP) [31]. However, they share common values and principles of managing teams and projects [13].

B. Understanding AgPM Competencies through Signaling Theory

A competency is a complex combination of knowledge, skills, abilities, traits and behaviors that allow an individual to successfully perform a task, activity or function within a defined work setting [32]. Competencies are related to job performance and are essential determinants for recruiting, selecting and measuring individuals' performance [33]. Research demonstrates that project manager competencies can have strategic implications for practice [19], including improving organizational and developmental practice [34] and improved project performance [35, 36]. AgPM competencies for managing Agile projects are valuable resources for an organization. Hiring the right people at the right time for the right job is a source of competitive advantage for organizations [37]. Thus, recruitment advertising performs a critical role in bringing the requisite human capital into the organization. Organizations unable to recruit and select the right talent cannot compete with organizations that do[38] .

Recruitment via job advertisements signals employer expectations and the required competencies for an advertised role [39]. We use signaling theory [40] as the theoretical underpinning to explain the role of job advertisements in demonstrating AgPM competencies. Signaling theory posits that two primary actors, the signaler and receiver, together with the signal itself create a signaling environment in which signalers are motivated (or not) to signal their quality to the receiver. The theory suggests that employer job advertisements (the signaler) serve as a signal to the job market (the receiver) about the organization's competency requirements and can affect institutional and organizational outcomes such as the

quantity and quality of the applicant pool [41] and expected level of professional norms [42]. Employers can utilize job advertisements as a signal for the market demand for competencies. Similarly, job seekers use job advertisements as information cues about unknown organizational attributes [43]. Moreover, the Agile movement can reflect on the content and utility of the competencies signaled by these organizations.

Examining organizational perspectives of competencies, such as by analyzing the signals they send when recruiting AgPM, allows an insight into what organizations think makes AgPMs successfully fulfil the role [44]. Research analyzing job advertisement signals shows how parties exchange vital information on role expectations and the required competencies [45]. Additionally, job advertisements signal the organization's intentions and requirements for competencies [35, 46, 47]. Studies have recently examined the signals that recruiting websites and employer reviews send to potential employees, highlighting the importance of consistent and congruent communication practices in those media [12]. This drives the development of professional competencies into ingrained frameworks. In project management, recruitment messages, such as job advertisements, signal the labor market demand for project manager competencies [19, 35] and particular preferences for the profession [48]. Thus, recruitment messages such as job advertisements for AgPM can provide an insight into organisational goals and messages regarding AgPM competencies useful for recruiting and selecting AgPMs [49]. Additionally, by studying these signals, insights into the professionalization of AgPM can be gleaned [50].

C. Conceptual Framework of AgPM Competencies and Mapping with PMBOK

A competency framework for professions defines and classifies job competency requirements and guides individuals and organizations in their recruitment, selection, development and performance [51]. The Project Manager Competency Development (PMCD) framework describes generic project manager competencies as dimensions of knowledge, performance and personal competencies [52]. Furthermore, the PMCD suggests developing a comprehensive competency framework for different industries [52] (p. 4). To our knowledge, there is no required competency framework for AgPM in the literature or by Agile-related professional bodies. Existing Agile-related professional body publications are primarily guidelines. For example, the Agile practice guide of the Project Management Institute (PMI) provides general guidelines and an understanding of Agile approaches and a framework, tools and techniques that project teams can use, and explains how to create and deliver a project in an agile environment to deliver valuable results to their customers [1]. Other professional bodies, such as the IPMA, published an Agile reference guide in 2018, which goes further to clarify the need of Agile leaders and explains how different Agile elements (perspective, people and practice) translate into observable competencies in an Agile environment [14].

The 7th edition of PMBOK introduced 12 principles of project management and eight performance domains of projects [53]. These are: be a respectful and caring steward; create a collaborative team environment; effectively engage stakeholders; focus on value; system thinking; demonstrate leadership behavior; tailor-based on context; build quality into process and deliverables; navigate complexity; optimize risk responses; embrace adaptability and resilience; and enable change. The eight performance domains are stakeholder; team; development approach and life cycle; planning; project work; delivery; measurement; and uncertainty [53]. These principles guide project managers to shape the performance domain to intended outcomes. Merging these performance domains is critical for the delivery of project values based on the project context and environment through tailoring project 'lifecycle and development' (such as predictive, adaptive or hybrid, Agile), 'methods', 'models', and 'artefacts' [53]. To adjust to the market demand for different types of competencies and to span value delivery in projects, the PMI also revised the format of the project management professional exam (widely known as PMP), which is now focusing on assessing professional knowledge in domains such as people, process and business environment in predictive, Agile and hybrid project approaches [54]. We adopted the IPMA Agile competency elements as our competency framework. We incorporate the IPMA Agile practice guide and consider the personal, project practice and Agile perspectives competencies required for managing Agile projects [14]. We mapped the IPMA competency categories with the Agile Manifesto values [1]. In integrating existing, albeit diverse Agile competency models, our comparative framework shows how the IPMA Agile elements align with the PMBOK principles, performance domains, and project methods, models, and artefacts. Table 1 provides a brief overview of the competency elements, including how the framework elements are also linked with PMBOK principles and performance domains.

III. RESEARCH METHODOLOGY

We utilised qualitative and quantitative content analysis methods to address our research questions. Content analysis provides a systematic and objective means to describe and quantify specific phenomena through making inferences from verbal, written or even visual data [19, 21]. Thus, due to our focus on what organizations are likely to require and signal to the labor market, we utilize content analysis of job advertisements as our research design. This approach is recommended by scholars to examine specific competencies required for a particular position (like AgPM) [55]. To investigate the market signals of AgPM from job advertisements (our first research objective), we employed/utilized a qualitative content analysis approach to code the job advertisement contents and develop a competency framework dictionary (sections III D-E). Subsequently, to examine the criticality of in-demand competency signals expected from AgPM (our second research objective), we quantitatively analyzed the competencies through the frequency of occurrences, cluster analysis, and rank order of the competencies (sections IV A-D). Although there is a wide range

of methods and techniques within a content analysis, typical steps are found in most studies [21]. In line with Mayring [56], this study employs the following research methodology (Fig. 1) suggested by Ahsan, et al. [19] for the content analysis of job advertisements in project management.

A. Creating an Agile Project Manager Competency Framework

The first step for this study involved creating an IPMA-based competency framework, outlined in Section 2(C) and Table 1. The framework consists of three broad categories of competencies (personal, practice, and Agile perspective) and competency indicators or sub-themes. This framework was the basis of our content analysis to investigate the market demand for competencies in each category. Within each category of the competencies, the following analysis method determines the specific competencies demanded by the market.

B. Identifying Job Advertisements

Job advertisements provide signals on the labor market as well as valuable insight into the skills and knowledge that is required within a professional realm [57]. This study sourced AgPM job advertisements over seven months (September 2020 to March 2021) from the most extensive job websites in Australia (seek.com.au) and New Zealand (seek.co.nz). Online job boards provided a comprehensive, reliable and broad source of job advertisements, allowing systematic and manageable access to their databases [19]. Over four million job advertisements are posted on Seek, and 450 million people visit these websites [58]. We did not consider other job boards as recruiters often post the same advertisements simultaneously on multiple websites [19].

C. Data collection

To minimize errors and endure consistency with the research scope, we used the keyword selection, job advertisement search process, and sample collection procedures recommended by Mayring [56]. We refined our search criteria using exclusion and inclusion criteria, restricting our search to articles that used keywords related to APM, such as 'Agile project manager', and 'project manager-Agile'. Our exclusion criteria included terms such as 'product development manager', 'IT manager' and 'software development manager'. We identified 130 jobs from Australia and 55 jobs from New Zealand. Job advertisements were saved in pdf from, with the job title as the file name. Each job advertisement was given a unique code, and further screening was conducted to remove duplicates. Following this process, we obtained a final sample of 154 useable job advertisements (118 jobs from Australia and 36 jobs from New Zealand).

D. Content Coding and Dictionary Development

We followed a coding process that recommended deductive structuring procedures for content analysis [56]. The initial step involved using NVivo®12 to conduct the content search and coding based on Table 1. Initially, the first author scanned the job advertisement contents/excerpts (codes) for each job advertisement. Codes that fell under an indicator (sub-theme)

were assigned within the sub-themes. Following this process, we completed the coding for all samples, recorded the frequency of each competency, and calculated the total frequency of the jobs related to the recorded competency. Next, the second author examined the coding for any inconsistencies. Examples of job advertisement excerpts are shown in Column 4 of Table 2.

In the second step (shown in Column 2, Table 2), sub-themes were identified and were matched to each sub-theme of the competencies in Table 1. Following this process, we identified 31 sub-themes, which were further matched with the relevant IPMA competency indicators in Table 1. Finally, we assigned these sub-themes (competencies) to each overarching competency dimension (competency categories of Table 1).

