

In search of project management principles

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In search of Project Management Principles¹

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The objective of this paper is to determine whether a set of project management principles can be identified to serve as a common framework for developers and publishers of project management standards and guidelines. Twenty-two project management standards and other consensus documents were reviewed, revealing a common understanding across the globe of the requirements for effective project management. Potential statements of principles were extracted and clustered into 4 categories. The validated principles identified in each category were rewritten in a prespecified, consistent form. The resulting set of 12 principles should serve as a common basis for future standards and guidelines.

Introduction

The Context of this paper

Over the last fifty years, considerable effort has been invested in formalizing the practice of project management by developing standards and guidelines, a significant number of which are based on stated or implied principles (Lichtenberg, 1989). Principles are an important focus, not only for practitioners, but also for students and those governing projects, such as sponsors and steering committee members. Evidence for narrow and specific principles appears in the literature, such as sustainability and collaborative work (Silvius and Schipper, 2020; Walker and Walker-Lloyd, 2019). However, no analysis of the degree of consistency of principles for project management has been found in published sources. This is in spite of the importance that principles play in fields as disparate as ethics (Ross, 1930) and artificial intelligence (Stahl et al., 2021), as well as the impact of agile principles on project management practices (Agile Alliance, 2001).

Objective and scope of work

The objective of this paper is to address the question: “Can a foundational set of project management principles be identified, in particular from practice standards and guidelines?” The answer to this question will determine whether or not it will be possible, in the future, to increase the consistency between all relevant standards and other authoritative documentation. The paper provides an overview, based on a set of commonly used standards, guidelines, and other published documents on project and program management, of how principles are currently written, used, and applied in project management.

Although all of the principles should be relevant to project management, their relative importance depends on the organization’s and project’s context and environment. In order, therefore, to allow the practitioner to select and apply the relevant principles and practices that are best suited to their specific situation, this paper does not assume a specific definition of a ‘project’.

Methodology

The approach taken in this paper is to identify principles that are viewed as underpinning project management practices by identifying commonalities across a range of standards and other authoritative documents developed through group consensus. This paper does not judge any of those sources as more relevant than others. Further, the research excluded individual or small group opinions reflected in articles or journal proceedings and no attempt was made to resolve any potential gaps by proposing additional principles.

The following process was adopted for this study:

- Investigate how principles are used in national, regional and international project management standards, what those principles are, and the way the term ‘principle’ is interpreted and applied, culminating in the derivation of a working definition of the term ‘principle’ to be used in the subsequent analyses;
- Develop criteria for identifying project management principles not only by using the standards but also by drawing on a range of other authoritative documents;
- Analyze the expanded set of published standards and other authoritative documents for consistency and, based

on the criteria developed previously, derive a list of principles in a form compliant with the working definition already provided.

Background: principles in project management standards

Project management standards

International, regional, national and government standards

An international or national standard is an agreed way of doing or managing something, or set of agreed criteria for a product or service. Official standards, with international, regional and national recognition, tend to come from four primary sources:

- International standards, which may be used throughout the world, such as those of the International Organization for Standardization (ISO) and others.
- Regional standards, which cover a part of the globe such as those of the European Committee for Standardization (CEN), the Pacific Area Standards Congress (PASC), the Pan American Standards Commission (COPANT), the African Organisation for Standardisation (ARSO), the Arabic Industrial Development and Mining Organization (AIDMO), and others.
- National standards, such as those of the American National Standards Institute (ANSI), British Standards Institute (BSI), Deutsches Institut für Normung (DIN, German), and others.
- Government standards, such as the UK government’s GovS series, are developed to mandate or guide practice in their respective public sectors and are only applicable in those contexts.

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Key features of standards

To avoid ambiguity, in cases where drafting rules are provided, the key features of standards are:

- a common pattern for the table of contents is used.
- the purpose of each clause is explicit.
- explicit drafting rules and use of language are employed.
- terms are defined where appropriate.
- a periodic review is undertaken to assess a standard’s on-going suitability.

Standards need to make the purpose of each clause, and part of a clause, explicit by differentiating between mandatory and advisory elements. The differentiation is commonly referred to as:

- **normative** content: prescriptive and set requirements which are mandatory, as in a specification. The word ‘shall’ is used in these, for example, “The outer dimensions shall be less than 3mm... ”;
- **informative** content: for guidance, such as a code of practice. The word ‘should’ is used in these, for example, “The project manager should tailor the management processes . . . ”.

In order to avoid ambiguity, terms which are critical for the use of a standard are defined unless the definition in the prescribed dictionary is adequate. Generally, standards should be free of jargon and trade-marked terms.

Table 1. Drafting basis for various project management related standards

	Narrative-based	Process-based	Practice-based	Principles-based practices	Principles-based narrative
ISO 21500:2021 Project, Programme and Portfolio Management – Context and Concepts	Current				
ISO 21500:2012 Project, Programme and Portfolio Management – Context and Concepts (SUPERSEDED)		ss			
ISO 21502:2020 Project, programme and portfolio management — Guidance on project management (replaces 21500:2012)			Current		
ISO 21505:2017 Project, programme and portfolio management — Guidance on governance	Current				
ANSI/PMI 99-001-1999 The standard for project management (SUPERSEDED)		ss			
ANSI/PMI 99-001-2017 The standard for project management (SUPERSEDED) (all previous versions)		ss			
ANSI/PMI 99-001-2021 The standard for project management					Current
BS 6079:2002, Part 1: Guide to project management (SUPERSEDED)	ss				
BS 6079:2010, Part 1: Guide to project management (SUPERSEDED)				ss	
BS 6079:2019, Project management – Principles and guidance for the management of projects				Current	
GovS 002: v 1.0 (2017), Project delivery functional standard (SUPERSEDED)				ss	
GovS 002: v 2.1 (2021), Project delivery functional standard				Current	

Key: ‘ss’ denotes a superseded standard; ‘current’ denotes a standard which is currently valid

Standardization approaches

Overview

Within project management, there has recently been significant attention paid to the various drafting approaches for standards. At the international level, ISO 21502:2020 (ISO, 2020) includes an annex in which it declares itself to be “practice-based” whereas the earlier ISO 21500:2012 (ISO, 2012) was “process-based”. In a similar vein, ANSI and the Project Management Institute (PMI) declare that ANSI/PMI 99-001-2021 The Standard for Project Management (ANSI/PMI, 2021) is “principles-based” whereas the previous PMI and ANSI/PMI project management standards from 1987 through 2017 were “process-based”. The authors of the annex in ISO 21500:2012 have indicated that their practice-versus-process distinction was based upon their own consensus rather than upon a formal study of the possible types of standards.

For this study, the authors found it useful to add two approaches to the three introduced by ISO 21502:2020 and ANSI/PMI 99-001-2021, namely:

- “narrative-based”; and
- “principles-based narrative”, a hybrid of “principles-based” and “narrative-based”.

While these two terms exist the literature, they do not appear to have influenced ISO 21502:2020 and ANSI/PMI 99-001-2021.

The purpose of a standard can range from purely informative (such as a guide) to rigidly normative such as a safety critical process or product specification. The project management standards reviewed here are listed in Table 1. The categorisation of drafting approach is based on that used for the majority of the document. The table shows examples of previous versions of the standard and when the drafting approach changed.

Narrative-based standards

The term “narrative-based standards”, introduced here, refers to sources that are ‘informative’ and written as guides, with themes for the main clauses dealing with specific, project management-related topics. The topics as a whole represent the scope of the standard. Narrative-based standards have been published by BSI (2002) and ISO (2017; 2021a).

Process-based standards

“Process-based standard”, the declared alternative to both ISO 21502:2020 and ANSI/PMI 99-001-2021, appears in Brigham (1990), and a few subsequent papers in law journals. Although the term occurs only rarely, when it appears outside

of law journals it is used mainly in reference to safety, medical devices, and security. Axinte et al., for instance, describe the use of PRINCE2 in quality assurance, an application that is akin to safety and security, and call it a “process-based standard” (Axinte et al. 2017), even though PRINCE2’s authors do not claim it to be a ‘standard’.

