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Project managers' ability to explore and exploit predictive and iterative best practices

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Abstract

Purpose – Project managers face decisions every day and those decisions result in an "either or" situation. This is also true when it comes to the choice of a project management approach, i.e. predictive versus iterative. A case is made in this article that project managers should be ambidextrous and apply practices that are beneficial to the project, irrespective of the origin of the practices.

Design/methodology/approach – This study is based on a questionnaire focussing on six themes. The results of 290 projects were analysed using ANOVA and boxplots to test for skewness and variances.

Findings – Based on the analysis of 117 practices, most of these projects could be classified as either hybrid or iterative projects. The results indicate that irrespective of the classification of the projects or the industry, projects are managed using a hybrid approach, with a tendency to incorporate more iterative practices than predictive practices.

Originality/value – This article contributes to the current debate on which approach is the best given certain circumstances.

Keywords Agile approaches, Traditional approaches, Leadership, Reflection, Ambidexterity, Explore, Exploit

Paper type Research paper

1. Introduction

Capitalism versus Communism. East versus West. Predictive project management versus iterative project management. The world is full of examples where the choice is between two supposedly opposing alternatives. When it comes to project management, the choice is between predictive project management (e.g. waterfall) or iterative project management (e.g. agile). But do we need to make a choice? The focus of this article is the practices that practitioners are incorporating both from a predictive and a hybrid approach.

Practitioners as well as academia are realising that both approaches do have good qualities. Practitioners from a more traditional environment, such as construction and engineering, perceive iterative approaches as being applicable only to IT with no relevance to traditional environments. On the other hand, practitioners from an IT or software environment perceive agile as "sexy" and maintain that it should be the way to manage all projects. Each project is unique, and the project approach needs to use the existing capabilities as best as possible, but project managers need to explore what can be done in that project to suit the specific context as best as possible.

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Traditional project management approaches follow a fixed sequence of initiation, planning, execution, monitoring and closure to manage projects. The emphasis is on linear processes, documentation, upfront planning and prioritisation. Traditional project management approaches utilise practices such as long-term planning and risk management during project implementations (Laufer *et al.*, 2015). These practices have changed over the last couple of years through the incorporation of agile practices that provide flexibility to respond to change when required (Laufer *et al.*, 2015; Worley *et al.*, 2016). The combination of traditional and agile project management practices has resulted in various hybrid approaches (Cooper and Sommer, 2016; Gemino *et al.*, 2020; Riesener *et al.*, 2018). The jury is still out on whether future project management approaches will be more agile or a combination of traditional and agile approaches, resulting in a hybrid approach.

What is evident is that project management practices are fluctuating between predictive and iterative approaches. To support this fluctuation, changes in the following project management areas are suggested: (1) project management practices (Svejvig *et al.*, 2019), (2) project team collaboration (López-Alcarria *et al.*, 2019; Hoda and Noble, 2017), (3) project team practices (Aga *et al.*, 2016), (4) leadership styles (Marnewick and Marnewick, 2020a; Zidane *et al.*, 2018) as well as (5) team reflection and learning (Hoda and Noble, 2017; Laufer *et al.*, 2015). To deal with this fluctuation, project managers need to be ambidextrous. Ambidexterity is about exploiting existing capabilities as best as possible with the ability to also explore new capabilities (Turner *et al.*, 2016). The following research problem is posed: project members do not know the extent of ambidexterity required to follow a hybrid project management approach. Given this problem, three research questions are derived:

RQ1. What is a hybrid project management approach?

RQ2. What level of ambidexterity is required to explore and exploit best practices associated with a hybrid project management approach?

RQ3. What practices are associated with a hybrid project management approach?

This article addresses this research problem, identifying potential practices that can be implemented either in a predictive or an iterative way. This is quantitatively validated by 290 practitioners placing 117 practices across five themes.

The results indicate that irrespective of the classification of the projects or the industry, projects are managed using a hybrid approach, with a tendency to incorporate more iterative practices than predictive project management practices. This indicates a level of ambidexterity. This article contributes to the current debate on which approach is the best given certain circumstances. It also provides guidelines to project managers and teams on the practices that should be employed to assist with the fluctuation between traditional and agile project management. Managing projects is still rooted in predictive project management, but iterative practices are being incorporated to ensure the success of projects.

This paper is organised as follows: In section 2 the hybrid approach to project management is viewed through the lens of ambidexterity. Section 3 details the research methodology, including the derivation of the data collection instrument from literature. Section 4 is a discussion of the data collection. The paper concludes with a discussion of the results.

2. Literature review

The first research question focusses on what constitutes a hybrid project management approach. This is answered in the next section where a hybrid approach is contextualised in relation to predictive and iterative approaches.

2.1 Hybrid approach to project management

Predictive and iterative approaches to implement a project are the two most popular approaches. Predictive approaches are the typical "waterfall' approach, and the iterative approach is based on the Agile Manifesto. Predictive approaches follow a fixed sequence of initiation, planning, execution, monitoring and closure to manage projects. The emphasis is on linear processes, documentation, upfront planning and prioritisation. Predictive approaches utilise practices such as long-term planning and risk management during project implementations (Laufer *et al.*, 2015). Within the iterative (agile) approach, the process is transparent and promotes regular inspection and adaptation in small and iterative intervals (Jamous *et al.*, 2021).

Predictive approaches have changed over the last couple of years through the incorporation of agile practices that provide flexibility to respond to change when required (Laufer *et al.*, 2015; Worley *et al.*, 2016). This combination of predictive and iterative project management approaches has resulted in various hybrid approaches (Cooper and Sommer, 2016; Gemino *et al.*, 2020; Riesener *et al.*, 2018). One of these approaches is the Agile-Stage-Gate hybrid model (Cooper and Sommer, 2016) where manufacturers are integrating agile elements of development processes into their existing gating systems. Barbosa and Saisse (2019) are of the opinion that this model is not suitable for innovation projects despite its advantages. This is attributed to the model being too linear and rigid. The model does not allow for proactive changes during the development phases.

Gemino *et al.* (2020) distinguish between an approach, a methodology and a practice. A project management approach is the highest level of abstraction used when describing how a project will be designed and governed, for example, predictive or iterative approaches. A methodology is more prescriptive and granular than an approach and provides project managers with detailed operational guidance on how to manage a project. A project management practice can then be defined as a technique or procedure used to manage an aspect of a methodology within a project. In essence, the hybrid approach then combines methodologies and practices from more than one project management approach (Jamous *et al.*, 2021; Papadakis and Tsironis, 2022). The rationale of combining multiple approaches is to reap the benefits of each approach. Therefore, a hybrid approach is based on the unique strengths of both predictive and iterative approaches, as well as eliminating their weaknesses (Papadakis and Tsironis, 2022).

There is a prevalence of hybrid project management approaches and this is an emerging topic for research (Gemino *et al.*, 2020). One such topic is the impact of a hybrid approach on the performance of the project itself.

The second research question focusses on the level of ambidexterity required to explore and exploit best practices associated with a hybrid project management approach. Dealing with a hybrid project management approach requires insights from the project manager and project teams involved. Project managers need to be equipped to deal with the tensions between predictive and iterative approaches and can look at the issue through the lens of ambidexterity.

2.2 Ambidexterity and project management

Ambidextrous people can use their right and left hands equally well. Within the context of business, ambidexterity implies that supposedly opposing processes or views can be implemented equally well to the benefit of the organisation. The concept of ambidexterity within organisations was first introduced by the seminal work of March (1991). Two opposing concepts (exploitation and exploration) are necessary for the survival of the organisation. Exploitation focusses on the ability to exploit "current capabilities and assets in a profitable way," whereas exploration focusses on "new technologies, markets, and customers to capture existing as well as new opportunities" (March, 1991). Various attributes have been assigned to exploration and exploitation. March (1991) originally defined exploration as "search, variation, risk taking,

experimentation, play, flexibility, discovery, innovation," whereas exploitation includes terms such as "refinement, choice, production, efficiency, selection, implementation, execution." The results of exploitation are more certain, closer in time and close to the locus of action. This is in opposition to the results of exploration, which are less certain, further away in time and more distant from the locus of time (Pellegrinelli *et al.*, 2015; Lavie *et al.*, 2010; March, 1991).

Just as a person requires both hands to function optimally, organisations need to harmonise and reconcile these two opposing concepts (Awojide *et al.*, 2018). Pellegrinelli *et al.* (2015) highlight that academia has wrestled with the challenge to balance the concepts of exploitation and exploration. Turner *et al.* (2016) support this view, mentioning that the detailed processes of achieving ambidexterity are far from clear. Pellegrinelli *et al.* (2015) suggest that exploitation and exploration should be investigated "how they might vary within and between contexts or co-exist within an organisational setting."