In Table 2, we describe each of the competencies, present how these were formulated and grouped under the relevant category, and give supporting data as a coding exemplar. The market demand competency framework comprises 31 competencies, of which 12 are personal, 13 are Agile project practice-related, and six are Agile perspective-specific.

E. Coding Reliability

The trustworthiness of our content analysis [22, 59] was enhanced by involving two researchers who went through the competency theme (Table 1) and sub-theme definitions (Table 2), and content analysis steps independently [23]. Disagreements were then discussed with reference to the existing Agile and project manager competency literature, and resolved by referring to the codes in question and reaching a consensus [60]. We achieved an inter-rater agreement of 93% (agreement on 1320 out of 1418 codes).

IV. ANALYSIS

A. Overview of the AgPM Job Market

Content analysis of 154 job advertisements shows that the majority (75%) were from major Australasian cities, such as Sydney (32%), Melbourne (19%), Auckland (14%) and Brisbane (10%). The jobs represented projects mainly for industries in the ICT (38%), banking, finance and insurance (33%), government (12%) and oil and gas (9%) sectors (see Fig. 2). About a 40% of the jobs were contractual and temporary (3–12 months duration). For temporary contract positions, the salary range was AUD 800–1000 per day (without superannuation). The salary range for a full-time position is between AUD 90–150K. About 20% of the jobs require a specific STEM-related tertiary degree as part of the qualification necessary to apply for the job.

B. Investigation of Market Demand for Competencies

The sample of job advertisements generated 1418 competency codes under the personal, practice and perspective categories. We performed a keyword frequency analysis of the competency codes and developed a word cloud (Fig. 3). Analysis of the weighted percentage (the frequency of the word relative to the total words counted) of keywords shows that the top ten most-used keywords around AgPM competencies are Agile, project, team, Scrum, skill, experience, delivery, teams, management

and communication. The frequency range of the top ten keywords is from 814 to 241, with a weighted frequency of greater than 1%. If we compare the keyword summary (Fig. 3) with the Table 2 competencies, it appears that the market demand analysis of competencies is captured well in our coding and frequency analysis.

C. Analysis of Market Demand for Different Categories of Competencies

We analyzed the frequency of occurrence of the competencies under each category. Competency code frequencies begin at '1' to indicate the presence of these competencies. In our analysis, 148 jobs mentioned practice, 142 jobs personal and 108 jobs Agile perspective competencies. We conducted a cluster analysis of the competency categories to investigate the co-occurrence of two sets of competencies in the same job advertisement. We used NVivo to perform the cluster analysis, assessing the degree of similarity and diversity between the paired sets of competencies with Jaccard's coefficient. The index value is always between 0 (meaning no co-occurrence) and 1 (for co-occurrence). The calculated index between each pair of items allows NVivo to group the items into clusters.

This cluster analysis shows strong demand co-occurrence between the 'practice' and 'personal' categories of competencies, with the highest Jaccard's coefficient value (0.907). There was high co-occurrence between the 'practice' and 'perspective' categories (Jaccard's coefficient 0.673). Competency categories 'personal' and 'perspective' also had showed a high co-occurrence (Jaccard's coefficient 0.655). Fig. 4 shows the cluster dendrogram (third column) of competency categories, where competencies co-occurring less often are shown to co-occur more often further away from each other, categories as close to each other. Overall, it appears that the majority of jobs demand all three competencies, with the most common combinations the 'personal' and 'practice' categories.

In the next step, we analyzed the market demand for all 31 competencies under the three broad categories, and a summary of the analysis is shown in Fig. 5.

1) Personal Competency
In total, nine out of ten jobs indicated requirements for personal competencies for the AgPM position. The AgPM jobs demanded 12 different personal competencies, shown in Fig. 5. Among these, teamwork is the most frequently required (70% of the jobs demand this competency). The second most frequently demanded competency under this group is effective communication. Frequently cited communication skills are verbal, written, presentation, and interpersonal communication. Leadership is the third most popular competency; (33% of jobs sought leadership ability). Other critical personal competencies are problem-solving, self-motivation, time management, self-driven learning, conflict resolution, negotiation, analytical mindset, Agile mindset and self-organization.

2) Agile Practice Competencies:
Clearly, all the AgPM jobs require Agile practice-related competencies. However, the priorities for the competencies under this group varied in the job advertisements. Fig. 5 shows the 13 different Agile practice-related competencies in the market. 'Agile delivery and implementation' is the most frequently required practice competency (64%). AgPMs must be able to lead Agile ceremonies, such as sprint planning, the daily Scrum, sprint reviews and sprint retrospectives. 'Stakeholder management' is the second most commonly required practice competency; 62% of jobs seek this competency. The third most common competency is 'cross-functional focus'; 32% of jobs mention this as one of the critical competencies needed in the AgPM role. Other Agile practice-related competencies are 'change management', 'scope, budget and timeline preparation', 'continuous improvement', 'progress reviewing and reporting' and 'multiple project coordination'.

3) Agile Perspective Competencies
Eight out of ten jobs seek Agile perspective competencies. In total, we identified six different competencies under this category. Agile framework competency (such as Scrum or Kanban) is the most sought-after Agile perspective competency in the market; 42% of jobs require this. Approximately 31% of jobs require fundamental knowledge and understanding of Agile principles, the second most named competency. Other Agile perspective competencies are 'monitor and manage compliance, standards and regulations', 'align Agile work with organization culture and values', 'governance and process' and 'mission and strategic alignment'.

D. Rank Order of Market Demand for Competencies
We analyzed the job market demand frequency of all the competencies and show the overall rank order of the competencies in Fig. 5. The concentration of market demand of the competencies varies between them (from 4.5 to 69.5%). It appears that out of 31 competencies, the top ten are 'teamwork', 'Agile delivery and implementation experience', 'stakeholder management', 'effective communication', 'Agile framework competency', 'leadership', 'cross-functional focus', understanding of Agile principles or methodologies', 'change management' and 'scope, budget and timeline preparation'. Out of this top ten, three are personal, five are practice, and two are Agile perspective competencies.

Fig. 5 displays the frequency of demand for all 31 competencies. The mean frequency of demand was 0.23; the standard deviation was 0.1789, the median was 0.188 and skewness 1.29. Because of the skewness, we focus on the median value instead of the mean. Based on the median frequency data, we further group competencies into three demand groups: 'high demand', 'moderate demand', and 'least demand'. Fig. 6 shows the three groups of competencies based on demand. Competencies whose market demand fell in the range more significant than 'median + 1 standard deviation' (36.72%) are considered high demand; whereas those whose demand fell within 'median or less' (18.8%) are considered least demand competencies. Those with demand levels falling between the ranges: 'greater than the median (18.8%) but less than equal to median + 1 standard deviation' (36.72%) are considered moderate demand competencies.

Out of the 31 competencies, five fell into the 'high demand' group, 11 fell into the 'moderate demand' group, and 15 were found to be in the 'least demand' group. Fig. 6 also shows that

the majority of practice competencies fall within the high and moderate demand groups. In contrast, personal and Agile perspective competencies are largely in the least demand group.

We note that these high-demand competencies are related to PMBOK's project performance domain (such as teamwork, stakeholders, planning, project work, delivery, development and life cycle); principles (such as stewardship, collaborative team environment, engaging stakeholders, focus on value, and tailoring to the context and environment and stakeholder needs); project management methods (such as meeting and events, stakeholder analysis); and artefacts (such as log and register, and plan) [53].

We also conducted a co-occurrence analysis of the 31 competencies and generated a cluster dendrogram, shown in Fig. 7. This showed high-demand competencies co-occurring with a Jaccard's similarity index value in the 0.4–0.5 range. The highest co-occurrences are between 'teamwork' and 'stakeholder management' (Jaccard's coefficient 0.496); 'teamwork' and 'Agile delivery and implementation' (Jaccard's coefficient 0.485); 'stakeholder management' and 'Agile delivery and implementation' (Jaccard's coefficient: 0.473); 'stakeholder management' and 'effective communication' (Jaccard's coefficient: 0.461) and 'teamwork' and 'effective communication'. Among the moderate demand competencies, the following combinations had a 0.353–0.25 co-occurrence rate: 'scope, budget and timeline preparation' and 'progress review'; 'understanding of Agile principles and methodologies' and 'change management'; 'scope, budget and timeline preparation' and 'change management'; 'scope, budget and timeline preparation' and 'quality and customer focus' and 'progress reviewing' and 'change management'. Among the least demanded competencies, none of the combinations had a co-occurrence rate of greater than 0.25.

V. DISCUSSION

This study investigates the research question, 'What do Australian and New Zealand job advertisements signal about AgPM competencies?' Our study identified 31 competencies for AgPM that organizations signaled to the APM labor market. Analysis of the market demand for all 31 competencies demonstrates different concentrations of competency requirements, which can be categorized into 'high demand', 'moderate demand' and 'least demand' groups, according to organizations' priorities in signaling their requirements. The following sections discuss these three different categories of competencies for AgPM and their implications for APM in general.