Process-based standards use a formal process as the foundation for the content with activities described with their inputs and outputs, often giving these specific names. Although the relevant process-based standards are not prescriptive in themselves, as they do not require the use of these processes, the processes themselves can be qualified as ‘prescriptive’ in that they define absolute relationships, outputs, and sequences of activities. Process-based standards have been published by ANSI/PMI (1996, ANSI/PMI 99-001-1999; also PMI, 1987), and ISO (2012).

Practice-based standards

“Practice-based standard”, the self-description of ISO 21502:2020, occurs rarely. When it does appear, it seems to be a substitute for ‘empirical’, derived from practice rather than from theory. Kellam (2017), for instance discusses practice-based standards for orthopedic surgery.

Practice-based standards avoid the rigidity of the process-based approach by describing the recommended or required ‘practices’. Practices are the actual application or use of an idea, belief, or method, as opposed to theories relating to it. As such, these standards use ‘practices’ to describe what needs to be done and why, as opposed to how to do something. How a practice is applied is left open to the users of the standard based, among other things, on the context, type, and complexity of the project being managed. This approach means a standard based on practices is very flexible compared with a process-based standard and so can encompass any compliant working methodologies, techniques and terminology. A practice-based standard has been published by ISO (2020).

Principles-based practice standards

“Principles-based standard”, the self-description of ANSI/PMI 99-001-2021, has become a common term since the passage in 2002 of the Sarbanes-Oxley Act (US Congress, 2002). This required the Securities and Exchange Commission (SEC) to “conduct a study on the adoption by the United States financial reporting system of a principles-based accounting system” (SEC 2003). It has become a common term in accounting papers, such as Tweedie (2007). The SEC distinguishes “principles-based standards” from the previous “rules-based standards” which, like process-based standards, were

intended to ensure compliance with safety, security, and quality. A search of Scopus found 68 papers since 2002 using the exact phrase “principles-based standard”. Fifty-six of them were in accounting journals and eight in law journals. None mentioned ISO or ANSI standards. However, the phrase does appear in 2015 in an ISO/IEC (International Electrotechnical Commission) standard for information technology (IT) (ISO/IEC, 2015). That was followed by a standard dedicated to “principles-based standards” in IT, ISO/IEC TR 38504:2016 Governance of information technology — Guidance for principles-based standards in the governance of information technology (ISO/IEC, 2016). This later standard has since been cited in several other ISO/IEC standards for IT. It seems possible that these ISO/IEC standards might be the origin of the term “principles-based standards” in ANSI/PMI 99-001-2021.

Principles-based practice standards have the same features and advantages as ‘practice-based’ standards except that they contain a list of overriding principles that apply at all times and that determine or constrain how the practices are to be undertaken. The advantage of adding principles is that they enable to user to apply the standard in circumstances and in ways which the detailed content doesn’t directly address. Principles-based practice standards have been published by BSI (2019) and HM Government (2021a), and have a wide-ranging scope similar to the 2020 ISO standard.

Principles-based narrative standards

Principles-based narrative standards only contain the principles and do not describe processes nor define any practices. The narrative is in descriptive form, as in narrative-based standards described above. As they only include principles, they can be more difficult to apply since only the accepted objectives for the practice of project management and its core functions are described. In this approach (as in the principles-based practices approaches) the principles are intended to apply across the spectrum of project management. ANSI/PMI (2021) is the only example of this format discussed here.

Project management principles

Use of the term 'principle'

When discussing 'principles' it is necessary to have a common understanding of what that term means in the context in which it is used.

None of the standards discussed in this section formally defines 'principle' and only one of those discussed in the following section has such a definition. All others by inference rely on a common, accepted, use of the word as defined in a dictionary. The dictionaries provide several different conceptual uses of the term of which the most relevant are in Table 2. For example,

is a principle a fundamental truth or is it a law? The two are very different: truth is a basis for decision-making whereas a law includes the decision. Those definitions not considered in Table 2 are either specific to a discipline such as natural sciences or psychology, rarely used, or obsolete.

Table 2. Dictionary definitions of principle

The Oxford English Dictionary (used by ISO and BSI and in the UK) (Oxford University Press [OUP], 2007)	Merriam-Webster (n.d.) (used by ISO and commonly used in the USA)
<p>II. Fundamental truth or law; motive force. 3</p> <p>a. A fundamental truth or proposition on which others depend; a general statement or tenet forming the (or a) basis of a system of belief, etc.; a primary assumption forming the basis of a chain of reasoning.</p> <p>b. first principle: a primary proposition, considered self-evident, upon which further reasoning or belief is based. Frequently in plural.</p> <p>c. <i>Science.</i> A general or inclusive statement about an aspect of the natural world that has numerous special applications or is applicable in a wide variety of cases. Frequently with distinguishing word or words</p> <p>4</p> <p>a. A general law or rule adopted or professed as a guide to action; a settled ground or basis of conduct or practice; a fundamental motive or reason for action, esp. one consciously recognized and followed.</p> <p>b. A personal code of right action; rectitude, honourable character. Frequently in <i>plural</i>.</p>	<p>1a: a comprehensive and fundamental law, doctrine, or assumption</p> <p>b: (1): a rule or code of conduct (2): habitual devotion to right principles //a man of principle</p> <p>c: the laws or facts of nature underlying the working of an artificial device</p> <p>2: a primary source : ORIGIN</p> <p>3 a: an underlying faculty or endowment //such principles of human nature as greed and curiosity</p> <p>b: an ingredient (such as a chemical) that exhibits or imparts a characteristic quality</p> <p>4 capitalized, Christian Science: a divine principle: GOD</p>

Furthermore, in some cases, different standards issued by a given standards-setting organization specify conflicting definitions of the term 'principle'. For example, the Project Management Institute's Standard for Portfolio Management uses one dictionary meaning, "the purpose of principles is to provide guidance for practitioners", that is in conflict with the definition given in its Standard for Program Management, "[principles are] tenets that are held to be true and important" (ANSI/PMI, 2017b, p. 7; 2017a, p. 2). ISO has over 50 definitions containing the word 'principle' in their library of standards.

Where the term 'principle' is not defined, some principles-based standards expand on the use of the term either within the standard itself or in separate documentation.

An example of this expansion is found in ANSI/PMI (2021). In its introduction,

ANSI/PMI says that it identifies "principles that guide the behaviors and actions of project professionals and other stakeholders who work on or are engaged with projects." In clause 3, it continues "The principles of project management are not prescriptive in nature. They are intended to guide the behavior of people involved in projects. They are broadly based so there are many ways individuals and organizations can maintain alignment with the principles. Principles can, but do not necessarily, reflect morals" (ANSI/PMI, 2021, p. 3). In its preface, it adds "The principle statements capture and summarize generally accepted objectives for the practice of project management and its core functions. The principle statements provide broad parameters within which project teams can operate and offer many ways to remain aligned with the intent of the principles." (ANSI/PMI, 2021, p. xi)

Another example is HM Government (2021a). This standard relies on the dictionary definition and no elaboration is included in the standard. The guide which accompanies all the HM Government functional standards (of which project delivery is just one) explains its principles as follows: "Principles: the mindset needed to follow the standard". The Handbook for managing a standard builds on this to say, "sets out the mindset needed to follow the standard within the scope of your function. Use these principles to encourage the right shared assumptions, values and group norms you want to see." (HM Government, 2021b)

The way principles are written

The way principles are written differs among the standards, as shown in Table 3.