Organisations need to adopt ambidexterity as it is a prerequisite for performance and longevity (Pellegrinelli *et al.*, 2015). Although the benefits of organisational ambidexterity have been highlighted, little is known on how to achieve it in practice (Turner *et al.*, 2014).

The activities associated with exploration and exploitation are distinctly different and compete for finite organisational resources (March, 1991; Turner *et al.*, 2016). This creates a challenge as to where and when to allocate resources, as both exploration and exploitation are essential for any organisation. Exploration and exploitation can be perceived as conflicting modes and should be reconciled through various modes (Awojide *et al.*, 2018). For this specific reason, various modes of ambidexterity are defined (Aubry and Lièvre, 2010; Awojide *et al.*, 2018; Lavie *et al.*, 2010; Sailer, 2019; Turkulainen and Ruuska, 2022; Turner *et al.*, 2016):

(1) Structural ambidexterity is characterised by the concurrent exploitation and exploration undertaken by different business units or departments. This is achieved through the separation of exploitation and exploration into different departments or groups.

(2) Contextual ambidexterity resolves the tension between exploration and exploitation by suggesting that these activities are maintained simultaneously at any given organisational level.

(3) Temporal or sequential ambidexterity balances exploitation and exploration actions by pursuing them successively. They co-exist in the same department but at different points in time and the department switches between exploration and exploitation.

Lavie *et al.* (2010) have a different perspective and are of the opinion that exploration and exploitation are on a continuum and not a choice between two discrete options. This perspective is in line with Sailer (2019) stating that true ambidexterity is only achieved through balancing exploration and exploitation actions. The conclusion is that exploration and exploitation are interrelated and can enable each other. Organisations need to engage with both exploration and exploitation to achieve their objectives (Lavie *et al.*, 2010).

Binci *et al.* (2023) explain that a predictive approach such as waterfall to implement projects leans towards exploitation due its stability and known processes. On the other hand, iterative approaches are explorative due to the dynamic and unpredictable requirements. This supports the view of Verganti (1999) who suggests that project approaches should be divided into the traditional approach (predictive) and the flexible approach (iterative). Verganti (1999) did not purport that one approach is better than the other, but that a flexible approach should be sought. Sailer (2019) provides evidence that a project using Scrum as a methodology alternated between explorative and exploitative practices. In light of this, Binci *et al.* (2023) suggest that contextual ambidexterity should be deployed at project level as it "highlights the simultaneous pursuit of the opposite tensions of exploration and exploitation within and across units of analysis."

Changes in the following project management areas are required to support the fluctuation between exploitation and exploration.

(1) To accelerate project delivery, predictive project management approaches need to incorporate iterative practices to support the required changes in organisations (Worley *et al.*, 2016; Laufer *et al.*, 2015; Svejvig *et al.*, 2019; Conforto *et al.*, 2016). This implies that organisations should embrace contextual ambidexterity. As noted by Conforto *et al.* (2016), "agility is the project team's ability to quickly change the project plan as a response to customer or stakeholder needs, market or technology demands in order to achieve better project and product performance in an innovative and dynamic project environment." The definition by Conforto *et al.* (2016) of agility includes two factors: (1) the capacity to respond to change the project plan (delivery frequency) and (2) the involvement of customers during the project process. To achieve agility, management processes need to align resources with the business needs and adjust the cycle times of delivery to support the need (Worley *et al.*, 2016). Compared to predictive project management approaches (exploitation) that utilise long-term delivery planning, the focus is on short and flexible planning (exploration) (Laufer *et al.*, 2015). For *project management practices and environment* to become explorative, a project planning approach must support change and shorter delivery times. An environment conducive to responding to change over following a plan needs to be cultivated. This is achieved if the team members are collocated (Chen *et al.*, 2010). Additionally, customer and project team interaction changes from a static environment to a dynamic one. This is in line with the Agile Manifesto, which indicates that the focus should be on customer collaboration and not contract negotiation.

(2) For the project team to respond to these changes, the development of *team collaboration* is essential (Laufer *et al.*, 2015). Open and collaborative discussions are core activities within an iterative environment (López-Alcarria *et al.*, 2019). The real-time informal collaboration removes communication barriers and empowers teams (Lappi *et al.*, 2018). Collaborative problem-solving practices within project teams that also encourage team members to help each other are a major driving force to accelerate project delivery (Sting *et al.*, 2015). As reported by Laufer *et al.* (2015), if there is no deliberate effort to create collaboration among team members, these team members could end up not communicating optimally with each other and the sharing of knowledge could be at risk.

(3) When it comes to predictive *project team practices*, the project manager assigns various tasks to each individual team member. These tasks are interdependent, they are the organised activities that lead to achieving the project goal and are traditionally displayed in a schedule (Marnewick and Marnewick, 2020b; Hoda and Noble, 2017). This approach can prevent collaboration if it is not deliberately facilitated. In contrast to predictive approaches, iterative approaches allow for hierarchical project team practices to transition from manager driven to team member driven where the team members assign tasks themselves (Hoda and Noble, 2017; Hoda and Murugesan, 2016). This transition to the self-definition of roles and responsibilities results in an authorised team, which has a positive impact on performance delivery and enables team member collaboration (Liu *et al.*, 2011a; b).

(4) This shift from hierarchical team structures to self-organising teams impacts *project leadership* practices. In a hierarchical structure, there are rigid reporting lines (Lappi *et al.*, 2018; López-Alcarria *et al.*, 2019). These hierarchical reporting lines reduce team

autonomy (López-Alcarria *et al.*, 2019). Decision-making up and down the hierarchy is slow, which does not support fast responses – a requirement in a dynamic environment. A dynamic environment that embraces change must be flexible, and flexibility is achieved when a project team has the autonomy to make decisions (Zidane *et al.*, 2018). With iterative approaches, much more autonomy is given to project teams with a dynamic structure which empowers teams (Hoda and Noble, 2017). The empowerment of project teams is highlighted as a practice that enables project acceleration (Svejvig *et al.*, 2019). With the removal of a hierarchical structure within autonomous teams, communication can be open and inclusive among the team members and with the stakeholders (Hoda and Noble, 2017).

(5) The removal of the hierarchical structure also implies that the traditional command-and-control leadership is transitioning to a servant–leadership facilitation (Marnewick and Marnewick, 2020a). This enables the project teams to be responsible for their own decisions, and there is no need to get approval from the hierarchical structures or management (Hoda and Noble, 2017). The decision-making time is reduced significantly but with an added responsibility on the team members (Conforto *et al.*, 2016). With this added responsibility, the project team can only become a performing team if reflection is embedded in the team's daily work; this will enable growth (Hoda and Noble, 2017). The contribution to project success when learning-based project reviews are conducted is highlighted as one of the important roles leaders within the team should adopt (Laufer *et al.*, 2015).

Both predictive and iterative project management approaches have practices that contribute to the successful management of a project. The decision is no longer an "either or" decision but rather which practices can be used to optimally manage the project. This leads to conflict within the project manager, as project managers are typically trained and experienced in one or the other approach to utilise a practice from the other approach borders on sacrilege. This is where the project manager and the team should illustrate contextual ambidexterity and apply practices that are best for the management of the project.

3. Research methodology

To answer the third research question (What practices are associated with a hybrid project management approach?), the literature was searched for differences between predictive and iterative approaches in terms of (1) project management practices, (2) project team collaboration, (3) project team practices, (4) leadership styles, and (5) team reflection and learning. The identified differences were converted into a questionnaire.

The questionnaire consisted of a biographical section and six themes. Theme 1 consisted of 11 questions and focussed on current project management practices and the environment itself. Theme 2 (team collaboration) consisted of 41 questions and covered aspects such as change and uncertainty management, the processes, the project manager and collaboration practices. Theme 3 focussed on the project team's practices and consisted of 23 questions. Theme 4 focussed on aspects of leadership such as structure and reporting lines, autonomy and decision-making, as well as changes to the scope of the deliverable. This theme consisted of 29 questions. Theme 5 focussed on how project teams reflect and learn and consisted of 13 questions. Each of the themes was measured using a Likert scale, with 1 indicating a more predictive project management approach and 5 indicating a more iterative approach.

Table 1 lists the various themes and associated identified literature used to construct the questionnaire.