A. Market Signals for Personal Competencies

The personal competencies are primarily related to AgPM-specific individual-level or people-related characteristics [52]. Most of the key personal competencies emphasize the IPMA competence lists [14] (p 44–47). However, in terms of demand intensity, we identified 12 personal competencies (see Fig. 6), of which teamwork, effective communication and leadership are in moderate and high demand in the market. These behavioural competencies are also critical for project managers

in waterfall methodology [19, 35].

The majority of AgPM jobs require teamwork competencies. In the advertisements, the main language used for teamwork was that AgPM need to 'support, mentor, or coach a team to work around the goals of Agile'; 'motivate teams to continuously increase their performance, support the team in a tough environment' and 'trust the team to achieve project objectives'. AgPM create a collaborative team environment [43] and form self-organizing and self-disciplined teams to generate value [1]. The attributes of these teamwork competencies align with the duties and responsibilities of the AgPM towards the team, as mentioned in the Agile practice guide [1].

AgPM also require a proven ability to communicate with clients, vendors, and project stakeholders. Job advertisement mentioned that AgPM need skills for 'creating and implementing a comprehensive communications plan' to run Agile project activities and that the ability to ensure the correct information is recorded, reported, and distributed in the correct format, to the right people, and in good time remains part of the project manager's role. The above summary of communications skills and abilities aligns with the Agile Manifesto [61], which encourages effective communication for a successful Agile project through regular meetings, verbal communication and instantaneous feedback.

Organizations expect 'Agile leadership' competencies from AgPM. AgPM are expected to show the ability to work as 'servant leaders' or to work as a facilitator with 'excellent adaptive team leadership capabilities'. Job advertisements expect Agile-focused leadership skills to 'foster a continuous improvement culture' and 'resolve impediments', 'coach and mentor' and 'mobilize and motivate' the Agile team to 'set direction' and 'to achieve the project goal'.

It is important to mention that nearly two-thirds of personal competencies fell into the least demand group. The least demanded competencies are (in descending order) self-organization, analytical mindset, Agile mindset, negotiation, self-learning ability, conflict resolution capacity, time management, self-motivated and problem-solving.

These findings are relevant to our examination of the market signals for AgPM through job advertisements because they present us with an approximation of the competencies required of AgPM in the industry. The signaled demands report on required personal competencies AgPM can acquire and develop for APM roles in the industry. These findings on personal competencies are consistent with the role of a project manager in APM [17, 25]. Additionally, personal competencies such as teamwork, effective communication and leadership, are also required by traditional project managers, as reflected by professional body documents [52] and the project management literature [19, 35]. However, our analysis shows that these personal competencies (teamwork, effective communication and leadership) must be customized for Agile projects in the APM environment.

B. Market Signals for Practice Competencies

Practice competencies are related to how project managers

accomplish projects activities by applying their knowledge and individual skills [52]. Practice competencies support the project to accomplish performance. We identified 13 different AgPM practice competencies (see Fig. 6) under the high and moderate demand groups. In other words, organizations signal more practice competencies to manage the essential key project performance of PMBOK (stakeholder management, development and life cycle, project work, delivery, measurement, and uncertainty domain) [53].

The market demand frequency of the practice competencies shows that Agile project implementation and delivery, and stakeholder management are the two high-demand practice competencies identified from the job market. An important implication from identifying practice competencies is that organizations are signaling that they require AgPMs with proven experience in implementing and delivering Agile projects, which is about planning, controlling, and coordinating project delivery work. The advertisements emphasized proven skills and experience in the end-to-end execution of Agile methodologies. Organizations expect AgPM to have the skills to lead end-to-end execution of Agile methodologies and facilitate Agile ceremonies. For example, Scrum includes several ceremonies and end-to-end processes that are essential practices for implementing Agile methods [1]. Organizations require managers to facilitate Scrum ceremonies, and particularly to be skilled in coordinating project meetings and events, such as daily stand-ups, iteration review, iteration planning, and to plan, manage, log and register artefacts such as the iteration plan, release plan, scope management plan, backlog, changelog, and assumption log. AgPM may also be responsible for facilitating Agile ceremonies in multiple projects.

There is a high demand for stakeholder management skills. AgPMs should have the skills and ability to manage stakeholders such as the Scrum team, the product owner, the end-user, the client, and the organizational units. AgPM require the skills to educate stakeholders on Agile practices and engage them more frequently in every project iteration. Market signals also highlight that AgPM must be capable of establishing an intensive, direct and continuous collaboration with stakeholders. At each iteration, through stakeholder management, an AgPM is expected to ensure a positive work environment for the team and to ensure the final project will be accepted.

More than two-thirds of the practice category competencies are moderate demand. According to their importance, the moderate demand practice competencies are cross-functional focus; change management; scope, budget and timeline preparation; progress reviewing and reporting; continuous improvement; work with the product owner to maintain backlog; quality and customer focus; remove organizational impediments and risk management. This further suggests that organizations recognize the dynamic nature of APM. When contrasted with the two practice competencies of the low demand group ('multiple (Agile) project coordination' and 'project delivery within time, budget and quality'), the practice competencies signal suggest that traditional project

management pressures do not play an essential role in APM, as these practice competencies signal the coordination and control imperative. One possible explanation is that as APM predominates in industry, philosophical changes to APM (such as self-organization and delivering value over costs) may still lag practice in the industry. However, this is speculative, and future work will need to address the dissemination of APM philosophies.

C. Market Signals for Perspective Competencies

Perspective competencies address how an AgPM adopts an Agile strategy, frameworks and standards and ensures compliance, standards and regulations in an organizational setting. Agile perspective competencies are the least signaled in this study (see Fig. 6). Among these competencies, only 'Agile framework competency' and 'understanding of Agile principles and methodologies' are in high and moderate demand.

AgPM require proven knowledge and experience through certification of their Agile framework competency. The market signal for this competency shows that there are strong requirements for Agile certification for AgPM. As proof of competency, job advertisements are seeking APM accreditation or certification such as Certified Scrum Master (CSM), Professional Scrum Master (PSM), PMI-Agile Certified Professional (ACP), scalable Agile frameworks (SAFe). APM is an umbrella term, with many Agile frameworks sharing common values and principles of managing teams and projects [13]. Hence, AgPM job seekers can focus on framework certification to be competitive in the market.

AgPM require a demonstrable understanding of Agile principles to guide, facilitate and support a team to work within an Agile framework. Nearly one-third of jobs signal knowledge and understanding of Agile principles and methodologies. Job advertisements strongly emphasized methodological knowledge of Agile approaches; including, but not limited to, Scrum, Kanban, and XP. Job advertisements quoted specific competencies such as 'expert-level knowledge of Scrum theory and practices', 'deep working knowledge of Agile delivery and frameworks', 'knowledge of Agile rituals' and 'excellent knowledge in the application of Agile and lean approaches'.

VI. CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

Our study examines organizational expectations of the competencies required for the AgPM role. Using the existing categories of Agile project competencies [14], we analyze AgPM job advertisements to investigate job market demands. We highlight the organizations' signals on 'high demand' AgPM competencies and how they link with the PMI's latest PMBOK project performance domain, principles, project management methods and artefacts [53].

Through qualitative and quantitative analysis, we answered what job advertisements signal about AgPM competencies; in other words, we identified a direct competency requirement communication between employers and AgPM job candidates. Concerning our first research objective, this study's use of qualitative content analysis allowed us to explore insights into the latent content of unstructured job advertisement texts. We

examined real-world labor market demands on AgPM competencies by exploring job advertisement textual data. The qualitative analysis of online job advertisements helps us to explore what and how employers stipulate specific competencies for the AgPM role. We employed a quantitative content analysis approach to empirically investigate the patterns relating to market signal through the frequency of each competency, word cloud of competencies, rank-order of competencies in-demand, cluster analysis of competencies, and related descriptive statistical analysis to group competencies. Our results demonstrated the criticality of market demand competencies for the AgPM role, highlighting the hierarchy of signals (high, medium, and low demand) broadcasted in job advertisements. Additionally, the inclusion of quantitative analysis also ensured the semantic validity of the results explaining how and to what extent market demand of competencies are emphasized and related to each other. This multi-prong approach to answering the research question offers a more rigorous analysis of the multidimensional and complex phenomena of AgPM competency signals in industry [11].

Our findings reveal that organizations highlight personal and practice-related competencies more than perspective competencies for their APM. Co-occurrence analysis shows that most of these highly demanded competencies are required by jobs concurrently. This demand commonality is observed between teamwork, stakeholder management, Agile delivery and implementation and practical communication competencies.

This study is one of the first attempts in the APM literature to conduct an in-depth empirical analysis of the market signals regarding AgPM competencies based on market signal (job advertisement) information. Our main findings show that organizations' signals regarding desirable competencies to potential AgPM candidates are specific and have meaning for the existing project management literature and professional body guidelines such as the PMBOK [53] and Agile guides [1, 14]. By identifying categories of competencies for AgPM based on Agile literature and industry reference guidelines [14], we have detailed the competencies required by AgPM. Although scholars have debated the role of project managers in APM [9, 11], this study provides an empirical grounding on the specific competencies for the AgPM role in industry, based on type and intensity of demand.