Table 3. How principles are written in the standards

Standard	Explanation				
<p>ANSI/PMI 99-001-2021, The standard for project management</p>	<p>This standard, clause 3, says it begins each principle with a figure that provides the principle label across the top with the principle and key points under the label. It then lists the labels. For example: 3.1 BE A DILIGENT, RESPECTFUL, AND CARING STEWARD ← the label</p> <table border="1" data-bbox="300 434 1305 864"> <thead> <tr> <th colspan="2" data-bbox="300 434 1305 463">STEWARDSHIP</th> </tr> </thead> <tbody> <tr> <td data-bbox="300 463 715 864"> <p>Stewards act responsibly to carry out activities with integrity, care, and trustworthiness while maintaining compliance and internal and external guidelines. They demonstrate a broad commitment to financial, social, and environmental impacts of the projects they support.</p> </td> <td data-bbox="715 463 1305 864"> <ul style="list-style-type: none"> ● Stewardship encompasses responsibilities within and external to the organization. ● Stewardship includes: <ul style="list-style-type: none"> - Integrity, - Care, - Trustworthiness, and - Compliance. ● A holistic view of stewardship considers financial, social, technical, and sustainable environmental awareness </td> </tr> </tbody> </table> <p>(ANSI/PMI, 2021, p. 24)</p> <p>Assuming it is the label of the subclause (i.e., Be a diligent, respectful, and...) which represents the 'principle' and not the description (i.e., Stewards act responsibly...), the principles are written as imperatives. The explanations are written as criteria stating what should be evident if the principle is complied with.</p> <p>After introducing each principle using a figure, there is a large amount of descriptive text, with little direct advice or recommendations (very few 'should' statements and mostly "is/are" statements or assertions).</p>	STEWARDSHIP		<p>Stewards act responsibly to carry out activities with integrity, care, and trustworthiness while maintaining compliance and internal and external guidelines. They demonstrate a broad commitment to financial, social, and environmental impacts of the projects they support.</p>	<ul style="list-style-type: none"> ● Stewardship encompasses responsibilities within and external to the organization. ● Stewardship includes: <ul style="list-style-type: none"> - Integrity, - Care, - Trustworthiness, and - Compliance. ● A holistic view of stewardship considers financial, social, technical, and sustainable environmental awareness
STEWARDSHIP					
<p>Stewards act responsibly to carry out activities with integrity, care, and trustworthiness while maintaining compliance and internal and external guidelines. They demonstrate a broad commitment to financial, social, and environmental impacts of the projects they support.</p>	<ul style="list-style-type: none"> ● Stewardship encompasses responsibilities within and external to the organization. ● Stewardship includes: <ul style="list-style-type: none"> - Integrity, - Care, - Trustworthiness, and - Compliance. ● A holistic view of stewardship considers financial, social, technical, and sustainable environmental awareness 				
<p>BS 6079:2019, Project management – Principles and guidance for the management of projects</p>	<p>This standard is mostly informative, however each principle is written in the imperative form as a heading followed by an expanded explanation. Finally, a third element provides some contextual guidance to aid understanding. For example: 5.1 Be driven by needs and benefits ← the principle Senior leaders in an organization should be able to demonstrate explicitly how each project they undertake contributes to their organization's strategy. Those projects which do not align with or contribute to the organization's strategy should be screened out as soon as possible. ← expanded explanation Strategic fit ought to be assessable from the beginning when a project is proposed; organizations which have clearly communicated strategies are able to screen more effectively than those which do not. Without a clear strategy and effective screening of proposed projects, there is likely to be more projects competing for scarce resources, resulting in the organization losing focus and jeopardizing its overall performance. ← contextual guidance By doing this, it makes it clear which words represent the 'principle' and avoids using a hard normative statement with 'shall'.</p>				
<p>GovS 002: v 2.1, Project delivery functional standard</p>	<p>The principles in this standard are applicable in all eventualities and are fundamental propositions, a basis of conduct and rules to guide action. The standard emphasises this by preceding the list of principles with a "shall" statement. For example: Those engaged in project delivery shall ensure:</p> <ol style="list-style-type: none"> 1. delivery objectives are aligned to government policy and organisational objectives 2. continuing business justification to confirm benefits can be realised and risks managed within the organisation's risk appetite, and that unjustified work is terminated, etc. 				

Working definition of 'principle' for this paper

The working definition of 'principle' for this paper is given below. is compatible with the corresponding dictionary definitions in Table 2:

Principle: a fundamental truth or proposition that serves as the foundation for a system of belief or behaviour or for a chain of reasoning

As explained above and in Table 3, each standard has adopted its own approach to the way principles are presented. In order to enable the consistent collation of the set of extracted principles, and to ensure that each statement complies with the definition of the term 'principle' provided above, they are rewritten in the following format: <action> leads to < outcome>.

Criteria for identifying project management principles

Overview

This section builds upon the previous two, ascertaining whether a coherent set of project management principles can be identified and what the criteria should be for determining whether a statement is a principle or not.

Identifying criteria for principles in source documents

In order to gain an understanding of how 'principles' are used and described in relation to project management, a set of standards which had been developed using a consensus approach was selected. Principles stated in the selected sources were analysed to identify common themes. As described in the previous section, typical examples of sources include international and national standards for project management and related disciplines. Project management-related documents which have gained international acceptance were also used, even though they are not formally recognized as 'standards'.

To identify current principles associated with project management, each of the source documents was examined to find statements considered to be fundamental for project management. The reasoning for their being identified as such was also considered. Given that many consensus documents do not refer specifically to, or define, the term 'principle', this paper identified candidate principles by inference from the context in which they are used.

Candidate principles were evaluated against the definition of 'principle' as described in the previous section, and incompatible ones were eliminated. Specifically, the 'foundation for a system of belief or behaviour or for a chain of reasoning' was used as key to why certain

actions are taken in project management practice. The analysis focused on statements describing the fundamental reasons 'Why we do it' rather than 'What to do'. This led to removing from analysis any statements describing specific practices, procedures or methods.

For the remaining candidate principles, common themes were identified, enabling comparison of differing expressions of similar concepts. Statements within each theme were compared in pairs, extracting common characteristics to identify areas of convergence.

Expanding the document set used for analysis

In order to explore the common understanding of a representative sample for project management practitioners world-wide, this paper not only investigates standards published by recognized bodies but also other documents that were developed through broad consensus-building processes.

Numerous efforts have been made by individual authors to identify principles of project management, including Holt (1983), Spierer (1984), Lichtenberg (1989), Bing (1994), Bondy (1995), and Wideman (2009). These, however, have not had a documented broad consensus and were not subject to public review, and thus were not selected as reference sources for this paper.

Table 4 identifies the sources associated with each of the principles discussed in this section. Short titles are used here to identify the relevant source of any principle.

One challenge faced in the selection of sources was the multiple editions of some sources. For example, ANSI/PMI 99-001-1999 (ANSI/PMI, 1996), which was revised in 2000, 2004, 2008, 2013, and 2017. ANSI/PMI 99-001-2021 states that these are all evolutions from PMBOK'87 (ANSI/PMI, 2021). The authors of this paper found that the 2000, 2004, 2008, 2013, and 2017 editions are not sufficiently different from ANSI/PMI 99-001-1999 to justify them being added as separate sources.

Sample analysis

Table 5 shows an example of output from the analysis. The example relates to accountability and governance, as that is a feature in all the sources, and serves to illustrate the differences among the source documents highlighted in the previous section.

[Insert Table 5 near here]

Criteria for determining principles

After reviewing the concepts in each of the principles described in the sources, a set of characteristics common to all project management principles was developed and specified. These characteristics were found to be consistent across all themes grouping candidate principles. This finding supports the conclusion that the characteristics of true principles are independent of the principle itself. On analysing the characteristics, a set of criteria for testing principles was derived. These criteria were then used for testing a potential principle. The criteria are:

- **Applicable:** the principle can be applied to projects and project management in general.
- **Essential:** the principle is necessary for project management practice and has a demonstrable impact on project success.
- **Timeless:** the principle is found repeatedly in project management literature through multiple editions, and is shown to be enduring.
- **Universal:** the principle is valid in all project management cases and contexts, regardless of culture, environment, project type or discipline.
- **Indivisible:** the principle is valid in its own right, and cannot be broken into underlying concepts.
- **Unique:** the principle is distinct in that it does not overlap or rely on any other principle.
- **Consistent:** the principle is coherent, working in conjunction with other principles and hence not in conflict or in contradiction with any other principle.

