The suitability of PRINCE2
for engineering infrastructure

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Abstract: The view that PRINCE2 was not suitable for application to infrastructure was identified in a study done for a separate purpose, namely, to examine project governance and methodology, which is not reported in this paper. It was asserted by several participants in interviews conducted with a sample of experienced practitioners across a range of industries and disciplines. This paper follows up on those comments by conducting an examination of PRINCE2 from an engineering infrastructure perspective to investigate the validity of this assertion. It takes a deductive, definitional approach to determine if there are any features in it that would cause difficulty for engineering infrastructure use. Seventeen features were examined, and 15 were found to have difficulty in application to the project management of engineering infrastructure. The remaining two found inconsistencies that were unlikely to cause too much difficulty. The features causing difficulty include non-generic terminology for the terms project, lifecycle and stage, using a product rather than a project-based process, use of an iterative product delivery process unsuited to predictive projects, use of a delivery process for all project phases, assumption of a board governance model with inappropriate accountabilities, lack of clarity around the use of the project plan, and absence of a lifecycle appropriate for engineering infrastructure, with PRINCE2 effectively self-declaring its need for a higher-level project lifecycle/ methodology from somewhere else. The paper concludes that PRINCE2 is quite poorly suited to managing engineering infrastructure projects and identifies that some of the reasons for this are likely to also cause difficulty for many ICT projects as well.

1 Introduction

The benefits of project management methodology have been considered obvious, as evident from the success of the worldwide marketing of PRINCE2, MSP, and associated products. KnowledgeTRAIN (2017, p. 380) states under its FAQs for PRINCE2 online courses that "In total, more than 1.4 million examinations have been taken worldwide since 1996. Of these, almost half were taken in the UK". This comes despite a lack of empirical evidence as to their efficacy and views having published to the contrary Wells (2012). It was not until some years later that Joslin and Müller (2015) were able to quantitatively demonstrate a positive impact of project management methodology (PMM) generally (PRINCE2 was not specifically mentioned) on project success, finding that "the application of a PMM account for 22.3% of the variation in project success".

However, attempts at quantification presume a positivist paradigm. Difficulties arise with intangibles or contextual or environmental variables; for example, it is quite difficult to attribute a proportion of success to leadership, as distinct from the leader's organization having and following a methodology that the leader supports. The full effect of introducing a PMM may also not become evident for some years, and there may be many variables, such as the appropriateness of the starting methodology to the content material, the efficacy of the modifications made to tailor it to the local content, the level of flexibility provided for in its application, the level of documentation it calls for, the persistence of the effort to implement and maintain it and the acceptance it receives from project managers and senior executives within the organization. These are very likely to change over time, making quantification a difficult and possibly unproductive path to pursue. Furthermore, measurement of how much methodology, or any other factor or combination of factors, might have actually either saved or avoided wasting can only be speculation as it was not actually there to be measured. Where such factors have contributed to failure rather than success, the costs are much easier to measure, but any attempt to quantify the impact of various factors is likely to be strongly contested as reputations and career/ economic prospects will be at stake.

PRINCE2 came from the ICT area in the British Government Office of Government and Commerce (OGC). It evolved from PROMPT, which was released in 1975 to save money in ICT projects (Haughey, 2014; McKenna & Whitty, 2012, p. 9). PRINCE was developed from PROMPT II in 1989 and "developed a reputation for being too unwieldy, too rigid and applicable only to large projects, leading to a revision in 1996… which became more generic and applicable to any project type" (Haughey, 2014). It was revised again in 2009 to make it simpler (Haughey, 2014). Its current manual states, "PRINCE2 has been designed to be generic so that it can be applied to any project regardless of project scale, type, organization, geography or culture" (AXELOS, 2017, p. 2).

The principal author attended project management conferences in the very early 2000s in Australia, where the PRINCE2 presenters came under considerable pressure about the paperwork generated. They defended by continually asserting, "it can be cut down". While audiences were unconvinced, its usage, nevertheless, eventually spread throughout Australia. The issue of replacing methodologies is still current, as indicated by Joslin and Müller (2016, p. 380), who specifically mentioned it, warning of the importance of considering context and environmental factors.

The view that PRINCE2 was not suitable for application to infrastructure was identified in a study done for a separate purpose, namely, to examine project governance and methodology, which is not reported in this paper. It was asserted by several participants in interviews conducted with a sample of experienced practitioners across a range of industries and disciplines. This paper follows up on those comments by conducting an examination of PRINCE2 from an engineering infrastructure perspective to investigate its suitability for application to engineering infrastructure project management by examining the contents of its manual(s).