These findings have important practical implications for the organizational and institutional-level outcomes of APM. From an organizational level, identifying AgPM competencies to run and manage Agile projects implies that organizations employ project managers to play a significant role in managing Agile project teams, stakeholders, and the project itself, often with a broad list of required competencies. These competencies have implications for recruiting organizations seeking AgPMs. First, these findings provide a valuable framework for understanding which competencies can signal the required human capital for successful APM [49]. Often there is a lack of information about the skills that are in demand in the market; employers are sometimes unable to determine what characteristics and skills they are looking for in potential AgPM. Thus, our study enables

organizations to better understand the basis of their AgPM advertising and the signals they wish to impart to the labor market. Our findings on the market demand for competencies can help employers prepare for potential job roles/descriptions and re-skill their existing or potential AgPM to deal with changes in the workplace due to technological and digital transformation through Agile projects. Second, from a development point of view, these signals demonstrate the AgPM competencies that are valued by organizations [62].

From an institutional perspective, the APM movement could now consider whether these frequently used and co-occurring competencies are signaling the full scope of competencies required for AgPM. For example, as APM grows in popularity in mainstream industries, should the APM movement actively champion less-signaled competencies, such as the perspective competencies, to deliver a more effective APM and AgPM framework for organizations? Our findings also reveal what organizations consider the potential professional norms for AgPM competencies. The APM movement can develop these competencies into a more comprehensive career and certification frameworks. Through integrating the historical professional development and existing AgPM competency frameworks, this research has provided an insight into the emergence and evolution of AgPM competencies, useful for further theoretical development and assessment.

Additionally, the research output can provide a market signal regarding the critical competencies for AgPMs and APM. This will allow potential AgPM to identify and develop the required competencies signaled by employer organizations. By shining a light on the demand-side and supply-side implications, our findings allow organizations and individuals working as AgPM to be strategic about their human resource management and their performance [18].

Finally, our study has certain limitations. We note that our data collection spans seven months during a pandemic that may have affected the number and types of APM roles advertised. However, we think that this does not impact the quality the study, for three main reasons. First, compared to the more established traditional project manager job advertisements, the number of AgPM job advertisements is smaller, but growing, in the Australasian job market. Other studies of emergent roles and professions have investigated similar or smaller sample sizes [63-66]. Second, our research objective was to content-analyse these job advertisements, therefore the theoretical saturation of content and scope of meaning formed the basis of the analysis, rather than a statistical generalisation. Lastly, as we only examined already adopted competencies, we think that this lower number of job advertisements will not affect the market signal from the advertisements we examined. Additionally, we have noted in our findings that although we highlight what organisations signal as necessary AgPM competencies, there is a dearth of systematic studies examining the competencies required for successful Agile projects in the literature [9, 67].

Although AgPM can develop and increase their potential attractiveness by having these competencies, further research is required for determining the competencies that lead to

successful completion of projects. Such research will benefit the APM movement and its dissemination through other industries. Finally, perspective competencies such as 'working on the mission and strategic alignment', and 'governance and process' are rarely mentioned in the job's advertisements. Perhaps future research can explore how AgPM can be involved more in Agile perspectives such as strategy, governance, regulations, culture, and values.

REFERENCES

[1] PMI, *Agile Practice Guide, Project Management Institute and Agile Alliance*. USA: Project Management Institute, Inc., 2017.

[2] VersionOne, "12th annual state of agile report," 2018. Accessed: December 2021. [Online]. Available: https://www.versionone.com/about/press-releases/12th-annual-state-of-agile-survey-open/

[3] P. Rostami and M. Neshati, "T-shaped grouping: Expert finding models to agile software teams retrieval," *Expert Systems with Applications,* vol. 118, pp. 231-245, 2019, doi: 10.1016/j.eswa.2018.10.015.

[4] M. W. Ho and K. Ahsan, "Agile Project Manager Competencies: Insights from Job Advertisements," in *Academy of Management Proceedings*, 2021, vol. 2021, no. 1: Academy of Management Briarcliff Manor, NY 10510, p. 12613.

[5] Busineswire, "14th Annual State of Agile Report " Business Wire, May 28 2020. Accessed: March 2022. [Online]. Available: https://www.businesswire.com/news/home/20200528005097/en/14th-Annual-State-Agile-Report-Shows-60

[6] X. Ju, F. A. Ferreira, and M. Wang, "Innovation, agile project management and firm performance in a public sector-dominated economy: Empirical evidence from high-tech small and medium-sized enterprises in China," *Socio-Economic Planning Sciences,* vol. 72, p. 100779, 2020, doi: 10.1016/j.seps.2019.100779.

[7] C. W. Butler, L. R. Vijayasarathy, and N. Roberts, "Managing Software Development Projects for Success: Aligning Plan- and Agility-Based Approaches to Project Complexity and Project Dynamism," *Project Management Journal,* vol. 51, no. 3, pp. 262-277, 2019, doi: 0.1177/8756972819848.

[8] P. Serrador and J. K. Pinto, "Does Agile work?—A quantitative analysis of agile project success," *International Journal of Project Management,* vol. 33, no. 5, pp. 1040-1051, 2015, doi: 10.1016/j.ijproman.2015.01.006.

[9] A. Cockburn and J. Highsmith, "Agile software development, the people factor," *Computer,* vol. 34, no. 11, pp. 131-133, 2001, doi: 10.1109/2.963450.

[10] J. McAvoy and T. Butler, "The role of project management in ineffective decision making within Agile software development projects," *European Journal of Information Systems,* vol. 18, no. 4, pp. 372-383, 2009, doi: 10.1057/ejis.2009.22.

[11] R. Hoda and L. K. Murugesan, "Multi-level agile project management challenges: A self-organizing team perspective," *Journal of Systems and Software,* vol. 117, pp. 245-257, 2016, doi: 10.1016/j.jss.2016.02.049.

[12] S. Pfeiffer, S. Sauer, and T. Ritter, "Agile methods as stress management tools? an empirical study," *Work Organisation, Labour & Globalisation,* vol. 13, no. 2, pp. 20-36, 2019.

[13] B. Hobbs and Y. Petit, "Agile methods on large projects in large organizations," *Project Management Journal,* vol. 48, no. 3, pp. 3-19, 2017, doi: 10.1177/875697281704800301.

[14] IPMA, *IPMA Reference Guide ICB4 in an Agile World Version 1.0*. International Project Management Association (IPMA), 2018.

[15] K. J. Taylor, "Adopting Agile software development: the project manager experience," *Information Technology & People,* vol. 29, no. 4, pp. 670-687, 2016, doi: 10.1108/ITP-02-2014-0031.

[16] Y. Shastri, R. Hoda, and R. Amor, "Understanding the roles of the manager in agile project management," in *Proceedings of the 10th Innovations in Software Engineering Conference*, 2017: ACM, pp. 45-55, doi: 10.1145/3021460.3021465.

[17] Y. Shastri, R. Hoda, and R. Amor, "The role of the project manager in agile software development projects," *Journal of Systems and Software,* vol. 173, p. 110871, 2021, doi: 10.1016/j.jss.2020.110871.

[18] E. Zavyalova, D. Sokolov, and A. Lisovskaya, "Agile vs traditional project management approaches: Comparing human resource management architectures," *International Journal of Organizational Analysis,* vol. 28, no. 5, pp. 1095-1112, 2020, doi: 10.1108/IJOA-08-2019-1857.

[19] K. Ahsan, M. Ho, and S. Khan, "Recruiting Project Managers: A Comparative Analysis of Competencies and Recruitment Signals from Job Advertisements," *Project Management Journal,* vol. 44, no. 5, pp. 36-54, 2013, doi: 10.1002/pmj.21366.

[20] D. E. Guest, K. Sanders, R. Rodrigues, and T. Oliveira, "Signalling theory as a framework for analysing human resource management processes and integrating human resource attribution theories: A conceptual analysis and empirical exploration," *Human Resource Management Journal,* vol. 31, no. 3, pp. 796-818, 2021, doi: 10.1111/1748-8583.12326.

[21] K. Krippendorff, *Content analysis: An introduction to its methodology*. Sage publications, 2018.

[22] S. Elo, M. Kääriäinen, O. Kanste, T. Pölkki, K. Utriainen, and H. Kyngäs, "Qualitative Content Analysis," *SAGE Open,* vol. 4, no. 1, pp. 1-10, 2014, doi: 10.1177/2158244014522633.

[23] V. J. Duriau, R. K. Reger, and M. D. Pfarrer, "A content analysis of the content analysis literature in organization studies: Research themes, data sources, and methodological refinements," *Organizational*

Research Methods, vol. 10, no. 1, pp. 5-34, 2007, doi: 10.1177/1094428106289252.