A quantitative approach was adopted to scientifically determine the dominant project management approach within South African organisations. The unit of analysis was people

Theme	Definition	Measure
Project management practices and environment		
Project approaches	The typical project approaches utilised in the practitioners' environment	Determine if the practitioners utilise more predictive project management or more iterative project management
Team location	The extent to which the core team works in the same location	How the location of core team members affects responsiveness to change by facilitating communication, meetings, ability to overcome challenges, solve problems and make decisions (Chen *et al.*, 2010)
Project interaction	The extent of interaction between the team and customer	How often the team and customer interact to discuss project topics (Conforto *et al.*, 2016)
Delivery environment	Project environment is set up for shorter delivery cycles	How often the team can do incremental deliveries to reduce uncertainty (Conforto *et al.*, 2016; Svejvig *et al.*, 2019; Zidane *et al.*, 2018)
Project team collaboration		
Communication media preferences	Communication media preferences	Determine the communication media typically utilised
Uncertainty management	The level of acceptance of uncertainty and response to change compared to following a predefined plan	The team's ability to accept change and uncertainty (López-Alcarria *et al.*, 2019)
Project process ability to respond to change	Management processes in place to enable change	Project management process designed to execute strategy, exercise capability and enable change when required (Worley *et al.*, 2016)
Project manager's ability to respond to change	Four roles a project manager needs to fulfil to respond to uncertainty	Ability to develop collaboration, integrate planning and enable learning, prevent disruptions and maintain momentum (Laufer *et al.*, 2015)
Collaboration practices	Collaborative problem- solving environment	Collaborative problem-solving (Sting *et al.*, 2015)
Project team practices		
Team practices	Manager-driven, manager-assisted, team-driven	Determine the team approach; manager-driven, manager-assisted, team-driven (Hoda and Noble, 2017)
Team building	Deliberate effort to build the team	The team is deliberately built and not just put together (Aga *et al.*, 2016)
Leadership		
Team structure	Reporting lines of the project team	Questions are derived from team management (López-Alcarria *et al.*, 2019)
Team management	Project team communication and decision-making	Questions are derived from team management (López-Alcarria *et al.*, 2019)
Autonomy	Decision-making responsibility in project team	Questions are derived from team management (López-Alcarria *et al.*, 2019)
Management	Driving-adopting-empowering	Determine the management approach - driving-adopting-empowering (Hoda and Noble, 2017)
Decision-making	Time taken to make decisions	Decision-making time (Conforto *et al.*, 2016)

Table 1.
Questionnaire themes and associated literature

(*continued*)

Theme	Definition	Measure
Team reflection and learning		
Learning	Team learning process	The process through which the team gains or creates knowledge (Chen *et al.*, 2010)
Lessons learnt process	Lessons learnt integration in project phases	Access, update and use of lessons learnt integrated in project management process (Mcclory *et al.*, 2017)
Reflective practice	Learning integration in project team	Reflective practices, limited-focussed-embedded (Hoda and Noble, 2017)

Source(s): Authors own creation

Table 1.

involved in the management of projects within an organisation. Non-purposive sampling was used to select the respondents as they were part of the specific predefined group. A total of 290 valid responses were received. The purpose was to determine the position of each theme in relation to the predictive or iterative project management approach. Most of the respondents (61.2%) were team members (28.4%), project managers (19.1%) or project team leaders (13.7%).

The questionnaire was tested for reliability by means of Cronbach's alpha, as seen in Table 2. An overall alpha value of 0.956 resulted from the analysis and indicates that there was internal consistency. Theme 1's results should be interpreted with caution as the alpha value indicates poor internal validity.

4. Data analysis

The 290 respondents were spread across 12 industry sectors, with the majority (27.3%) in the financial services sector (Figure 1). The other three sectors that were well represented in this study were the building and construction (12.2%), ICT (12.9%) and public administration (16.2%) sectors.

Table 3 indicates the distribution of the approaches used to implement projects and provides some insight into the changing project landscape. Half of the organisations surveyed adopted a hybrid approach, with only 20.9% of the organisations using a predictive approach.

The public administration sector is the sector that still relies the most on a predictive approach to implement projects. The financial services and ICT sectors are the two sectors that have embraced agile the most; 65% of the respondents from the construction and engineering sector indicated that they also followed a hybrid approach.

4.1 Theme 1 (PM practices and environment)

Theme 1 focussed on the practices and the environment within which projects are implemented. Figure 2 and Table 4 provide a synopsis of this theme and some interesting

Themes	Cronbach	No. of items	Internal consistency
Theme 1: Project management practices and environment	0.578	9	Poor
Theme 2: Project team collaboration	0.936	31	Excellent
Theme 3: Project team practices	0.927	23	Excellent
Theme 4: Leadership	0.890	27	Good
Theme 5: Team reflection and learning	0.921	13	Excellent
Theme 6: Challenges	0.849	19	Good

Source(s): Authors own creation

Table 2.
Cronbach's alpha results

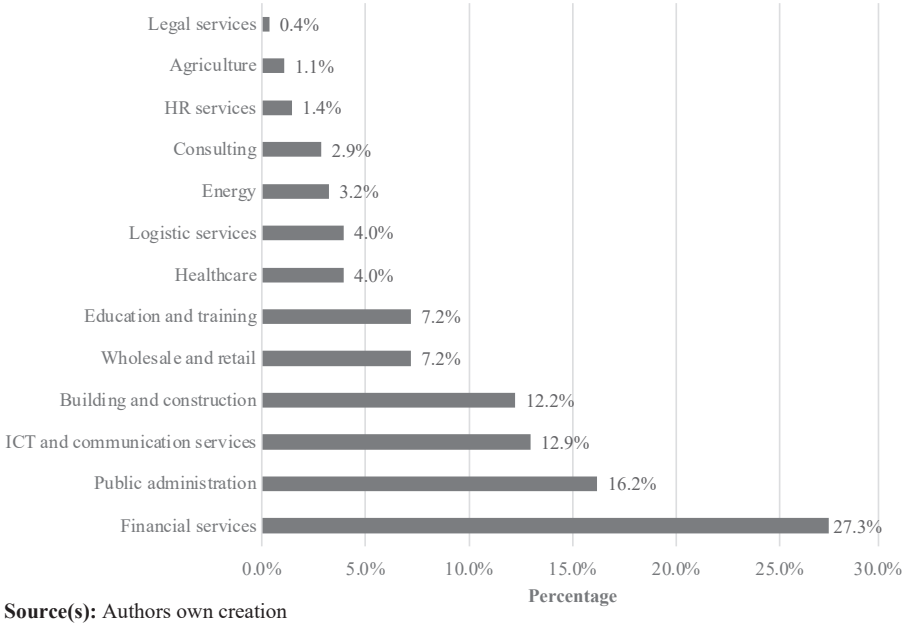


Figure 1.
Industry sector

Source(s): Authors own creation

	PM approach		
	Predictive	Iterative	Hybrid
Agriculture	1	1	1
Energy	0	3	*6*
Building and construction	8	4	*22*
Healthcare	1	3	7
Wholesale and retail	4	3	*13*
Logistic services	4	1	*6*
Financial services	8	30	*39*
Legal services	0	*1*	0
HR services	*2*	1	1
ICT and communication services	4	10	*23*
Consulting	2	*5*	1
Public administration	*20*	6	19
Education and training	4	1	*13*
Percentage	*20.9%*	*24.8%*	*54.3%*

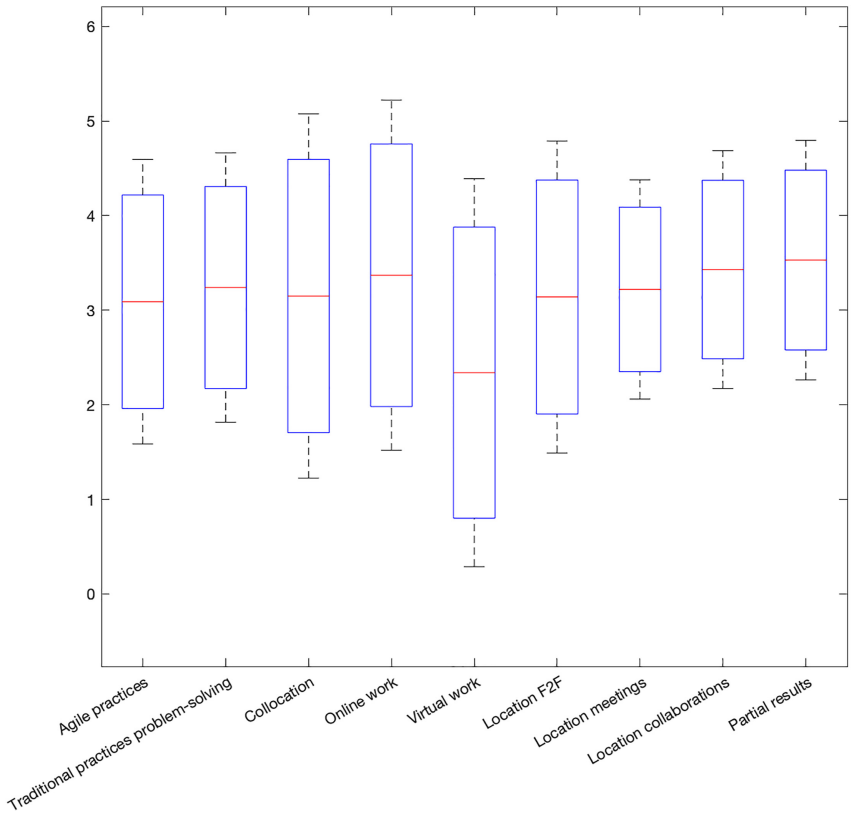
Table 3.
Cross-tabulation between project classification and industry

Source(s): Authors own creation

observations can be made. Of the nine practices, only one (virtual work) is moderately skewed towards predictive practices. By implication, it means that within predictive and hybrid approaches, team members adopted virtual working, irrespective of the approach.