Table 4. Sources used in the analysis

Short title	Title
ISO Standards	
ISO 37000:2021	<i>Governance of organizations — Guidance.</i> ISO 37000:2021 (ISO, 2021b)
ISO 21500:2021	<i>Project, programme and portfolio management — Context and concepts.</i> ISO 21500:2021 (ISO, 2021a)
ISO 21505:2017	<i>Project, programme and portfolio management — Guidance on governance.</i> ISO 21505:2017 (ISO, 2017)
ISO 21502:2020	<i>Project, programme and portfolio management — Guidance on project management.</i> ISO 21502:2020 (ISO, 2020)
Regional/National Standards	
PM Squared	<i>PM² Project Management Methodology Guide 3.0.1</i> (European Union, 2021a)
Agile PM Squared	<i>The PM² Agile Guide 3.0.1</i> (European Union, 2021b)
BS 6079:2019	<i>Project management – Principles and guidance for the management of projects.</i> BS 6079:2019 (BSI, 2019)
GovS 002	Government Functional Standard GovS 002 v 2.0. <i>Project delivery portfolio, programme and project management</i> (HM Government, 2021a)
ANSI/PMI 99-001-2021	<i>The Standard for Project Management</i> , seventh edition, ANSI/PMI 99-001-2021 (ANSI/PMI, 2021)
ANSI/PMI 99-001-1999	<i>A Guide to the Project Management Body of Knowledge</i> , 1996 / First Edition adopted by ANSI as ANSI/PMI 99-001-1999 (ANSI/PMI, 1996)
Other consensus-based documents	
PMBOK'87	<i>Project Management Body of Knowledge (PMBOK)</i> (PMI, 1987)
APM BoK	<i>APM Body of Knowledge 7th edition</i> (APM, 2019)
Agile Manifesto	<i>Manifesto for Agile Software Development</i> (Agile Alliance, 2001)
APM Responsible PM	<i>A Guide to Responsible Project Management</i> (Thompson & Williams, 2018)
Disciplined Agile	<i>Choose your WOW! A Disciplined Agile Delivery Handbook for Optimizing Your Way of Working</i> (Ambler and Lines, 2020)
APM Governance	<i>Directing Change – A guide to governance of project management. 3rd edition</i> (APM, 2018)
PMI Sustainable Development	<i>Project Management and Sustainable Development Principles</i> (Gareis et al., 2013)
Equator Principles	<i>The Equator Principles</i> (Equator Principles Financial Institutes [EPFIs], 2020)
GAPPS PM	<i>GAPPS Project manager competency framework, v1.7</i> , (GAPPS, 2017a)
GAPPS Sponsor	<i>GAPPS Sponsor competency framework, v1.7</i> , (GAPPS, 2017b)
ICB	<i>Individual Competence Baseline v.4 (ICB4)</i> (IPMA, 2015)
PRINCE2	<i>Managing Successful Projects with PRINCE2</i> , 6th edition (Axelos, 2017)

Table 5. Example of analysis output on different forms of fundamental statements

Source Statement	Meets Definition (mandatory)	Applicable to and essential for any project	Similar concept in other publications	Describes a single concept	Works in conjunction with other concepts
ISO 21500:2021 authority and accountability should be defined and assigned, consistent and traceable across all levels of a project, programme or portfolio;	? (‘should’ implies an action)	√	√	√	√
ISO 21505:2017 The governance framework should contribute to and provide oversight of the creation and realization of value for stakeholders by: a) the selection of members of the governing body and delegated governance entities that have the appropriate levels of capability, competence, authority, experience and access to the resources they require; b) responsible management of human and other resources and their use.	— (describes how is it used, i.e., a practice)	—	—	—	—
GovS 002 v 2.0, 15 July 2021 Accountabilities and responsibilities are defined, mutually consistent and traceable across all levels of management.	√	√	√	√	√
PRINCE2 The PRINCE2 project team should have a clear organizational structure and involve the right people in the right tasks.	? (‘should’ implies an action)	√	√	— (two concepts)	√
BS6079:2019 Single point accountability for a project is critical to its successful delivery.	√	√	√	√	√
Agile Manifesto - 2019 Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.	√ (first sentence – the second sentence is a practice)	√	√	√	√
ISO 37000:2021 The governing body should demonstrate its accountability to the organization as a whole and hold to account those to whom it has delegated.	? (“should” implies an action)	√	√	— (two concepts)	√

Key: √ denotes that the criterion is met; — denotes that the criterion is not met; ? denotes that the criterion may be met.

Analysis and results

Data collection and clustering

Overview

The main challenge encountered during the literature review was that many of the sources did not explicitly have clauses, sections, or descriptions identified as 'principles'. In many cases what are identified in some sources as 'principles' are included in another source's narrative content. Only 10 of the 22 sources, the Agile Manifesto (Agile Alliance, 2021), Disciplined Agile (Ambler and Lines, 2020), ANSI/PMI 99-001-2021 (2021), APM Governance (APM, 2018), BS 6079:2019 (BSI, 2019), Equator Principles (EPFIs, 2020), GovS 002 (HM Government, 2021a), ISO 37000:2021 (ISO, 2021b), PMI Sustainable Development (Gareis et al., 2013), and PRINCE2 (Axelos, 2017) include statements explicitly identified as 'principles'.

While the remaining sources considered do not specifically use the term 'principles', they do include statements that satisfy the definition of the term that has been provided here. These statements were identified and extracted for assessment against statements addressing the same or similar concept found in other sources.

The assessment of the extracted statements uncovered that indeed several concepts occurred in multiple sources in different forms and formats (see Table 3). The subsequent step in the analysis was to identify common topics and group corresponding statements into four focus areas as follows:

Focus Area 1

Each project is undertaken to bring about a change, and the need for that change stems from the sponsoring organization's objectives. Not surprisingly, therefore, most sources discuss the relationship between the sponsoring organization's overall objectives and the project it is undertaking. This concept occurs through the discussion of business cases capturing the intentions underpinning a project and required to authorize a project. There are also several references to value generation, organizational needs, and expected benefits from project execution.

Principles in this area include strategic alignment, continuing justification, and continuous improvement. These are discussed in more detail later.

Focus Area 2

Uncertainty is an area of focus in many of the sources because projects exist in an environment where uncertainty is a fact of life. It is impossible to know with 100-percent confidence what circumstances might impact the project and its environment and consequently threaten

the achievement of the project's objectives. This uncertainty exposes risks to the work effort as well as the organization or group undertaking or impacted by a project or its outcomes. Thus, as one would expect, many sources identified principles or included discussions related to uncertainty and risk.

Principles in this area include governance, resilience, and risk. These are discussed in more detail later.

Focus Area 3

Projects usually require the collective effort, skills and contribution of people from a range of disciplines to manage, supervise, and undertake the work. Each person working on a project needs to understand their role, what deliverables, outputs, products, services, or outcomes they are responsible for, the associated quality expectations, from whom they receive inputs, to whom they supply outputs, with whom they will need to engage, to whom they are accountable, and many other facets of team coordination.

Principles in this area include team structure, teamwork, and organizational values. These are discussed in more detail later.