[24] A. Celani and P. Singh, "Signaling theory and applicant attraction outcomes," *Personnel Review,* vol. 40, no. 2, pp. 222-238, 2011, doi: 10.1108/00483481111106093.

[25] E. C. Conforto, F. Salum, D. C. Amaral, S. L. Da Silva, and L. F. M. De Almeida, "Can agile project management be adopted by industries other than software development?," *Project Management Journal,* vol. 45, no. 3, pp. 21-34, 2014, doi: 10.1002/pmj.21410.

[26] S. Gjøystdal and T. Karunaratne, "Effect of Inadequate Self-Organized Teams in Agile Project Management: A Case Study From the Oil and Gas Industry," *International Journal of Information Technology Project Management,* vol. 11, no. 3, pp. 95-106, 2020, doi: 10.4018/IJITPM.2020070106.

[27] A. Ribeiro and L. Domingues, "Acceptance of an agile methodology in the public sector," *Procedia Computer Science,* vol. 138, pp. 621-629, 2018, doi: 10.1016/j.procs.2018.10.083.

[28] T. Dybå and T. Dingsøyr, "Empirical studies of agile software development: A systematic review," *Information and Software Technology,* vol. 50, no. 9-10, pp. 833--859, 2008, doi: 10.1016/j.infsof.2008.01.006.

[29] M. Poppendieck and T. Poppendieck, *Lean software development: an agile toolkit.* Addison-Wesley, 2003.

[30] K. Schwaber and M. Beedle, *Agile software development with Scrum.* Prentice Hall Upper Saddle River, 2002.

[31] K. Beck, *Extreme programming eXplained: embrace change* MA: Addison-Wesley, 1999.

[32] M. Bowles, N. Bowes, and P. Wilson, "Future-proof human capabilities: Raising the future employability of graduates," *International Journal of Business and Social Science,* vol. 10, no. 11, pp. 18-29, 2019, doi: 10.30845/ijbss.v10n9p2.

[33] R. J. Mirabile, "Everything you wanted to know about competency modeling," *Training & Development,* vol. 51, no. 8, pp. 73-78, 1997.

[34] S. M. Takey and M. M. de Carvalho, "Competency mapping in project management: An action research study in an engineering company," *International Journal of Project Management,* vol. 33, no. 4, pp. 784-796, 2015, doi: 0.1016/j.ijproman.2014.10.013.

[35] J. W. S. P. do Vale, B. Nunes, and M. M. de Carvalho, "Project managers' competences: what do job advertisements and the academic literature say?," *Project Management Journal,* vol. 49, no. 3, pp. 82-97, 2018, doi: 10.1177/8756972818770884.

[36] M. Chipulu, J. G. Neoh, U. Ojiako, and T. Williams, "A multidimensional analysis of project manager competences," *IEEE Transactions on Engineering Management,* vol. 60, no. 3, pp. 506-517, 2012, doi: 10.1109/TEM.2012.2215330.

[37] P. M. Wright and G. C. McMahan, "Theoretical perspectives for strategic human resource management," *Journal of Management,* vol. 18, no. 2, pp. 295-320, 1992, doi: 10.1177/014920639201800205.

[38] S. Keller and M. Meaney, "Successfully transitioning to new leadership roles," *McKinsey Quarterly,* 2018.

[39] Y. Choi and E. Rasmussen, "What qualifications and skills are important for digital librarian positions in academic libraries? A job advertisement analysis," *The Journal of Academic Librarianship,* vol. 35, no. 5, pp. 457-467, 2009, doi: 10.1016/j.acalib.2009.06.003.

[40] M. Spence, "Job market signaling," in *Uncertainty in Economics*, 1978, pp. 281-306.

[41] K. Moore and M. H. Khan, "Signalling organizational commitment to employability through job advertisements: the communication of HRD practices to young inexperienced job seekers," *Human Resource Development International,* vol. 23, no. 1, pp. 25-45, 2019, doi: 10.1080/13678868.2019.1679569.

[42] T. Ashuri and Y. Bar-Ilan, "Collective action recruitment in a digital age: Applying signaling theory to filtering behaviors," *Communication Theory,* vol. 27, no. 1, pp. 70-91, 2017, doi: 10.1111/comt.12108.

[43] D. M. Cable and D. B. Turban, "The value of organizational reputation in the recruitment context: A brand-equity perspective," *Journal of Applied Social Psychology,* vol. 33, no. 11, pp. 2244-2266, 2003, doi: 10.1111/j.1559-1816.2003.tb01883.x.

[44] A. Mahjoub and P. M. Kruyen, "Efficient recruitment with effective job advertisement: an exploratory literature review and research agenda," *International Journal of Organization Theory & Behavior,* vol. 24, no. 2, pp. 107-125, 2021, doi: 10.1108/IJOTB-04-2020-0052/full/html.

[45] C. B. Cadsby, M. Frank, and V. Maksimovic, "Pooling, separating, and semiseparating equilibria in financial markets: Some experimental evidence," *The Review of Financial Studies,* vol. 3, no. 3, pp. 315-342, 1990, doi: 10.1093/rfs/3.3.315.

[46] M. Ho and S. Teo, "The state of human resource (HR) competency research: Charting the research development of HR competencies and examining the signals from industry in New Zealand," *New Zealand Journal of Employment Relations,* vol. 40, no. 2, pp. 72-89, 2015, doi: 10.3316/informit.778396504261375.

[47] I. Kregel, N. Ogonek, and B. Matthies, "Competency profiles for lean professionals–an international perspective," *International Journal of Productivity and Performance Management,* 2019, doi: 10.1108/IJPPM-09-2017-0237.

[48] M. Chipulu *et al.*, "Building cultural intelligence: insights from project management job advertisements," *Production Planning & Control,* vol. 27, no. 3, pp. 133-147, 2016, doi: 10.1080/09537287.2015.1083623 CrossMark LogoCrossMark.

[49] J. Koch and C. C. Schermuly, "Who is attracted and why? How agile project management influences employee's attraction and commitment," *International Journal of Managing Projects in Business,* vol. 14, no. 3, pp. 699-720, 2021, doi: 10.1108/IJMPB-02-2020-0063.

[50] P. W. Morris, L. Crawford, D. Hodgson, M. M. Shepherd, and J. Thomas, "Exploring the role of formal bodies of knowledge in defining a profession– The case of project management," *International Journal of Project Management,* vol. 24, no. 8, pp. 710-721, 2006, doi: 10.1016/j.ijproman.2006.09.012.

[51] S. E. Jackson, R. S. Schuler, and S. Werner, *Managing human resources*. South-Western Cengage Learning Mason, OH, 2009.

[52] PMI, *Project Manager Competency Development (PMCD) Framework*, 3rd ed. Project Management Institute, Inc., 2017.

[53] PMI, *A guide to the project management body of knowledge (PMBOK® Guide) 7th Ed.*, 7th ed. Pennsylvania, USA: Project Management Institute, Inc., 2021.

[54] PMI, "Project Management Professional (PMP)® Examination Content Outline," Project Management Institute, Inc., USA, January 2021. [Online]. Available: https://www.pmi.org/certifications/project-management-pmp/earn-the-pmp/pmp-exam-preparation/pmp-exam-updates

[55] J. A. Rios, G. Ling, R. Pugh, D. Becker, and A. Bacall, "Identifying critical 21st-century skills for workplace success: A content analysis of job advertisements," *Educational Researcher,* vol. 49, no. 2, pp. 80-89, 2020, doi: 10.3102/0013189X19890600.

[56] P. Mayring, "Qualitative content analysis: Theoretical background and procedures," in *Approaches to Qualitative Research in Mathematics Education*: Springer, 2015, pp. 365-380.

[57] A. Gardiner, C. Aasheim, P. Rutner, and S. Williams, "Skill requirements in big data: A content analysis of job advertisements," *Journal of Computer Information Systems,* vol. 58, no. 4, pp. 374-384, 2018, doi: 10.1080/08874417.2017.1289354.

[58] SEEK. "SEEK Employment Report- Job growth continues into 2018." https://www.seek.com.au/about/news/job-growth-continues-into-2018 (accessed December 2020).

[59] M. Schreier, *Content analysis, qualitative*. SAGE Publications Limited, 2020.

[60] M. B. Miles, A. M. Huberman, and J. Saldaña, *Qualitative data analysis: A methods sourcebook*. Sage publications, 2018.

[61] K. Beck *et al.*, "Manifesto for Agile Software Development," 2020. Accessed: November 2021. [Online]. Available: www.agilemanifesto.org

[62] A. López-Alcarria, A. Olivares-Vicente, and F. Poza-Vilches, "A systematic review of the use of agile methodologies in education to foster sustainability competencies," *Sustainability,* vol. 11, no. 10, p. 2915, 2019, doi: 10.3390/su11102915.

[63] S. Sohal and H. Kaur, "A content analysis of YouTube political advertisements: evidence from Indian parliamentary elections," *Journal of Creative Communications,* vol. 13, no. 2, pp. 133-156, 2018, doi: 10.1177/0973258618761408.