It can be concluded for this theme that the respondents chose practices that suited either a hybrid approach or an iterative approach. The fact that the results relate to a hybrid approach implies that contextual ambidexterity is the mode to deal with conflict.

Theme 2 focusses on the practices associated with project team collaboration.



Note(s): On each box, the central mark indicates the median, and the bottom and top edges of the box indicate the 25th and 75th percentiles, respectively. The y-axis presents the Likert-scale
Source(s): Authors own creation

Figure 2.
Theme 1 – Project management practices and environment

Practices	Skewness	Interpretation	Approach focus
Agile practices	−0.173	Symmetrical	Hybrid
Traditional practices	−0.311	Symmetrical	Hybrid
Collocation	−0.260	Symmetrical	Hybrid
Online work	−0.412	Symmetrical	Hybrid
Virtual work	0.592	Moderately skewed	Predictive <-> Hybrid
Location F2F	−0.149	Symmetrical	Hybrid
Location meetings	−0.235	Symmetrical	Hybrid
Location collaborations	−0.299	Symmetrical	Hybrid
Partial results	−0.384	Symmetrical	Hybrid

Source(s): Authors own creation

Table 4.
Skewness of Theme 1 practices

4.2 Theme 2 (project team collaboration)

This theme constitutes four sections: (1) how team collaboration practices influence change and uncertainty, (2) how project management processes influence team collaboration, (3) the

influence of the project manager on team collaboration and (4) the influence of the identified collaboration practices.

In contrast with theme 1, none of the items in theme 2 lean towards a predictive approach. The items in this theme suggest either a hybrid approach or an iterative approach. When it comes to the management of change and uncertainty, four items lean towards an iterative approach. Two of these items are counter-intuitive to an iterative approach as they focus on a fully defined project before the start of the project and the continuous tracking of the triple constraint. The other two items focus on quickly adapting to change and customer feedback, which relates to agile principles. The remainder of the items all suggest a hybrid approach as per Figure 3 and Table 5. The second section focusses on the effectiveness of the project management processes in use. One practice (alignment of resources with the business strategy) was classified as an iterative practice. The other items are either hybrid or iterative practices.

The third section focusses on the project manager or scrum master's role in choosing the appropriate practices. The respondents agreed that the project managers choose practices that are inclusive of hybrid/iterative approaches. Collaboration is essential if a team wants to respond to change (Laufer *et al.*, 2015). The collaboration practices in section 4 all support a hybrid or iterative approach.

It is evident from the results that contextual ambidexterity is applied to deal with the conflict between the exploitative practices of predictive approaches and the explorative practices of iterative approaches. Project managers do see the value of incorporating practices from both approaches.

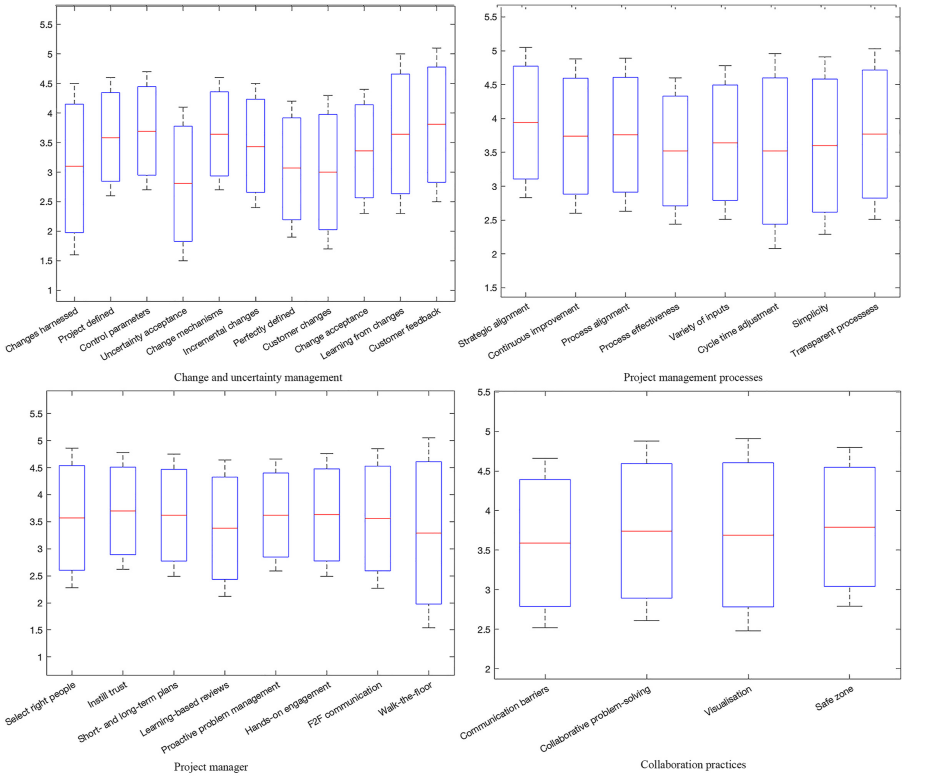


Figure 3.
Boxplots of project team collaboration

Source(s): Authors own creation

Practices	Skewness	Interpretation	Approach focus
Changes harnessed	−0.093	Symmetrical	Hybrid
Project defined	−0.557	Moderately skewed	Hybrid → Iterative
Control parameters	−0.518	Moderately skewed	Hybrid → Iterative
Uncertainty acceptance	−0.045	Symmetrical	Hybrid
Change mechanisms	−0.514	Moderately skewed	Hybrid → Iterative
Incremental changes	−0.287	Symmetrical	Hybrid
Perfectly defined	−0.252	Symmetrical	Hybrid
Customer changes	0.049	Symmetrical	Hybrid
Change acceptance	−0.277	Symmetrical	Hybrid
Learning from changes	−0.454	Symmetrical	Hybrid
Customer feedback	−0.865	Moderately skewed	Hybrid → Iterative
Process strategic alignment	−1.067	Highly skewed	Iterative
Process continuous improvement	−0.601	Moderately skewed	Hybrid → Iterative
Process alignment	−0.679	Moderately skewed	Hybrid → Iterative
Process effectiveness	−0.455	Symmetrical	Hybrid
Process variety of inputs	−0.650	Moderately skewed	Hybrid → Iterative
Cycle time adjustment	−0.476	Symmetrical	Hybrid
Simplicity	−0.528	Moderately skewed	Hybrid → Iterative
Transparent processes	−0.666	Moderately skewed	Hybrid → Iterative
PM selects right people	−0.744	Moderately skewed	Hybrid → Iterative
PM instils trust	−0.627	Moderately skewed	Hybrid → Iterative
PM short- and long-term plans	−0.432	Symmetrical	Hybrid
PM learning-based reviews	−0.413	Symmetrical	Hybrid
PM proactive problem management	−0.676	Moderately skewed	Hybrid → Iterative
PM hands-on engagement	−0.631	Moderately skewed	Hybrid → Iterative
PM F2F communication	−0.658	Moderately skewed	Hybrid → Iterative
PM walk-the-floor	−0.363	Symmetrical	Hybrid
Communication barriers	−0.093	Symmetrical	Hybrid
Collaborative problem-solving	−0.557	Moderately skewed	Hybrid → Iterative
Visualisation	−0.518	Moderately skewed	Hybrid → Iterative
Safe zone	−0.045	Symmetrical	Hybrid

Source(s): Authors own creation

Table 5. Skewness of Theme 2 practices

4.3 Theme 3 (project team practices)

The focus of this theme is on various team practices. These practices reflect both predictive and iterative practices. There are 23 practices within this theme and the distribution of each practice is displayed in Figure 4.