Focus Area 4

As projects require people with varied expertise working together in an organized fashion, it is not surprising that systematic management of work was a common theme across most of the sources investigated. To achieve the intended results, the team must tailor their working methods, including processes and procedures for planning, monitoring and controlling the project's activities. The approaches used to manage and undertake the work need to be adapted to support the project's objectives and context, the team's capabilities, complexity, and characteristics of the stakeholder community. This includes defining and planning the work so that it can address stakeholders' concerns and use their input to help the project team achieve the intended objectives. Specialized development and delivery approaches may be adopted as needed, such as predictive, adaptive or hybrid methodologies, which may be managed in the context of an appropriately tailored project life cycle.

Principles in this area include management, flexibility, and stakeholder engagement. These are discussed in more detail later.

Approach to developing the principles

After each of the candidate principles in the sources had been assigned to an applicable focus area, each area was

analyzed to identify a minimum set of principles that represented all of these candidate principles and complied with the criteria listed in the third section of this paper.

Based on the analysis and applying the definition of 'principle' from the second section of this paper and the criteria identified in the third section, a set of validated project management principles was identified. Each of the principles proposed below captures a common focus and corresponding concepts found in the analyzed sources. Each of the candidate principles has been reworked to comply with the working definition of a principle and the corresponding selection criteria, and formulated in accordance with the template "doing A results in B", consistent with the definition of principles as fundamental truths. The resulting set is now a compliant set of principles.

For each of the proposed principles Appendix A provides select examples of corresponding statements from the sources. In addition, in a number of cases, additional potential principles that did not appear in enough sources to be considered representative are listed in Appendix B with select examples of corresponding statements from source documents.

Common set of validated project management principles

Strategic alignment: aligning a project's objectives with the organization's strategy ensures that the project's outcomes contribute to achieving the organization's objectives.

Every organization has strategic goals, whether documented or not, and projects are undertaken to bring about the changes that the organization wishes to make to achieve its goals. A project's specific objectives should be stated and documented at the start of the project. Alignment-related references in the analyzed sources include discussions of organizing around products and services, being aware of the project's relationship to the enterprise, ensuring a demonstrably coherent and supporting relationship between the overall business strategy and the project, developing an informed business case, being driven by needs and benefits, using a value generation model, and being aware of the wide range of perspectives that different groups and different people may have about the purpose of a project.

Continuing justification: on-going confirmation that a project is justified contributes to achieving objectives and avoiding waste.

The analyzed sources highlight that it is good practice to ensure a project is justified before it is started and that such

justification is confirmed as the project proceeds. Justification drives decision-making to ensure the project remains aligned with the organization's objectives. Accordingly, projects are justified at the start of each new phase of the work or if a significant change to the objectives, plan or proposed solution is proposed. Justification is often in the form of a 'business case' which specifies the following project features: strategic alignment; constraints and risk, economic, financial, commercial, technical and social viability; the choice of solution; the business or societal changes needed; the delivery schedule; and the allocated budget. If a project can no longer be justified, it should be terminated so that its funds and resources can be reinvested.

Continuous improvement: capturing, sharing, and applying experience and lessons learned from previous work improves current and future project performance.

Projects are characterized by uncertainty, and new information and issues are uncovered regularly as the project proceeds. Teams learn from these new facts as they proceed and adjust their plans and working methods accordingly. Team members also bring their lessons from prior projects and carry those lessons forward to future projects. Teams and sponsors need to hold regular reviews; adjust the project's objectives, scope and plan; promote a culture of improvement; draw on lessons from earlier work; and share lessons. They also discuss updating the project management approaches, and sharing lessons between teams.

Governance: adopting a proportionate and appropriate governance framework enables the organization's governing body to control the work and manage the risks.

Governance frameworks set the boundaries within which a project sponsor, project manager, and team operate. These frameworks provide boundaries to ensure the project is aligned with the organization's values and aid the project team in achieving the project's objectives. Often the governance principle is put into practice through a gated approach or a phased life-cycle to enable formal controls at the start and end of phases. The management frameworks and controls put in place need to be proportionate and appropriate to the work being undertaken, the level of prevailing risk expected, and the benefits likely to be realized. Tailoring the governance frameworks to align with the circumstances to be encountered is considered good practice and not only reduces the management effort needed, but helps to maintain rigorous control of the risks involved with respect to the benefits expected.

Resilience: embracing adaptability enables project teams to accommodate and manage change.

Uncertainty and change are factors that are constantly present in the business and organizational environments within which most projects operate. Organizations and project teams must continuously adapt to these changing factors making the adjustments necessary for keeping the project on track to accomplish the goals for which it was undertaken. Actively embracing the need to adapt approaches, working relationships, and communication needs while seeking ways to accommodate and manage changes in a positive way gives project teams the greatest flexibility to respond appropriately as the need arises.

Risk: ongoing management of risks, in terms of opportunities and threats, maximizes positive impacts and minimizes negative impacts to the project and its outcomes.

The environments within which project teams operate are filled with uncertainty and risk. Each project team must address this uncertainty and manage the risks in a way that maximizes the probability that the project being undertaken can deliver the outcomes expected and ultimately lead to the value being sought by the organization or group initiating the effort. Risks can manifest themselves as opportunities or as threats to achieving the objectives. Risks may apply directly to the project work or even apply to the organization or group as a whole. Risk management is an essential component of project management, and it encompasses the evaluation of opportunities and threats, developing responses, and implementing the planned responses as appropriate.

Team structure: maintaining a clear team structure with defined roles enables team members to understand each other's responsibilities and ensures that role holders with delegated authority can be held to account.

Although a clear definition of the team structure and a description of the governing body's expectations are necessary conditions for success, they are not sufficient. The analyzed sources discuss organizational structure, involving the right people in the right tasks, promoting accountability, defining responsibilities, and ensuring accountability to the organization as a whole.

Teamwork: collaborative working as teams between individuals with diverse skills, knowledge, and experience enables them to accomplish shared objectives efficiently.

Although communication of the team structure and expectations from the

governing body is necessary, it is not sufficient, alone, to ensure efficient project execution. Team members must also take responsibility for working together to accomplish the project's objectives, and must work both flexibly and collaboratively to ensure that the objectives are met. The analyzed sources discuss a collaborative team environment, diversity of skills, and shared objectives. They also talk of collaboration between units and people at the same level in the organizational hierarchy, between people at different levels in the hierarchy, and between people in the team and partners, suppliers, customers and stakeholders outside the team.

Organizational values: upholding organizational values and codes of conduct creates a culture of respect and trust.

Effective project delivery requires that team members have a common commitment to the norms and codes of conduct within which the team operates. Norms are standards of behavior expected of team members in the performance of their assigned roles within the project. Alignment of a project's governance and codes of conduct with broader community expectations and the organization's policies, values and objectives also helps promote collaborative cooperation across teams and stakeholders.

Management: defining, planning, monitoring, and controlling work maximizes the likelihood of achieving project success.

Work on projects requires and consumes organizational resources to realize defined objectives that fulfill specific needs. These resources should be used efficiently to contribute to achieving the expected results and meeting the project's success criteria. Multiple analyzed sources explicitly indicate that a project's activities must be appropriately defined, planned, monitored and controlled, and many analyzed sources describe specific practices derived from this principle, such as management by exception or management by phases or stages. In addition, it is inferred from multiple analyzed sources that this principle is fundamental to most common project management practices such as scope management, cost management, and schedule management.

Flexibility: tailoring the ways of working to the context of the project maximizes the likelihood of success.

Each project has not only unique objectives, but also a context that can directly impact how the project is organized and its activities managed. The methods, processes or practices that are effective for one project might not produce the same results on another project that

operates in a different context. Tailoring the working approaches on a project to suit the specific context increases the likelihood of achieving the project's objectives. Typical factors listed in the analyzed sources as considerations for adapting the work approach include the project environment, its objectives, stakeholders, governance, size, complexity, importance, capability and risk. The most important practice derived from this principle is adopting appropriate methodologies such as predictive, adaptive or hybrid.

Stakeholder engagement: Engaging stakeholders at a level commensurate with their needs, expectations and impact fosters trust and contributes to the project's success.