[64] H. C. Perrin, "What are employers looking for in new veterinary graduates? A content analysis of UK veterinary job advertisements," *Journal of Veterinary Medical Education,* vol. 46, no. 1, pp. 21-27, 2019, doi: 10.3138/jvme.0317-045r.

[65] J. Dobroszek, "Supply chain and logistics controller– two promising professions for supporting transparency in supply chain management," *Supply Chain Management: An International Journal,* vol. 25, no. 5, pp. 505-519, 2020, doi: 10.1108/SCM-04-2019-0169.

[66] P. Puncheva-Michelotti, S. Hudson, and G. Jin, "Employer branding and CSR communication in online recruitment advertising," *Business Horizons,* vol. 61, no. 4, pp. 643-651, 2018, doi: 10.1016/j.bushor.2018.04.003.

[67] S. Matook and L. M. Maruping, "A competency model for customer representatives in agile software development projects," *MIS Quarterly Executive,* vol. 13, no. 2, 2014.

Kamrul Ahsan, received the Ph.D. degree in project management from Tokyo Institute of Technology, Japan, in 2003. He is currently an Associate Professor with Supply Chain and Logistics Department, College of Business and Law, RMIT University, Melbourne, Australia. He has authored or coauthored research papers in academic journals such as *International Journal of Project Management, Project Management Journal, Journal of Management in Engineering, Journal of Cleaner Production, International Journal of Logistics Management*, and *International Journal of Physical Distribution & Logistics Management*. He has been increasingly recognized by the research and professional community and has received several prestigious awards and scholarships such as the Project Management Institution New Zealand (PMINZ) research achievement award 2011.
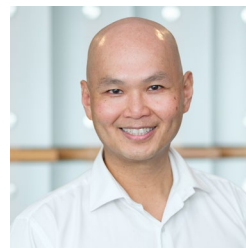
Marcus Ho is a senior lecturer in human resource management (HRM) and entrepreneurship at Auckland University of Technology Business School in Auckland, New Zealand. He has a Ph. D. from the University of Auckland Business School and has worked in industry as an HR consultant and organizational psychologist. He has published in international leading journals such as P*ersonnel Review*, *International Journal of Human*

Resource Management, and *Entrepreneurship: Theory and Practice*.

TABLE 1
CONCEPTUAL FRAMEWORK OF APM COMPETENCIES

Competency category or theme	Brief explanation	IPMA competency indicators or sub-themes	Agile Manifesto values	PMBOK principles and performance
Personal	Personal competency describes people skills: core personal abilities or behaviours and attitudes in the social arena that allow individuals to function in an organisational setting when performing project activities [14].	• self-reflection and self-management • personal integrity and reliability • personal communication • relationship and engagement • leadership • teamwork • conflict and crisis • resourcefulness or problem-solving • negotiation • result orientation	• individuals and interactions over process and tools • customer collaboration • working software over comprehensive documentation	Team, project work, leadership, stewardship.
Project practice	Practice competencies include project management performance and practice-related competencies, explaining how knowledge, skills, and abilities allow individuals to meet project requirements for effective delivery of project outcomes [14, 53].	• design • goals and requirements • scope • time • organisations and information • quality • finance • procurement • plan and control • risk and opportunity • stakeholders • change and transformation	• customer collaboration • responding to change	Stakeholder, planning and control, quality, development approach and life cycle, change, navigate complexity, delivery, measurement, uncertainty, and project work
Agile perspective	Agile perspectives are related to individual's knowledge, understanding, and justification of the Agile approach, and how an individual is working in adopting Agile strategy, frameworks, and standards, and ensuring compliance, standards and regulations in an organisational setting [14].	• strategy • governance and process • compliance, standards and regulations • power and interest • value and culture	• individuals and interactions over process and tools • working software over comprehensive documentation	Development approach and life cycle, systems thinking, adoptability, tailoring, delivery

TABLE 2:
DEVELOPMENT OF MARKET FOCUS COMPETENCY DICTIONARY AND EXAMPLE OF JOB ADVERTISEMENT CONTENTS

Category (Theme)	Sub-theme or competency indicators (link with IPMA)	Sub-theme definition	Job advertisement excerpts
Personal (12)	Self-organisation (self-reflection and self-management)	Organise personal work depending on the situation and own resources [14].	Ability to self-organise and ask questions confidently; encouraging self-organisation; work well with minimal supervision
	Self-motivated (self-reflection and self-management)	Identify and reflect on personal motivations to set goals and keep focus [14].	Strong self-motivation, discipline and charismatic self-starter; enthusiastic, and full of personal drive; highly motivated individual; motivated under pressure
	Effective communication (personal communication; stakeholders)	Effectively exchanges accurate, appropriate and relevant information with stakeholders using suitable methods [14, 52].	Excellent communication skills; clearly articulate message to variety of audiences; presentation skills; verbal communication skills; written communication skills
	Teamwork (teamwork)	Address activities and functions (such as supporting, management and development) associated with the people who are producing project deliverables [14, 53].	Support and manage a team in a tough environment; facilitate or coach a team; ensure an environment where team member can work well
	Leadership (leadership; development approach and life cycle)	Ability to guide, inspire, delegate and motivate team members and other project stakeholders to manage and overcome issues to achieve project objectives and values [14, 53].	Lead the work of multiple cross-functional teams; know when to be hands-off; supportive or directive, inspiring others to strive for excellence; set direction; work as a servant leader; adaptive team leadership; coach, mentor and motivate the team
	Conflict resolution (conflict and crisis)	The ability to identify, surface and solve conflicts involving the project team or stakeholders in a way that is conducive to both progress and good team dynamics [14].	Ability to manage conflicting agendas and navigate political situations; possesses conflict resolution ability, communicates focusing on Scrum values of openness, honesty, and respect; comfortable resolving conflict and facilitating discussion on alternative approaches
	Negotiation (negotiation)	The ability to explore the interests and needs of others and propose solutions that increase benefits for all parties involved [14, 52].	Negotiate with stakeholders to protect the team from external influences impacting their ability to meet the agreed goals
	Self-learning ability (self-reflection and self-management)	Ability and willingness to take responsibility for personal learning and development both within and outside formal learning programs [14].	Track record of continuous learning in Agile; developing a learning mindset that fosters a healthy team culture; strong appetite to learn
	Analytical mindset (resourcefulness)	Ability to apply logical and critical thinking to analyzing situations, financial and organisational data and trends to find alternatives and solutions [14].	Analytical and numerical interpretation and conceptual thinking skills; technical mind; strong analytical skills, investigative and troubleshooting skills
	Agile mindset (resourcefulness)	Individual's attitude or ability or awareness or point of view to work iteratively continually to create an effective solution swiftly and to constantly improve and adapt in changing circumstances [14].	Has an Agile mindset; ability to think quickly and manage issues under pressure; promote Agile mindsets, values and behaviours; helping teams to adopt Agile mindset; exhibit lean-agile behaviours and mindset

	Problem-solving (resourcefulness)	Ability to solve project-related problems in an iterative process to redefine problems, identify possible strategies and solutions to understand customer needs [14].	A creative problem solver; solving client challenges; approaching problems with curiosity and open mindedness; skills in analysis and problem-solving; logical and structured problem-solving skills
	Time management (self-reflection and self-management)	Awareness of pace of work, and the ability to identify urgent and important activities, choose the most efficient way to perform the work required to manage the timely completion of the project within workable stress levels [14].	Work completed in a timely manner; high-level time management skills with the ability to prioritise multiple pieces of work according to their importance
Practice (13)	Scope, budget and timeline preparation (scope, time, finance, and plan)	Ability to define project scope, identify and sequence the tasks needed to achieve a certain goal, assign deadlines and responsibilities, plan project budget [14].	Assist in the creation of budgets and timelines; planning, scheduling, and managing projects; understanding the planning and delivery of projects; establish a project timeline/activity sequencing and tasks to build required schedule
	Progress reviewing and reporting (scope, time, finance, plan and control)	Activities measuring project performance (of time and costs and value) such as measuring progress, reporting progress to stakeholders, and implementing appropriate responses [53].	Solid experience in reporting, budget, risk and issue management; preparing the project plan and communicating milestones; excellent skills in budget tracking and complex cost benefit analysis; establishing formal reporting arrangements for project progress; monitor sprint progress; taking proactive measures to achieve deadlines and objectives
	Delivery within time, budget and quality (scope, time, finance, plan and control)	Ability to complete and close Agile work on time, within budget and maintain quality [14].	Demonstrated experience delivering projects and solutions on time and on budget; release value on time using Agile methodology; proven track record in the continued optimisation of the project release schedule; known for on time, on budget deliverables; facilitate a delivery environment to release value on time; history of meeting challenging timelines
	Stakeholder management (stakeholders)	Establish and maintain strong, collaborative and productive working relationships with stakeholders in project decision-making and implementation [14].	Aligning the stakeholders into a team; engaging stakeholders throughout the Agile process; conducting training sessions with stakeholders; coach external stakeholders on the benefits of a lean, Agile framework
	Cross-functional focus (organisation and information)	Ability to develop and maintain a strong work relationship (closely) with a diverse range of stakeholders from different functional units of an organisation to identify cross-functional dependencies, resources and risks [14, 53].	Experience in developing and maintaining strong relationships across business; lead an Agile cross-functional team; cross-functional experience; experience managing multi-functional teams across business analysis; collaborate and effectively co-ordinate across functions
	Risk management (risk and opportunity)	Tailor the risk management frameworks for Agile work. Conduct activities such as risk management planning, identification, analysis, response planning and controlling risk [14].	Identify and manage risks and issues across all projects related areas including budgets; facilitating the ownership and active management of risks and dependencies; tracking project risks and issues through to resolution; effectively analyse and develop mitigation plans for any significant potential risks
	Continuous improvement (CI) (change and transformation)	Skills to continuously adapt to the changing circumstances of the environment for delivering the desired outcomes of the project and to gain a competitive advantage for customers [14].	CI and champion for ongoing process improvement initiatives; commitment to ongoing quality and CI; use of CI techniques to remove bottlenecks and drive performance; challenge the standard in the organisation's processes and procedures to drive CI