Before doing so, we will review both the academic and practitioner literature to determine if any previous examinations of the suitability of PRINCE2 for use in engineering infrastructure have been conducted.

2   Literature review

2.1   Academic literature

We searched multiple databases for multiple combinations of terms. In summary, no evaluations of the suitability of PRINCE2 for engineering infrastructure use were located. Only one evaluation of actual implementations of PMMs was located, and while it did not deal with engineering infrastructure, it did evaluate PRINCE2.

Wells (2012) studied practitioners with varying levels of experience, all within an IT/ IS environment. She noted there had been a "drive from government and the public sector toward the promotion and usage of the PRINCE2 (Office of Government Commerce [OGC], 2009) PMM in recent years for the development and management of large and complex IT/IS projects" (Wells, 2012, pp. 43-44). She also documented difficulties with PMMs including "the indifference of the methodologies to their organizational business interests and benefits beyond those of a single project; complexity in tailoring and modification; leadership and strategy; and their reliance on documentation and their inflexibility of dealing with change" (Wells, 2012, p. 44). She noted PMMs being applied "as a fetish used with pathological rigidity for its own sake" (Wells, 2012, p. 45). Her research approach was "phenomenological with an exploratory purpose" and also with "an inductive approach and reasoning" and "a multiple-case-study approach" (Wells, 2012, p. 46). Four PMM cases were examined; PRINCE2, a tailored PRINCE2, and two other methodologies. She used an inductive approach and interpretivism paradigm collecting data through semi-structured interviews with 48 practitioners. A significant conclusion of this work was that "Most project managers perceived the prime purpose of PMM to be management, control, and compliance rather than support and guidance. The investigation on this aspect reveals that 47.9% of project managers… claimed that using PMMs hinders their project delivery" (Wells, 2012, p. 57).

We provide below a brief overview of the other evaluations located for context and background purposes. Most simply compared documents, and none critically evaluated any particular PMM.

Hughes, Dwivedi, and Rana (2017) brought together a group of five expert PRINCE2 participants to review a list of failure factors and determine relative rankings. They mapped these "to PRINCE2® project stages… as public sector failure seems to feature highly in the

literature… where PRINCE2® is extensively used" (Hughes et al., 2017, p. 777). They did not critically review any aspect of PRINCE2 and accepted continued failure as "inevitable" (Hughes et al., 2017, pp. 787-788).

Joslin and Müller (2015, 2016)were concerned with project success of methodology rather than with evaluating any particular methodology.

Xue, Baron, Esteban, and Zheng (2015) compared ISO 21500 with PMBOK and ISO/IEC TR 29110 and did not question the content of any of these documents.

Słoniec (2014) studied the theoretical possibility of using PRINCE2 in the management of a specific project involving the relocation of industrial facilities" (Słoniec, 2014). The conclusions were full of the word "could."

Sadeanu, Candea, and Bodea (2013)compared PMBOK (2013), PRINCE2 (2009), and ICB V. 3.0:2006 and did not question their content.

Zandhius and Stellingwerf (2013) compared PMBOK (2013), PRINCE2 (2009), and ICB Version 3 as well as Agile, Lean Six Sigma, and others and did not question their content.

Delgado, Marcilla, Calvo-Manzano, and Vicente (2012) conducted a theoretical evaluation of PRINCE2 against ISO/IEC 38500 and did not examine any PRINCE2 implementation.

Łuczak and Górzna (2012) aimed to adapt PRINCE2 to manage projects under the annual action plans for the Office of the Prime Minister of Poland in response to the concept of new public management (NPM). It effectively just summarised the PRINCE2 manual.

Sargeant, Hatcher, Trigunarsyah, Coffey, and Kraatz (2010) was commissioned and funded by a group working with the OGC itself. It used a survey instrument to sample internationally in comparing PRINCE2 with an unspecified group of other frameworks. Its overall findings were complimentary to PRINCE2, confirming its methodology while making various recommendations for improvement to its manual.

We viewed with some astonishment the failure of such extensive literature searching to locate anything other than a 2012 evaluation of PRINCE2 with findings somewhat unfavorable to it. For it to have spread to over 1.4 million people, as mentioned in the introduction, one would have expected to find a multitude of papers investigating and confirming its veracity. This leads to the conclusion that PRINCE2 has spread without any academic scrutiny of its veracity. This begs the question as to how this could possibly have occurred. We also note that none of the items located related to engineering infrastructure. It therefore also appears that any claims of PRINCE2 applicability to infrastructure have also been academically untested.