The successful outcome of a project depends not only on the effectiveness of the project team, but also on how stakeholders react during the project or as a result of the changes the project enables. Consequently, appropriate engagement strategies need to be defined and implemented to effectively engage the project's stakeholders to maximize their support and minimize any adverse impacts. Several analyzed sources specifically indicate that this engagement should be commensurate with the stakeholders' needs and expectations, as well as the importance of each stakeholder to the project. As most analyzed sources indicate that the project's deliverables, outputs and outcomes should meet the agreed needs and be validated by stakeholders, the project cannot be considered successful without acceptance from stakeholders that the project's objectives have been achieved. Communication management and stakeholder engagement activities are examples of practices implementing this principle in day-to-day planning and management of the project.

Frequency of occurrence

Table 6 summarizes the frequency of occurrence of the common principles in the sources.

- GovS 002 (HM Government, 2021a) is the largest sources of the 12 common principles, as it explicitly states 10 of the 12 principles.
- APM Governance (APM, 2019) is the next largest source, explicitly stating 9 of the 12 principles.
- ISO 21500:2021 (2021a) is the third largest source, explicitly stating 8 of the 12 principles. (Whilst ISO 21500:2021 does not explicitly contain content it calls 'principles', it does list a set of 'concepts', which are in a form similar to the principles in other

documents. They have therefore been treated as 'principles' here.)

In nine of the 22 sources no explicit statements were found that could be interpreted as clearly specified principles. Eight of these nine do, however, include narrative or practices that appear to support some of the principles.

The principle that is explicitly stated most frequently has to do with stakeholder engagement, present in the form of a principle in 8 of the 22 sources. The next most frequently stated principles are strategic alignment and continuous improvement, which are stated in the form of a principle in 7 of the 22 sources.

The relationship between principles and practices

As defined here, principles 'serve as the foundation for a system of belief or behaviour or for a chain of reasoning'. Accordingly, the principles provide the reasons for those involved in project management to take certain actions within a project context. This view of the role of principles is common across all the sources which explicitly include principles.

In all except one of the principles-based sources, the principles are supported by 'practices' or narratives describing what those involved in project management should do in relation to specific principles if they are to be effective in their roles. Those sources which do not include principles are defined directly in terms of practices or narrative content. Practices tend to be based on established and commonly used management approaches in a specific environment or methodological framework, and are hence potentially more limited in scope than principles.

What is apparent in the sources is that the statements which are considered as 'principles' are distinct from those described as project management practices or activities. The actual application of principles in day-to-day project management takes the form of practices that describe what needs to be done to obtain a successful outcome for a project. The main differences between principles and practices are:

- A principle applies to project management as a whole, and therefore multiple practices may be derived from a single principle.
- A principle justifies a practice but does not dictate or suggest what each practice should be, nor how it should be defined or what a practice should cover.

- A principle can serve as a guide in situations where practices are missing or are not fully described.

In this way, the principles are open to any method being used. If this were not the case, they would not be universal, which is one of the criteria specified for testing each of the candidate principles.

While an exhaustive mapping of project management practices to the principles listed above is not in scope for this paper, the following is an example of the essential differences between principles and practices.

The Management principle, "Defining, planning, monitoring and controlling work maximizes the likelihood of achieving project success", states the reason for which project managers practice scope, schedule, cost, resource and quality management and the processes through which these practices are implemented, such as breaking down to scope of work, estimating, handling dependencies, assigning tasks, reviewing quality and many more.

Understanding the principle describing the reason behind a project management practice enables those involved in project management to tailor the application of that practice to the context of the specific project. For example, in some agile methods, scope is flexible and time and costs are fixed, whereas in many projects, the scope is fixed; in both cases, the work is being managed in a defined and controlled way, it is just that the circumstances differ. This leads to another of the principles, Flexibility, which enables a modified version of that practice or a different practice rooted in the same principle to be used. At the same time, based on the Governance principle, these practices should be applied in an appropriate and proportionate way. The interworking of principles, as in the above example, illustrates how the set of principles provides a cohesive foundation for the whole of project management.

Table 6. Frequency of occurrence of the principles in the sources

Principle	ISO 37000:2021	ISO 21500:2021	ISO 21505:2017	ISO 21502:2020	BS 6079:2019	PM Squared	Agile PM Squared	GovS 002	ANSI/PMI 99-001-2021	PMBOK'87	ANSI/PMI 99-001-1999	APM BoK	Agile Manifesto	APM Responsible PM	Disciplined Agile	APM Governance	PMI Sustainable Development	Equator Principles	GAPPS PM	GAPPS Sponsor	ICB4	PRINCE 2	= Count of Explicitly Covered	= Count of intent supported in narrative	= Total covered or supported
Strategic Alignment	✓	✓		*	✓	*		✓		*	*	*		✓	✓	✓				*	*	*	7	8	15
Continuing Justification	✓	✓		*		*		✓	✓		*	*				✓				*	*	✓	6	6	12
Continuous Improvement	*	✓		*	✓		✓	✓		*	*	*	✓			✓			*	*	*	✓	7	8	15
Governance	*		✓	*	✓			✓		*	*	*				✓		✓	*	*	*	*	5	9	14
Resilience	*			*		*	✓	*	✓		*	*	✓	✓	✓			✓		*	*	*	6	6	12
Risk	✓	✓		*	*	*		*	✓	*	*	*		✓		✓			*	*	*	*	5	11	16
Team Structure	✓	✓		*	*	*		✓		*	*	*				✓				*	*	✓	5	8	13
Teamwork				*	✓	*		✓	✓	*	*	*							*		*	*	3	8	11
Organizational Values	✓		✓		*	*		✓		*	*	*		✓	✓	✓				*	*	*	6	6	12
Management		✓		*	✓	*		✓		*	*	*				✓			*	*	*	✓	5	8	13
Flexibility		✓		*	*	*		✓	✓										*		*	✓	4	4	8
Stakeholder Engagement	✓	✓	✓	*	✓	*		✓	✓		*	*				✓		✓	*	*	*	*	8	8	16
Count of Explicitly Covered =	6	8	3	0	6	0	2	10	6	0	0	0	2	4	3	9	0	3	0	0	0	5			
Count of intent supported in narrative =	3	0	0	11	4	10	0	2	0	8	10	10	0	0	0	0	0	0	6	9	11	6			
Total covered or supported =	9	8	3	11	10	10	2	12	6	8	10	10	2	4	3	9	0	3	6	9	11	11			

Note:

✓ = explicitly covered in a referenced source stated principle

* = the intent is supported in the narrative, practice or other written form but no explicit principle stated

Comparison table constructed based on data analyzed from referenced sources

- Highest occurrence =
- 2nd highest occurrence =
- 3rd highest occurrence =

Completeness of the principle set

The principles proposed here meet the criteria specified for a 'principle' and occur, or are inferred, in a sufficient number of the sources analysed to be considered established and relevant. The principles in the sources are those that people undertaking project management are expected to comply with, regardless of the methodology and delivery approaches they use.

Neither the principles in the sources nor those in the validated set proposed here are intended to represent distinguishing characteristics of project management. As such they cannot be used as a set of criteria, which if met, would define what 'project management' is.

As noted above, concepts, often stated as practices, such as cost, schedule, scope, and quality management have long been presented in project management standards and guides advising on the undertaking of functional management areas of project management. However, these concepts were not generally detailed in any stated 'principles' as they are established practices for which the justification is felt to be obvious.

Conclusions

Overall conclusion

As noted in the introduction to this paper, considerable effort has been invested by many organizations in formalizing the practice of project management by developing standards and guidelines to help novices and experts carry out their work more effectively.

This paper draws together many authoritative sources to investigate the question:

"Can a coherent set of project management principles be identified?"

The study has demonstrated that the chosen sources do provide the basis for a set of validated principles. The wording of each of the principles in the sources, however, needed to be adapted to comply with the format and the formal definition developed as part of this study.