	Agile delivery and implementation lead (plan and control)	Lead implementation of Agile methodologies in delivery of Agile work [14].	Demonstrated experience in introducing and driving Agile methodologies and processes; recommend, agree and administer an appropriate delivery approach; experience in Agile delivery; plan and manage the delivery roadmap and execution; lead the delivery of projects making use of Agile techniques
	Work with the product owner to maintain a backlog (scope or goals and requirements)	Ability to work with the product owner to check the scope what teams deliver and maintain the list of all the project work and continuously refine the list based on progress [1, 14].	Assist the product owner to plan delivery based on the selected approach and available team capacity; work with business leaders to develop high-level backlog
	Remove organisational impediments (plan and control)	The ability to remove impediments (non-value-added activities, those obstructing the project) related to the organisational processes, methods and practices and make them as efficient and effective as possible [14].	Foresee the issues before it arises; find additional resources to remove impediments and distractions from the team; technical and functional knowledge to remove roadblocks; communicates and collaborates with stakeholders to assist the team to remove impediments
	Change management (change and transformation)	Plan and manage changes (such as organisational policies, ways of working, mindset, reporting structure and attitude) successfully for the transition from predictive development approaches to adaptive approaches [14, 53].	Managing project change, client expectations and mitigation of variance; develop change management plans; managing change requests when appropriate; significant experience in changing waterfall to Agile techniques; ability to influence change through sharing innovative and creative ideas; ability to change priorities in response to business needs
	Multiple projects coordination (plan and control)	Experience in prioritising, managing and tracking multiple Agile projects at one time[14, 53].	Demonstrated success in leading multiple concurrent projects; ability to effectively work across multiple projects and teams; engage multiple projects; lead delivery of multiple projects; work across multiple small/medium sized application projects; co-ordinate multiple projects of various sizes
	Quality and customer focus (quality)	Addresses activities and functions associated with delivering the scope and quality to meet project requirements and client's expectation throughout the Agile activities [52, 53].	Ensuring deliverables are up to quality standards at the end of each sprint; ensure quality in Agile activities; proven track record in the frequent delivery of high-quality releases; understanding the customer's problems; high customer and delivery orientation
Agile perspective (6)	Understanding of Agile principles and methodologies (governance, structure and process)	Know the principles and methods of Agile work [1, 14].	Methodological knowledge of Agile approaches such as Scrum/Kanban/theory of constraint; expert-level knowledge of Scrum theory; strong knowledge of Agile ceremonies, principles, and tools
	Agile framework competency (compliance, standards and regulations)	Knowledge of, and competency in, the Agile framework to ensure that the work complies with professional standards[14].	Having proven experience in frameworks such as Scrum and tools such as Jira /Confluence; Certification of competencies in APM such as Certified Scrum Master (CSM), Professional Scrum Master (PSM), PMI-Agile Certified Professional (ACP)
	Governance and process skills (governance, structure and process)	Align the Agile work with supporting functions of the organisation and the organisation's decision-making, control process and functions and reporting structures [14].	Experience in executing governance; align project scope to maximise resourcing; give feedback for development purposes and provide support as required; knowledge of the organisation's core business process and operations; providing leadership in matters of governance and probity

|		
Align Agile work with organisation culture and values (culture and values)	Promote and align Agile values, principles and practices with organisational culture and values [14].	Promoting an Agile culture across the organisation; a champion of Agile practice; support and promote Agile values, principles and practices; drive an Agile organisational culture to deliver the best; create and maintain an Agile culture of creativity
Mission and strategic alignment (strategy)	Identify and exploit opportunities to influence the organisational mission and strategy[14].	Engage and align people with our mission, vision, strategy and values; interpreting the organisations vision and translating it into a realistic roadmap; adopt appropriate management strategies to maintain high levels of motivation and productivity
Monitor and manage compliance, standards, and regulations (compliance, standards and regulations)	Develop professional standards and tools for the Agile work and ensure work is completed in accordance with all relevant legislation and codes of conduct [14].	Monitor and manage work quality against established performance standards; ensure project products is in line with regulatory requirements; ensure adherence to delivery standards and frameworks
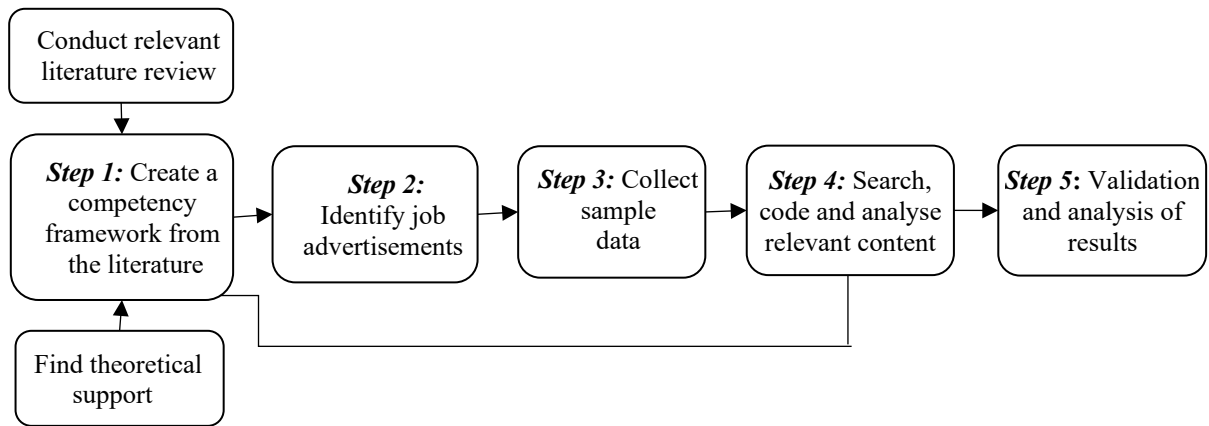
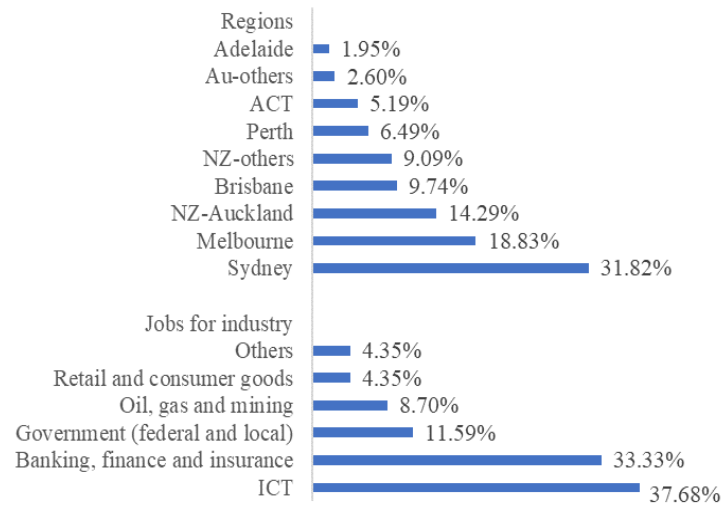Fig. 1. Steps in the implementation of the research methodology

Fig. 2. Market data for job advertisements (location and project industry)

Fig. 3. Word cloud of AgPM competency codes

Categories of competencies	Total demand frequency and percentage of jobs	Cluster dendrogram	Demand co-occurrence between competency categories (no of jobs, Jaccard coefficient)
Perspective	108 (70%)		'perspective' and 'personal' (99, 0.655)
Personal	142 (92%)	AGILE - Perspective Personal Practice	'personal' and 'practice' (138, 0.907)
Practice	148 (97%)		'practice' and 'perspective' (103, 0.673)