Table 6 provides a summary of the level of skewness of each practice. This theme shows 13 highly skewed practices (iterative); this is 56% of the practices. Five principles are moderately skewed towards iterative practices. Project managers are seeing the benefits of continuously involving team members and customers. This has resulted in the adoption of more iterative practices.

This theme can be summarised as a theme that is highly iterative in nature and the project teams adopted iterative principles to manage their activities.

4.4 Theme 4 (leadership)

The focus of this theme is the leadership style that is exhibited by project managers and managers in general. The leadership style influences the type of approach used in managing projects (López-Alcarria *et al.*, 2019; Hoda and Noble, 2017; Conforto *et al.*, 2016). This theme is divided into (1) the structure of the organisation and the associated reporting lines, (2) the project manager's influence over the team and (3) the level of autonomy and decision-making delegated to team members. Refer to Figure 5.

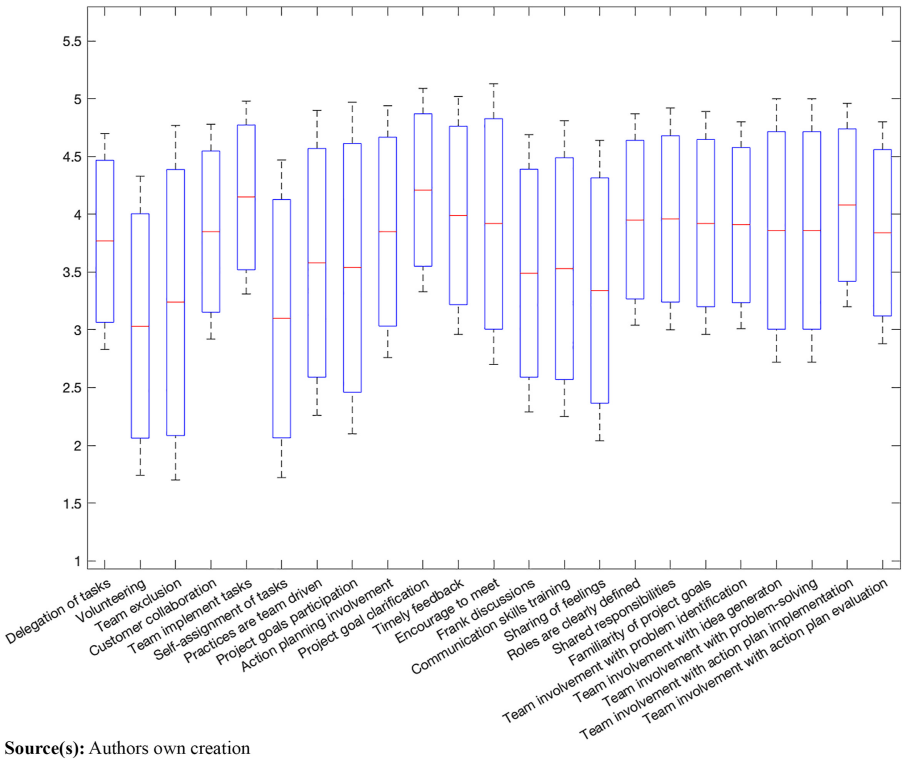


Figure 4.
Theme 3 – Project team practices

Source(s): Authors own creation

The negative skewness of the structure and reporting lines practices indicates a tendency towards a hybrid approach. This indicates that although the structure and reporting lines incorporate aspects such as self-organising teams and the continuous inclusion of the customer, there are still predictive practices such as a rigid hierarchy and the definition of tasks by the project manager. The second theme focus on team practices and negative skewness indicates a tendency towards an iterative approach.

Seventeen practices are part of *autonomy and decision-making*, and the practices can be classified as hybrid with a strong tendency towards an iterative approach. This implies a strong level of team autonomy, and decisions are made by the team. The skewness of each practice is indicated in Table 7.

4.5 Theme 5 (team reflection and learning)

The last theme focusses on the team's ability to reflect and learn. Teams should be able to reflect and learn from their mistakes if they want to become better. The boxplots in Figure 6 highlight that the practices are classified as either hybrid or hybrid with a strong iterative approach. The boxplots also indicate high levels of variance.

The analysis as presented in Table 8 indicates a level of maturity of the team. The teams incorporate aspects such as lessons learnt and are improving practices.

Figure 7 provides a summary overview of each theme or sub-theme. Theme 1 and sub-theme 4 (structure and reporting lines) have a wide variance, indicating practices from predictive as well as iterative approaches. The other themes and sub-themes are more centralised, indicating a more focussed hybrid approach.

Practices	Skewness	Interpretation	Approach focus
Delegation of tasks	−0.958	Moderately skewed	Hybrid → Iterative
Volunteering	−0.182	Symmetrical	Hybrid
Team exclusion	−0.356	Symmetrical	Hybrid
Customer collaboration	−1.263	Highly skewed	Iterative
Team implements tasks	−1.175	Highly skewed	Iterative
Self-assignment of tasks	−0.072	Symmetrical	Hybrid
Practices are team driven	−0.673	Moderately skewed	Hybrid → Iterative
Project goals participation	−0.604	Moderately skewed	Hybrid → Iterative
Action planning involvement	−1.078	Highly skewed	Iterative
Project goal clarification	−1.543	Highly skewed	Iterative
Timely feedback	−1.161	Highly skewed	Iterative
Encourage to meet	−1.072	Highly skewed	Iterative
Frank discussions	−0.479	Symmetrical	Hybrid
Communication skills training	−0.640	Moderately skewed	Hybrid → Iterative
Sharing of feelings	−0.391	Symmetrical	Hybrid
Roles are clearly defined	−1.223	Highly skewed	Iterative
Shared responsibilities	−1.283	Highly skewed	Iterative
Familiarity of project goals	−1.152	Highly skewed	Iterative
Team involvement with problem identification	−1.123	Highly skewed	Iterative
Team involvement with idea generation	−1.082	Highly skewed	Iterative
Team involvement with problem-solving	−1.091	Highly skewed	Iterative
Team involvement with action plan implementation	−1.318	Highly skewed	Iterative
Team involvement with action plan evaluation	−0.971	Moderately skewed	Hybrid → Iterative

Source(s): Authors own creation

Table 6. Skewness of Theme 3 practices

In general, the results indicate a tendency towards a hybrid approach, with some practices skewing towards an iterative approach. Only one practice (working virtually) was moderately skewed towards a predictive approach. It can be concluded that project managers apply contextual ambidexterity to deal with the tension between predictive and iterative approaches. They apply the practices that are best suited to the situation.

Based on the results of Figure 7, it can be said that, due to the large number of respondents selecting either hybrid or iterative as their project classification, the results are biased towards a hybrid or iterative approach. For that reason, ANOVA was done.

4.6 ANOVA

Levene's test was done to test for the homogeneity of variances, and three practices had a significance level of less than 0.05, that is, collocation, online work and location meetings. Variances for these three were not equal, and they were excluded from the rest of the analysis. The following null hypothesis was formulated:

H0. The practice level for each of the practices across the three approaches is equal.

For this article, only the practices where the F-scores have *p*-values (Sig.) less than 0.05 are displayed in Table 9. The ANOVA results show that the F-scores have *p*-values (Sig.) less than 0.05 for the following Theme 1 practices: agile, traditional and virtual work. This indicates that there is a significant difference between the practices of the various approaches. Therefore, the null hypothesis is rejected for the following practices: iterative, predictive and virtual work.