Based on criteria adopted in the paper, it was concluded that twelve principles together comprise a set of validated principles.:

Strategic alignment: aligning a project's objectives with the organization's strategy ensures that the project's outcomes contribute to achieving the organization's objectives.

Continuing justification: on-going confirmation that a project is justified contributes to achieving objectives and avoiding waste.

Continuous improvement: capturing, sharing, and applying experience and lessons learned from previous work improves current and future project performance.

Governance: adopting a proportionate and appropriate governance framework enables the organization's governing body to control the work and manage the risks.

Resilience: embracing adaptability enables project teams to accommodate and manage change.

Risk: ongoing management of risks, in terms of opportunities and threats, maximizes positive impacts and minimizes negative impacts to the project and its outcomes.

Team structure: maintaining a clear team structure with defined roles enables team members to understand each other's responsibilities and ensures that role holders with delegated authority can be held to account.

Teamwork: collaborative working as teams between individuals with diverse skills, knowledge, and experience enables them to accomplish shared objectives efficiently.

Organizational values: upholding organizational values and codes of conduct creates a culture of respect and trust.

Management: defining, planning, monitoring, and controlling work maximizes the likelihood of achieving project success.

Flexibility: tailoring the ways of working to the context of the project maximizes the likelihood of success.

Stakeholder engagement: engaging stakeholders at a level commensurate with their needs, expectations, and impact fosters trust and contributes to the project's success.

Discussion

The following points were noted during the study:

- Most of the sources analyzed in the study do not provide a definition of 'principle' and assume that a dictionary definition could be used. As the sources were developed by consensus and subject to peer review, that implies a definition was not considered necessary for understanding the document. As the dictionary definitions are aligned but not identical, this issue has been addressed by developing a working definition which is closely aligned to that in the Oxford English Dictionary.

- None of the sources provides any guidelines for the specification of a principle. For this paper, however, criteria were developed and applied to ensure consistency in the analysis, and as a basis for any future work.
- A small number of project management standards earmarked for analysis turned out to be unusable because they did not provide the basis for identifying any principle that complied with the criteria.

Although each of the validated principles is essential from a project management perspective, the set of validated principles may not be complete and cannot be used to define a project or project management. That is to say, if a project team complies with all of the validated principles, that should not be taken to infer the work being undertaken is a 'project'.

Value to the project community

This study has demonstrated that, despite being drafted by independent teams across the globe, the source documents demonstrate a common understanding of the necessities for effective project management. This feature represents an additional benefit from the development of international standards. The differences between sources derive from the importance different drafting panels place on each topic addressed and the context of their work. For example, at one end of the scale, drafting panels consider projects as a means of managing business and societal change whilst others limit project management to solely the creation of outputs. The wider view on project management is in the majority and is growing.

It is intended that this paper and the proposed set of principles be used to provide a common framework for developers and publishers of project management standards and guidelines. This framework should lead to a growing consensus and common understanding across the project management profession as to the principles that provide a foundation for effective practice.

While all principles apply to all or most types and sizes of projects, not all principles would be equally relevant in every case. With a common set of principles, project managers can apply the principles regardless of the methodologies used, whilst opening the way for the creation of new, innovative approaches, when required.

Identification of areas for future work

This study is based on sources by well established and authoritative organizations. However, none of the sources covers all the validated principles presented here, although one came very close. It is therefore suggested that this research could be expanded to include other lesser-known sources and thereby provide greater insight into approaches for ensuring projects are successful.

Further research could include:

- widening the research to determine if alternative criteria for testing principles are appropriate and, if so, whether that makes a difference to the results here;
- widening the research base to analyse additional sources in order to further test and validate the principles derived from professional standards;
- determining if a set of principles can be derived which, if treated as criteria and met, would indicate that the work being undertaken is being managed as a project;
- investigating the applicability of each of the listed principles to program and portfolio management, as well as other spheres of management;
- mapping commonly-used project management practices onto the set of principles listed here;
- investigating the need to define new principles, compliant with the stated criteria, in case the mapping cannot be effectively carried out, and re-evaluating the resulting set of principles with respect to completeness and its applicability to current best practice.

We trust that these findings will be of benefit to future crafters of project management guidelines.

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Author Contributions

The authors confirm that they all contributed to the study conception and design; data collection; analysis and interpretation of results; and draft manuscript preparation. All authors reviewed the results and approved the final version of the manuscript.

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Appendix A. Selected quotations from the sources

The following lists quote a few of the principles as they appear in the sources and provide citations for additional supporting principle statements.

Strategic alignment.

- "1. delivery objectives are aligned to government policy and organisational objectives" (HM Government, 2021a, p. 7)
- "strategic alignment. projects, programmes and portfolios should be linked to organizational strategy and objectives;" (ISO 2021a, p. 7)
- Additional principle statements that relate to strategic alignment appear in Ambler and Lines (2020, p. 32), APM (2018 pp. 17 & 18), BSI (2019, p. 13), ISO (2021b, p. 17), and Thompson & Williams (2018, p. 22).

Continuing justification.

"13. Projects are closed when they are no longer justified as part of the organisation's portfolio" (APM, 2018, p. 17 & 18)

"1. Continued business justification. There must be a justifiable reason to be running and managing the project. If not, the project should be closed." (AXELOS, 2017)

"2. continuing business justification to confirm benefits can be realised and risks managed within the organisation's risk appetite, and that unjustified work is terminated" (HM Government, 2021a, p. 7)

Additional principle statements that relate to continuing justification appear in ANSI/PMI (2021, p. 34), and ISO (2021a, p. 7; 2021b, p. 12)

Continuous improvement.

"At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly." (Agile Alliance, 2019)

"5.6 Experience and lessons should be captured, shared and applied at the start of any project, those involved and key stakeholders should identify and apply relevant lessons from previous experience when planning the project. (BSI, 2019, p. 15)

Additional principle statements that relate to continuous improvement appear in APM (2018, p. 18), AXELOS (2017), ISO (2021a, p. 8; 2021b, p. 17), and HM Government (2021a, p. 7)

Governance.

"Principle 3. Applicable Environmental and Social Standards. ...address compliance

with relevant host country laws, regulations and permits that pertain to environmental and social issues." (EPFIs, 2020, p. 3)

"5.5 Governance and management should be appropriate and proportionate. In order for a project to remain viable, the effort and costs of undertaking governance and management should be appropriate and proportionate to the work being undertaken, risks involved and benefits likely to be realized." (BSI, 2019, p. 14)

Additional principle statements that relate to governance appear in APM (2018, pp. 17 & 18), BSI (2019, p. 14), EPFIs (2020, pp. 6 & 7), HM Government (2021a, p. 7), and ISO (2017, p. 3)

Resilience.

"Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage" (Agile Alliance, 2001)

"3.11 Embrace adaptability and resiliency. Build adaptability and resiliency into the organization's and project team's approaches to help the project accommodate change, recover from setbacks, and advance the work of the project." (ANSI/PMI, 2021, pp 55)

Additional principle statements that relate to resilience appear in Agile Alliance (2001), Ambler and Lines (2020, pp. 27 & 28), ANSI/PMI (2021, pp. 24 & 47), EPFIs (2020, pp. 1, 4, & 6), and Thompson & Williams (2018, p. 30).

Risk.

"3.10 Optimize risk responses. Continually evaluate exposure to risk, both opportunities and threats, to maximize positive impacts and minimize negative impacts to the project and its outcomes." (ANSI/PMI, 2021, p. 53)

Appropriate framework. "governance and management frameworks and controls should be proportionate and appropriate to the work being performed, the risks associated with it and the organization's acceptable level of risk;" (ISO, 2021a, p. 7)

- Additional principle statements that relate to risk appear in APM (2018, p. 18), ISO(2021b, p. 30) and Thompson & Williams (2018, p. 26)

Team structure.