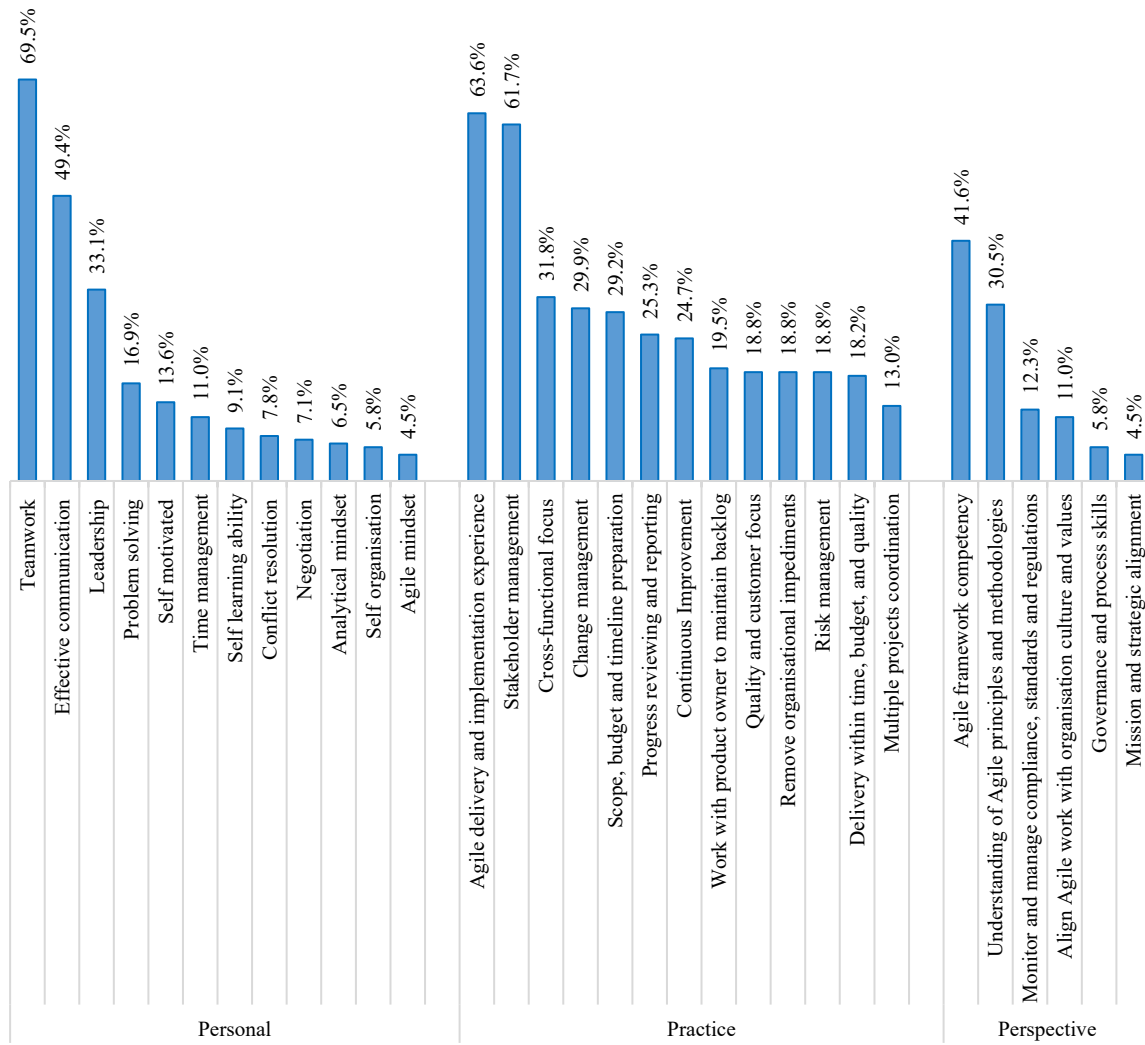Fig. 4. Demand frequency and cluster dendrogram of competency categories

Fig. 5. Summary of personal, practice and Agile perspective competency demands

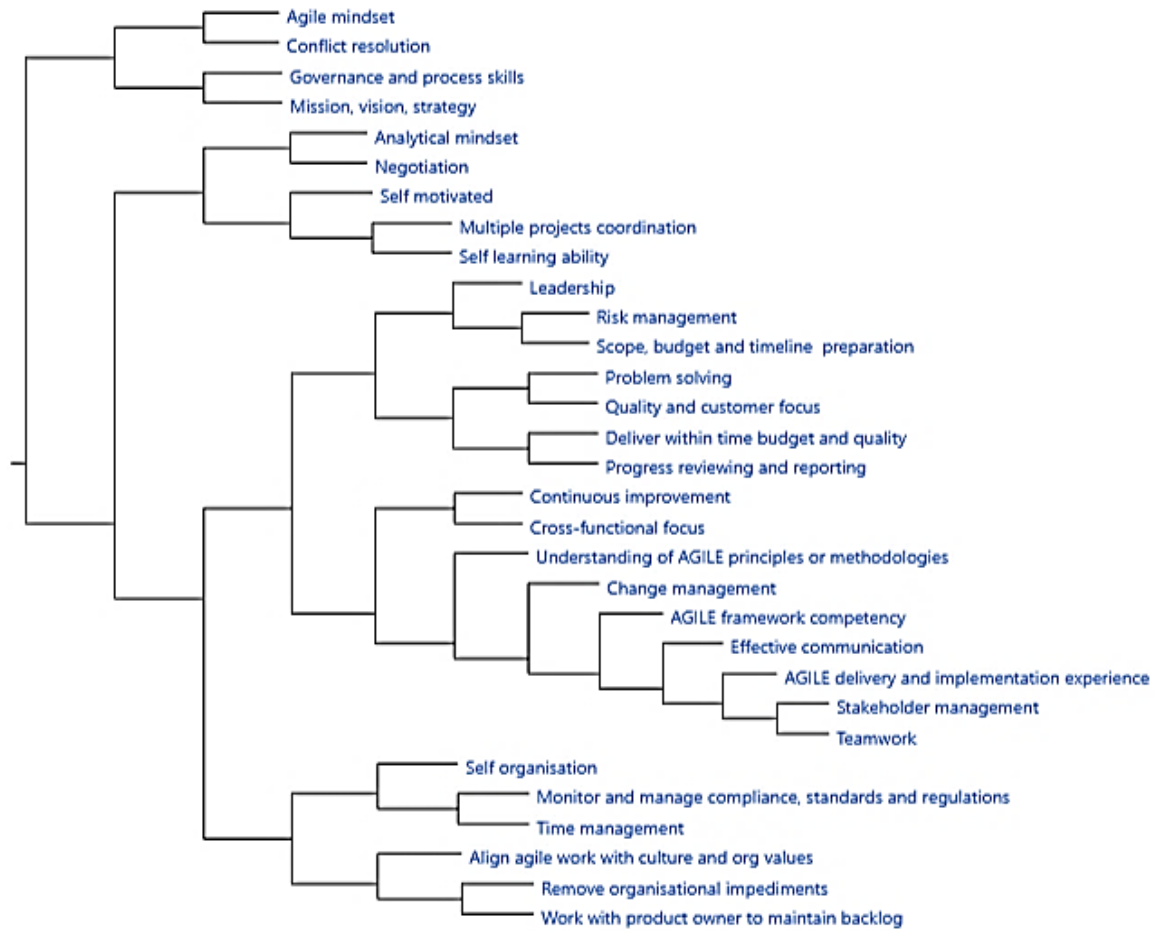|	Personal	Practice	Perspective
Least demand	• Self-organisation (rank 29) • Analytical mindset (rank 27) • Negotiation (rank 26) • Self-learning ability (rank 24) • Conflict resolution (rank 25) • Time management (rank 23) • Self-motivated (rank 19) • Problem-solving (rank 18) • Agile mindset (rank 31)	• Multiple project coordination (rank 20) • Delivery within time, budget, and quality (rank 17)	• Mission and strategic alignment (rank 30) • Governance and process skills (rank 28) • Align Agile work with organisation culture and values (rank 22) • Monitor and manage compliance, standards and regulations (rank 21)
Moderate demand	• Leadership (rank 6)	• Quality and customer focus (rank 16) • Remove organisational impediments (rank 15) • Risk management (rank 14) • Work with the product owner to maintain backlog (rank 13) • Continuous improvement (rank 12) • Progress reviewing and reporting (rank 11) • Scope, budget and timeline preparation (rank 10) • Change management (rank 9) • Cross-functional focus (rank 7)	• Understanding of Agile principles and methodologies (rank 8)
High demand	• Teamwork (rank 1) • Effective communication (rank 4)	• Agile delivery and implementation experience (rank 2) • Stakeholder management (rank3)	• Agile framework competency (rank 5)
	Personal	**Practice**	**Perspective**

Fig. 6. AgPM competencies, ranked in three demand groups

Fig. 7. Dendrogram of AgPM competency co-occurrence clusters