Regarding Theme 2, 8 of the 31 practices have F-scores with *p*-values (Sig.) less than 0.05. Four of these practices deal directly with change management. This implies that change is managed differently between predictive, hybrid and iterative approaches. The other four

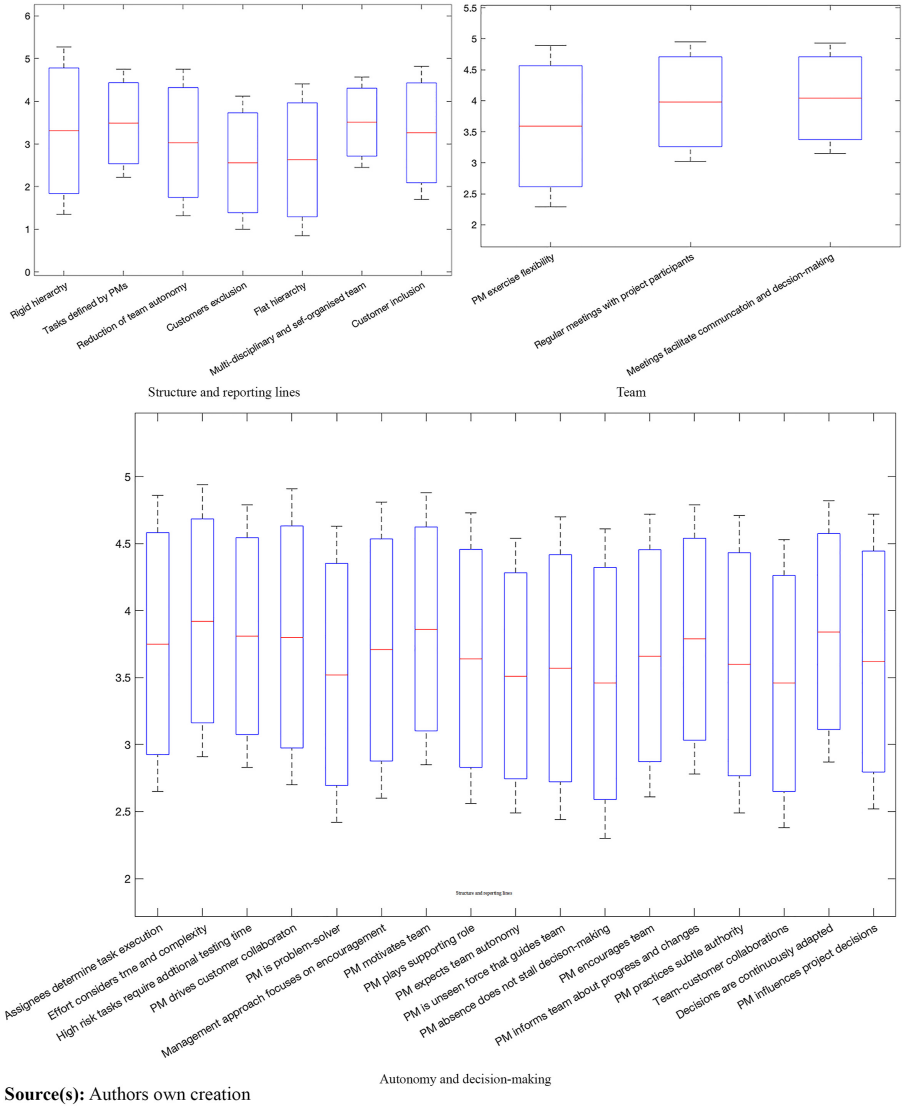


Figure 5.
Boxplots of Theme 4 practices

Source(s): Authors own creation

practices deal with alignment planning. The alignment of (1) resources with the strategy and (2) project management with other management processes is done differently between predictive, hybrid and iterative approaches. This is also applicable to how cycle times are adjusted and the development of stable short-term and flexible long-term plans by the project manager.

Theme 3 consists of 23 practices, only 5 of which have F-scores with p-values (Sig.) less than 0.05. These 5 practices all relate to the involvement of the team in decision-making and the direction of the project. The results highlight a more predictive approach to these practices where the project manager determines the project strategy, that is, a more command-and-control style (refer to Figure 4).

Practices	Skewness	Interpretation	Approach focus
Rigid hierarchy	−0.360	Symmetrical	Hybrid
Tasks defined by PMs	−0.456	Symmetrical	Hybrid
Reduction of team autonomy	−0.111	Symmetrical	Hybrid
Customer exclusion	0.297	Symmetrical	Hybrid
Flat hierarchy	0.269	Symmetrical	Hybrid
Multi-disciplinary and self-organised team	−0.430	Symmetrical	Hybrid
Customer inclusion	−0.292	Symmetrical	Hybrid
PM exercises flexibility	−0.559	Moderately skewed	Hybrid → Iterative
Regular meetings with project participants	−0.856	Moderately skewed	Hybrid → Iterative
Meetings facilitate communication and decision-making	−1.054	Highly skewed	Iterative
Assignees determine task execution	−0.910	Moderately skewed	Hybrid → Iterative
Effort considers time and complexity	−1.163	Highly skewed	Iterative
High-risk tasks require additional testing time	−0.971	Moderately skewed	Hybrid → Iterative
PM drives customer collaboration	−0.932	Moderately skewed	Hybrid → Iterative
PM is problem-solver	−0.539	Moderately skewed	Hybrid → Iterative
Management approach focusses on encouragement	−0.725	Moderately skewed	Hybrid → Iterative
PM motivates team	−0.935	Moderately skewed	Hybrid → Iterative
PM plays supporting role	−0.625	Moderately skewed	Hybrid → Iterative
PM expects team autonomy	−0.675	Moderately skewed	Hybrid → Iterative
PM is unseen force that guides team	−0.582	Moderately skewed	Hybrid → Iterative
PM absence does not stall decision-making	−0.532	Moderately skewed	Hybrid → Iterative
PM encourages team	−0.813	Moderately skewed	Hybrid → Iterative
PM informs team about progress and changes	−0.770	Moderately skewed	Hybrid → Iterative
PM practises subtle authority	−0.657	Moderately skewed	Hybrid → Iterative
Team-customer collaborations	−0.464	Moderately skewed	Hybrid → Iterative
Decisions are continuously adapted	−1.028	Highly skewed	Iterative
PM influences project decisions	−0.579	Moderately skewed	Hybrid → Iterative

Source(s): Authors own creation

Table 7. Skewness of Theme 4 practices

Theme 4 consists of 27 practices, 9 (33%) of which have F-scores with *p*-values (Sig.) less than 0.05. When it comes to the sub-theme of structure and reporting lines, 4 of the 7 practices show significant differences between the various approaches. These practices focus on the hierarchy of the project as well as the management and autonomy of the team. Some projects portray a more command-and-control structure (predictive approach), whereas other projects portray a more servant–leadership structure (iterative approach). All three practices from the *Team* sub-theme show significant differences between the various approaches. This correlates with the practices of the sub-theme *Structure and reporting lines* where teams are managed in command-and-control style (predictive approach) versus a more servant–leadership style (iterative approach). Only two practices from the *autonomy and decision-making* sub-theme show significant differences between the various approaches. These two practices are contradictory as one practice is that the team makes the decisions and the other that the project manager influences project decisions.

Theme 5 consists of 13 practices and 8 of these practices show significant differences between the various approaches. The essence is that an iterative approach is conducive to lessons learnt and reflection as highlighted by the 12 principles of the Agile Manifesto. Predictive approaches, on the other hand, encourage lessons learnt at the end of the project and little or no reflection takes place.

The ANOVA results in Table 9 show that the F-scores have *p*-values (Sig.) less than 0.05 for some of the practices. This indicates that there is a significant difference between the practices of the various approaches. Therefore, the null hypothesis is rejected for the practices listed in Table 9.

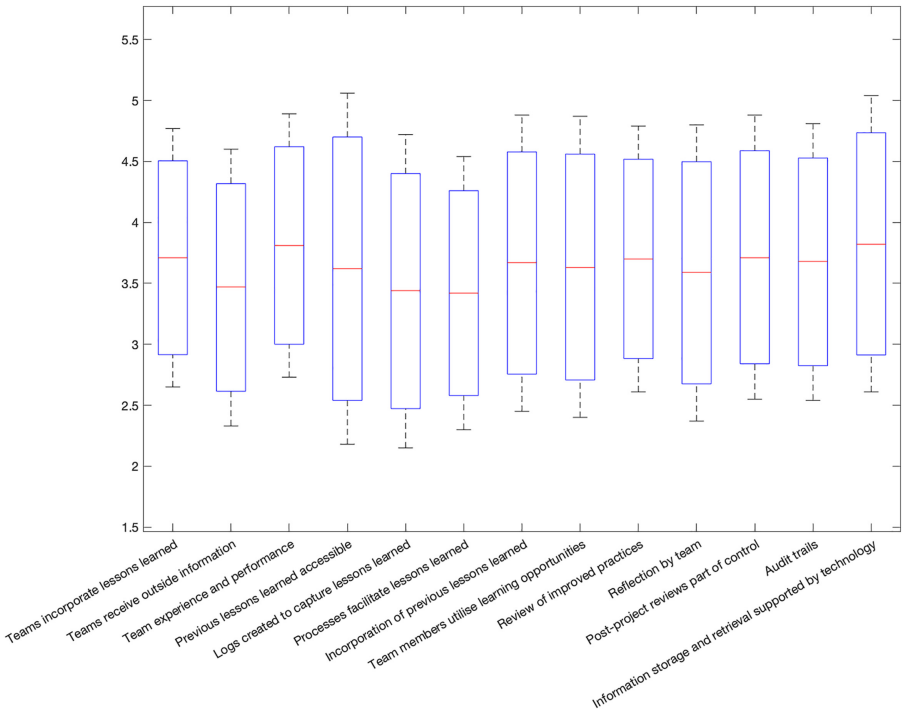


Figure 6.
Boxplots for Theme 5 (team reflection and learning)

Source(s): Authors own creation

5. Discussion

The results paint a mixed picture where the practices range from predictive project management approaches to iterative project management approaches. This is illustrated in Figure 8. The upper and lower limits were calculated using the standard deviations for each theme. The first observation is that, irrespective of the approach, the application of practices is broad, indicating that organisations fluctuate between predictive and iterative practices. This results in contextual ambidexterity where decisions are made on what is best for the project. It also confirms Lavie *et al.* (2010) observation that exploration and exploitation is a continuum. A second observation is that organisations lean more towards a hybrid and/or iterative approach than a more predictive approach.