"3. Defined roles and responsibilities. the PRINCE2 project team should have a clear organizational structure and involve the right people in the right tasks." (AXELOS, 2017)

"4. accountabilities and responsibilities are defined, mutually consistent and traceable across all levels of management" (HM Government, 2021a, p. 7)

Additional principle statements that relate to team structure appear in APM (2018 p 18) and ISO (2021a, p. 7; 2021b, p. 22),

Teamwork.

"3.2 Create a collaborative team environment. Project teams are made up of individuals who wield diverse skills, knowledge, and experience. Project teams that work collaboratively can accomplish a shared objective more effectively and efficiently than individuals working alone." (ANSI/PMI, 2021, p. 28)

"5.4 Promote collaborative working. Collaborative working should be promoted to ensure that all necessary work is coordinated and controlled." (BSI, 2019, p. 14)

"8. work is undertaken in multidisciplinary teams and is assigned to people who have the required capability and capacity." (HM Government, 2021a, p. 7)

Organizational values.

"5.4.2 Guidelines. The governing body should develop specific guidelines that provide the context within which its projects, programmes and portfolios should be managed, in accordance with the organization's values and requirements." (ISO, 2017, p. 4)

"10. public service codes of conduct and ethics and those of associated professions are upheld" (HM Government, 2021a, p. 7)

Additional principle statements that relate to organizational values appear in Ambler and Lines(2020, p. 26), APM (2018, p 17), ISO (2017, p.5; 2021b, p. 33), and Thompson & Williams (2018, p. 28)

Management.

"4. Manage by stages. PRINCE2 projects should be planned, monitored and controlled on a stage-by-stage basis." (AXELOS, 2017)

"6. work is appropriately defined, planned, monitored and controlled, quality is

actively managed to maximise the likelihood of success and defined working methodologies are tailored for use accordingly" (HM Government, 2021a, p. 7)

"appropriate planning and management. Work should be appropriately planned and quality should be actively managed." (ISO, 2021a, p. 7)

Additional principle statements that relate to management appear in APM (2018, p. 17), AXELOS (2017), and BSI (2019, p. 15)

Flexibility.

"3.7 Tailor based on context. Design the project management approach based on the context of the project, its objectives, stakeholders, governance, and the environment using "just enough" process to achieve the desired outcome while maximizing value, managing costs, and enhancing speed." (ANSI/PMI, 2021, p. 44)

"7. Tailor to suit the project environment. PRINCE2 must be tailored to suit the project's environment, size, complexity, importance, capability and risk." (AXELOS, 2017)

"Ways of working should be tailored to maximize the likelihood of success within a project, programme or portfolio environment;" (ISO, 2021a, p. 7)

Stakeholder engagement.

"3.3 Effectively engage with stakeholders. Engage stakeholders proactively and to the degree needed to contribute project success and customer satisfaction." (ANSI/PMI, 2021, p. 31)

"5.2. There should be appropriate communication and engagement with internal and external stakeholders throughout a project." (BSI, 2019, p. 14)

Additional principle statements that relate to stakeholder engagement appear in APM (2018, p. 17), EPFIs (2020, p. 4), HM Government (2021a, p. 7), and ISO (2017, p. 5; 2021a, p. 7; 2021b, p. 24)

Appendix B. Insufficient commonality

The following are examples of principles from the reference sources that were found to have insufficient commonality to derive general principles.

- “Simplicity – the art of maximizing the amount of work not done – is essential.” (Agile Alliance, 2019)
- “Principle 1. Delight Customers – “...As disciplined agilists, we embrace change because we know that our stakeholders will see new possibilities as they learn what they truly want as the solution evolves. We also strive to discover what our customers want and to care for our customers...” (Ambler and Lines, 2020, p. 25)
- “Principle 4. Be Pragmatic – “Let’s be pragmatic and aim to be as effective as we can be.” (Ambler and Lines, 2020, p. 28)
- “Principle 6. Optimize Flow – “Looking at the flow of value enables teams to collaborate in a way as to effectively implement our organization’s value streams. Although each team may be but one part of the value stream, they can see how they might align with others to maximize the realization of value.” (Ambler and Lines, 2020, p. 31)
- “E1. The organization differentiates between change projects and business as usual (BAU) or repetitive activities (and their management) and is supportive of both.” (APM,2018, p. 15)
- “3.5 Recognize, evaluate, and respond to system interactions.” (ANSI/PMI, 2021, p. 37)
- “3.6 Demonstrate leadership behaviors. Demonstrate and adapt leadership behaviors to support individual and team needs.” (ANSI/PMI, 2021, p. 40)
- “3.9 Navigate complexity. Continually evaluate and navigate project complexity so that approaches and plans enable the project team to successfully navigate the project life cycle.” (ANSI/PMI, 2021, p. 50)
- “3.12 Enable change to achieve the envisioned future state. Prepare those impacted for the adoption and sustainment of new and different behaviors and processes required for the transition from the current state to the intended future state created by the project outcomes.” (ANSI/PMI, 2021, p. 58)
- “5.8 Take a gated approach to projects. The outcome of a project is always uncertain and often requires investigative work to determine what outputs are required and whether different options for a solution are viable in business and technical terms. A gated approach should be taken by breaking the project into life cycle phases, each of which progressively adds to knowledge regarding the project and reduces risk. In this way, the amount of funding committed to the project is limited and only extended once continuation of the project into the next phase has been justified.” (BSI, 2019, p. 15)
- “Principle 9. Independent Monitoring and Reporting. ...in order to assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting.” (EPFIs, 2020, p. 8)
- “Principle 10. Reporting and Transparency. [provides for additional client and EPFI ongoing reporting requirements]” (EPFIs, 2020, p. 8)
- “appropriate planning and management: work should be appropriately planned and quality should be actively managed.” (ISO, 2021a, p. 7)
- “9. the transition of capabilities to operations is planned and programme or project closure managed, with ongoing operational responsibilities agreed and accepted” (HM Government, 2021a, p. 7)
- “5.4.6 Management policies. The governing body should develop or adopt, implement and monitor management policies, and if needed, procedures and processes for projects, programmes and portfolios, which should align with the organization’s management policies, procedures and tolerances, adapted as needed.” (ISO, 2017, p. 5)

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Crispin ("Kik") Piney, B.Sc., after many years managing international IT projects within large corporations, decided to work as a freelance project management consultant. At present, his main areas of focus are risk management, and integrated Portfolio, Program and Project management. He is the author of Earned Benefit Program Management providing novel techniques for effective benefits realization management. He served as a volunteer for the Project Management Institute (PMI) from year 2000, contributing to most of their foundational standards, from the first edition of the Organizational Project Management Maturity Model (OPM3™) right up to the seventh edition of the Guide to the Project Management Body of Knowledge, in 2020. He co-authored PMI's original Practice Standard for Risk Management. In 2008, he was the first person in France to receive PMI's PgMP® credential; he was also the first recipient in France of the PfMP® credential. He can be contacted at kik@project-benefits.com

Chris Stevens' career is focused on project management. He held many line and project management positions in the UK Ministry of Defence, with responsibility for complicated projects. By focusing on how organisations can reduce risks and costs in delivering strategies and programmes, Chris is a proponent that properly implemented portfolio and program management, with practical governance and risk management, really does work. He has helped organisations maximise investment and strategy execution performance whilst minimising risk. Moving to Australia in 1993, Chris joined the worldwide transport company TNT, with responsibility for all operational technology, from truck to back-office, including a multi-national mobile data infrastructure project. Chris managed an international .com project, before becoming Program Director for Group Technology, Commonwealth Bank of Australia. His subsequent work included similar responsibilities for Australia's largest project, the National Broadband Network. He now manages a deeply complex and technical program of national importance. Chris has a BSc with Honours in Systems and Management, and a PhD in Systems Science, both from City, University of London. He can be contacted at chris_stevens_phd@gmail.com

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