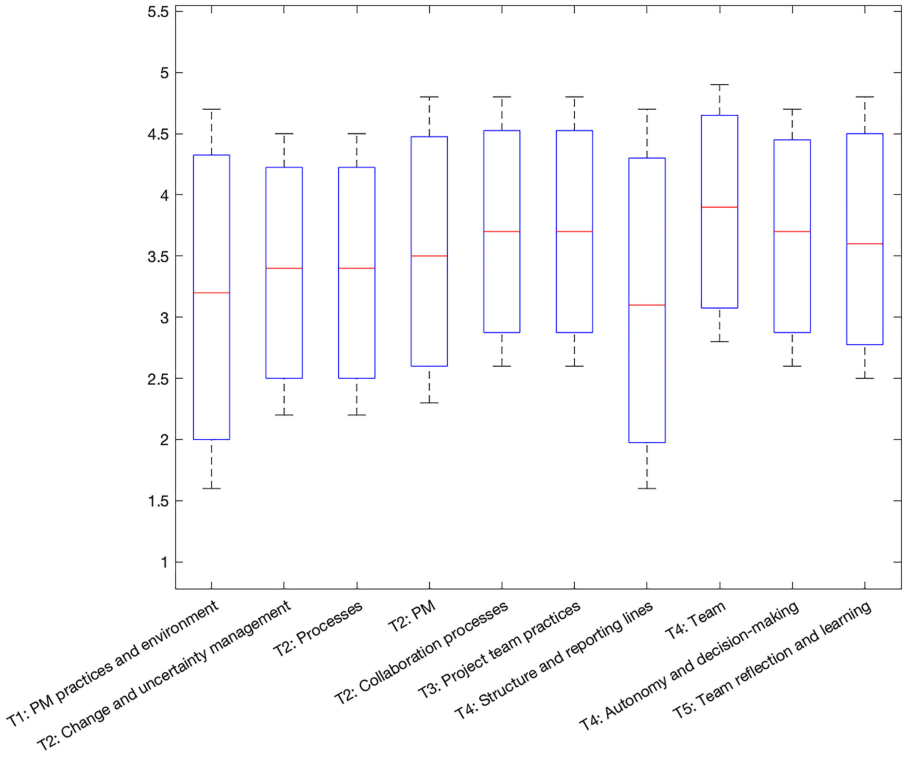
This answers the first research question. A hybrid approach explores and exploits practices from predictive and iterative approaches. The extent of this exploration and exploitation depends on the environment and the type of project. The results support the works of Cooper and Sommer (2016), Gemino *et al.* (2020) and Riesener *et al.* (2018) that a combination of predictive and iterative project management approaches resulted in a hybrid approach. The application of practices is on a continuum and project managers need to decide which practices is best at a specific point in time, thus the call for ambidexterity.

Theme 1 focusses on collaboration and the type of working environment. The results highlight that organisations followed very much a hybrid approach and that they did not see the value of practices such as collocation, the location of meetings and collaboration enforced by collocation. Organisations were also still experimenting with concepts such as online and

Practices	Skewness	Interpretation	Approach focus
Teams incorporate lessons learnt	−0.747	Moderately skewed	Hybrid → Iterative
Teams receive outside information	−0.410	Symmetrical	Hybrid
Team experience and performance	−0.840	Moderately skewed	Hybrid → Iterative
Previous lessons learnt accessible	−0.714	Moderately skewed	Hybrid → Iterative
Logs created to capture lessons learnt	−0.548	Moderately skewed	Hybrid → Iterative
Processes facilitate lessons learnt	−0.481	Symmetrical	Hybrid
Incorporation of previous lessons learnt	−0.794	Moderately skewed	Hybrid → Iterative
Team members utilise learning opportunities	−0.776	Moderately skewed	Hybrid → Iterative
Review of improved practices	−0.724	Moderately skewed	Hybrid → Iterative
Reflection by team	−0.424	Symmetrical	Hybrid
Post-project reviews part of control	−0.654	Moderately skewed	Hybrid → Iterative
Audit trails	−0.588	Moderately skewed	Hybrid → Iterative
Information storage and retrieval supported by technology	−0.744	Moderately skewed	Hybrid → Iterative

Source(s): Authors own creation

Table 8.
Skewness of Theme 5 practices



Source(s): Authors own creation

Figure 7.
Overview of themes

virtual work where virtual work was leaning towards exploration. The ANOVA results also highlight that there is a difference in how the practice of virtual work was addressed.

		Sum of squares	df	Mean square	F	Sig
THEME 1 (PM practices and environment)						
Agile practices	Between Groups	131.764	2	65.882	65.881	0.000
	Within Groups	273.004	273	1.000		
	Total	404.768	275			
Traditional practices	Between Groups	26.208	2	13.104	9.770	0.000
	Within Groups	368.842	275	1.341		
	Total	395.050	277			
Virtual work	Between Groups	21.892	2	10.946	5.450	0.005
	Within Groups	546.289	272	2.008		
	Total	568.182	274			
THEME 2 (Project team collaboration)						
Changes harnessed	Between Groups	13.808	2	6.904	4.827	0.009
	Within Groups	393.371	275	1.430		
	Total	407.180	277			
Uncertainty acceptance	Between Groups	13.670	2	6.835	5.551	0.004
	Within Groups	338.603	275	1.231		
	Total	352.273	277			
Customer changes	Between Groups	9.077	2	4.538	3.547	0.030
	Within Groups	351.891	275	1.280		
	Total	360.968	277			
Change acceptance	Between Groups	6.538	2	3.269	3.266	0.040
	Within Groups	275.278	275	1.001		
	Total	281.817	277			
Alignment of resources with strategy	Between Groups	8.244	2	4.122	3.743	0.025
	Within Groups	302.835	275	1.101		
	Total	311.079	277			
Alignment of PM and other management processes	Between Groups	11.782	2	5.891	5.217	0.006
	Within Groups	310.548	275	1.129		
	Total	322.331	277			
Cycle time adjustment to fit market rhythm	Between Groups	9.136	2	4.568	3.186	0.043
	Within Groups	394.349	275	1.434		
	Total	403.486	277			

Table 9.
ANOVA results

(*continued*)

		Sum of squares	df	Mean square	F	Sig
PM develops stable short- and flexible long-term plans	Between Groups	9.118	2	4.559	4.071	0.018
	Within Groups	307.976	275	1.120		
	Total	317.094	277			
THEME 3 (Project team practices)						
Self-assignment of tasks	Between Groups	14.531	2	7.265	5.564	0.004
	Within Groups	357.772	274	1.306		
	Total	372.303	276			
Practices are team driven	Between Groups	13.842	2	6.921	5.485	0.005
	Within Groups	345.739	274	1.262		
	Total	359.581	276			
Project goals participation	Between Groups	16.221	2	8.110	5.899	0.003
	Within Groups	376.704	274	1.375		
	Total	392.924	276			
	Total	327.141	276			
Team involvement with problem identification	Between Groups	9.564	2	4.782	5.591	0.004
	Within Groups	235.188	275	0.855		
	Total	244.752	277			
Team involvement with action plan evaluation	Between Groups	9.498	2	4.749	5.110	0.007
	Within Groups	255.538	275	0.929		
	Total	265.036	277			
THEME 4 (Leadership)						
Reduction of team autonomy	Between Groups	23.111	2	11.555	7.056	0.001
	Within Groups	450.371	275	1.638		
	Total	473.482	277			
Customer exclusion	Between Groups	12.367	2	6.183	4.027	0.019
	Within Groups	422.213	275	1.535		
	Total	434.579	277			
Flat hierarchy	Between Groups	24.940	2	12.470	7.283	0.001
	Within Groups	470.877	275	1.712		
	Total	495.817	277			

(*continued*)

Table 9.

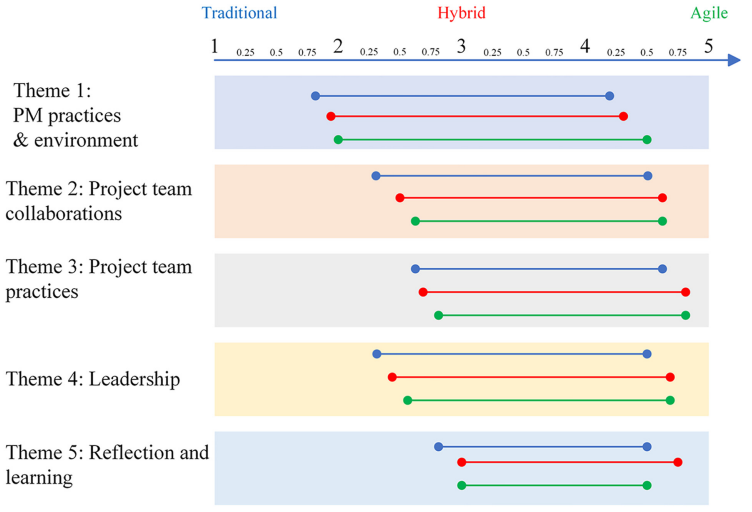
		Sum of squares	df	Mean square	F	Sig
Multi-disciplinary and self-organised team	Between Groups	10.451	2	5.226	5.080	0.007
	Within Groups	282.872	275	1.029		
	Total	293.324	277			
PM exercises flexibility	Between Groups	16.053	2	8.026	6.315	0.002
	Within Groups	349.544	275	1.271		
	Total	365.597	277			
Regular meetings with project participants to confirm target schedules	Between Groups	6.646	2	3.323	3.435	0.034
	Within Groups	266.063	275	0.968		
	Total	272.709	277			
Meetings facilitate communication and decision-making	Between Groups	6.459	2	3.230	3.641	0.027
	Within Groups	243.933	275	0.887		
	Total	250.392	277			
PM absence does not stall decision-making	Between Groups	15.891	2	7.946	6.243	0.002
	Within Groups	350.022	275	1.273		
	Total	365.914	277			
PM influences project decisions	Between Groups	8.404	2	4.202	3.649	0.027
	Within Groups	316.690	275	1.152		
	Total	325.094	277			
THEME 5 (Team reflection and learning)						
Teams incorporate lessons learnt	Between Groups	12.181	2	6.090	5.895	0.003
	Within Groups	284.121	275	1.033		
	Total	296.302	277			
Teams receive outside information	Between Groups	12.311	2	6.155	5.482	0.005
	Within Groups	308.754	275	1.123		
	Total	321.065	277			
Team experience and performance	Between Groups	17.628	2	8.814	8.534	0.000
	Within Groups	284.016	275	1.033		
	Total	301.644	277			
Previous lessons learnt accessible	Between Groups	9.902	2	4.951	3.481	0.032
	Within Groups	391.191	275	1.423		
	Total	401.094	277			

Table 9. (*continued*)

		Sum of squares	df	Mean square	F	Sig
Logs created to capture lessons learnt	Between Groups	11.382	2	5.691	4.459	0.012
	Within Groups	350.953	275	1.276		
	Total	362.335	277			
Processes facilitate lessons learnt	Between Groups	11.141	2	5.571	5.029	0.007
	Within Groups	304.618	275	1.108		
	Total	315.759	277			
Reflection by team	Between Groups	9.329	2	4.665	3.892	0.022
	Within Groups	329.549	275	1.198		
	Total	338.878	277			
Audit trails	Between Groups	9.606	2	4.803	4.280	0.015
	Within Groups	308.614	275	1.122		
	Total	318.219	277			

Source(s): Authors own creation

Table 9.



Source(s): Authors own creation

Figure 8. Application of predictive and iterative practices

Theme 2 consists of four sub-themes. Change and uncertainty are part and parcel of any project (Walker *et al.*, 2017; Saunders *et al.*, 2016) but are dealt differently in predictive and iterative approaches. The results highlight that organisations embraced change and uncertainty and dealt with these concepts in a more explorative way. Saying that, the ANOVA results do indicate that there is a difference between the approaches regarding harnessing change, the acceptance of uncertainty, the acceptance of change and the way forced changes by the customer are dealt with. These four practices are iterative and support

the principle of embracing change but are not that easily executed in industries where a more predictive approach is required.

The results from Theme 3 indicate that teams were self-organising and allowed to make their own decisions. The teams were built to achieve a specific goal and were not just put together based on the people available.

The overall focus of Theme 4 is on the leadership of the project manager. Again, there is not much difference between the three project classifications. When it comes to structure and reporting lines, mixed results are portrayed. Two-thirds of the respondents indicated that rigid hierarchies were in place and that the project managers still defined the tasks. These practices do not allow for quick decision-making and negatively influence the transition to an agile project environment. Irrespective of a rigid hierarchy, the respondents indicated that the teams did experience high levels of autonomy and decision-making. Again, these conflicting results can be attributed to the fact that organisations were still in the transition phase.

Reflection and learning are important aspects of an iterative project management approach. The results indicate that teams were reflecting and learning, irrespective of the project classification. Lessons learnt is a specific process that is followed within traditional project management and forms part of the project integration management knowledge area (Project Management Institute, 2017). Various authors highlight the benefits of lessons learnt in construction projects (Carrillo *et al.*, 2013) as well as in an iterative environment (Sutherland, 2004).

In response to the second research question, project managers need to exhibit a high level of ambidexterity. Thirty-three practices are unique to either the predictive or iterative approach. This resembles 28.2% of the 117 identified practices. The remainder of the practices (84 or 71.8%) requires ambidexterity.

Research question 3 posed the question which practices are applied in a hybrid approach. Tables 4–8 identified the 84 applicable practices. The level at which these practices are applied, is highly dependent on the level of exploration or exploitation, that is, ambidexterity.

6. Conclusion

"Either or" no longer applies to project management, and organisations need to adopt contextual ambidexterity. This approach is needed to incorporate the best of both worlds (predictive and iterative) into one project management approach, that is, hybrid. This study empirically investigated which approach is favoured. To achieve this, five themes were identified: (1) project management practices, (2) project team collaboration, (3) project team practices, (4) leadership styles, and (5) team reflection and learning.

Based on the analysis of 290 respondents, it can be concluded that most of the organisations followed a hybrid approach, thus applying contextual ambidexterity. This is irrespective of the industry sector or the organisation's own classification of the approach that it followed. All five themes apply practices that span predictive and iterative project management approaches. The direct result is that organisations adopted a hybrid approach where the best of two worlds was incorporated.

Organisations that indicated that they implemented iterative practices had practices that are associated with predictive project management approaches. The opposite is also true. The conclusion can be made that organisations will employ project management practices that are applicable to a specific scenario and project and that the pendulum will swing between predictive and iterative project management approaches. The impact on project managers is also enormous. They should be able to determine the best approach to implement a project and should therefore have adequate knowledge and skills to support their decisions. This indicates that project managers must be ambidextrous. It also has an impact on the training of project managers. All project managers should be trained in predictive as well as iterative

project management approaches. This will broaden their horizons to be more ambidextrous and choose the practices that are applicable to a certain project in a certain environment.

This article's theoretical contribution supports the view of other researchers (Pellegrinelli *et al.*, 2015; Turner *et al.*, 2014) that ambidexterity is a requirement for managing projects. Contextual ambidexterity is the preferred mode to manage hybrid projects. This article also filled the gap identified by Turner *et al.* (2014) on how to achieve ambidexterity in practice.

From a practical perspective, project managers are provided with 84 practices that can be explored or exploited to achieve the purpose of the project. There is no prescription of which practices should be used and to what extent. It is up to the project managers to make this decision. Project managers also need to realise that a hybrid approach to managing projects is here to stay. This will impact their skills and competencies. The training and education of project managers should include hybrid project management irrespective of the discipline.

This research opens various avenues for future research. Research can be done on a simulation model that can be used to determine which approach and practices are the best, given a certain situation and/or scenario. Various attributes can be used as input for such a model and machine learning can be utilised in this instance. Research into the role of the organisation's culture and structures on the adoption of a project management approach should also be conducted. An approach is often forced into an organisation without considering the culture and structures in place. This creates challenges and the focus should be on how best to incorporate certain approaches given the organisation's environment.

Project managers should be ambidextrous and be able to strike a balance between the adoption of predictive and iterative practices.

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