Joslin (2017, p. 166) also noted a case where "a highly evolved methodology that was aligned to the needs of the different business divisions in an engineering company was replaced with a standardized methodology with catastrophic results – project success rates dropped from 90% to 55%". He did not name the methodology.

Calder (2008, Chapter 7) said: "Organisations whose IT projects usually failed all deployed recognizable project management methodologies; the reasons for failure were invariably to do with failures of project governance rather than simply of operational management."

We subsequently became aware of a later paper by Joseph and Marnewick (2018) that, while not relevant to engineering infrastructure, had actually investigated the efficacy of PRINCE2 certification in IT and concluded:

> IT project performance was not influenced by the project management certification presence. Moreover, PRINCE2 Practitioner presence has a negative influence on failed and challenged IT projects, which raises further questions regarding the adoption of project management certifications.
> This research, therefore, contradicts the PWC as well as the PMI studies [11, 12], which stated that projects are more likely to succeed when project management certification is present. Moreover, this research confirmed that project management certification is not crucial for improved IT project performance.
> Future research should investigate why there has been a decrease in certification and what is influencing this change, especially if certification is considered a key criterion for the project management discipline. Furthermore, it must be investigated why IT projects have performed better without certification in recent times, as this could help clarify the decrease in certification presence. An investigation into how certification influences project performance at different organizational project management maturity levels is needed to establish whether certification contributes at different maturity levels. Research into PRINCE2 Practitioner certification must be conducted to determine why it is leading to more challenged and failed IT projects than successful IT projects (Joseph & Marnewick, 2018, p. 63).

This raises the question that if PRINCE2 has been unsuccessful in IT where it originated, it would appear to have less chance of being successful in fields outside IT.

2.2   Practitioner literature

Wideman (2002), the principal author of the PMBOK, evaluated PRINCE2 at the time when PRINCE2 usage was starting to spread internationally. He noted, "The (PMBOK) Guide is generally written from … the project owner's perspective rather than from that of a supplier or seller. Consequently, the Guide covers more ground than does PRINCE2" Wideman (2002, p. 10). He considered "that PRINCE2 is clearly project lifecycle-based with six out of eight major processes running from 'Starting up a project' to 'Closing a project' " Wideman (2002, p. 4), he also noted:

> The PRINCE2 project life cycle does not start with an original need, solution generating, and feasibility studies – these are considered as inputs to the project life cycle, perhaps as separate projects in their own right. For example, PRINCE2 describes a product's life span as having five phases: Conception, Feasibility, Implementation (or realization), Operation and Termination but, of these, the only Implementation is covered by PRINCE2. Indeed, the manual states, "Most of what in PRINCE2 terms will be staged will be divisions of 'implementation' in the product life span" Wideman (2002, p. 4).

Appelo (2008) noted the rigidity of PRINCE2 and that "There is so much overhead involved in running a Prince2 project, with so many documents to be produced" (Appelo, 2008). He also noted PRINCE2 does "*not* address *Requirements Management* or *Requirements Development...* (or) the way the *Technical Solution* should be built nor… processes for *Verification* or *Validation* of a product… (nor) progress measurements, the post-deployment phase, project portfolios, or the scaling of project size. (Appelo, 2008).

Having established as far as can reasonably be determined that there has been no previous work along the line we are investigating, we will proceed to propose our research question.

3   Research Question (RQ)

Posing a research question inductively would require establishing probabilities and confidence limits and ultimately making a subjective value judgment. This would not be appropriate for our purpose, and ultimately the research question needs to be such that any features that may be unsuitable are identified. The research question is, therefore, posed deductively as follows: Are there any features of PRINCE2 that make it difficult to apply to engineering infrastructure projects?

4   Research Design

As we are seeking to use deduction rather than induction, the use of a qualitative approach is appropriate.

The determination of source documents, together with the methods of analysis and evaluation are set out below.

4.1   Sources selected for examination

We will principally examine the latest (2017) version of the PRINCE2 manual. However, due to the recency of its release, we will examine earlier versions where appropriate, as their impact upon current practice will obviously have been much greater. Having access to academic databases and library sources, we were able to view the 2017 and 2009 versions of the PRINCE2 manual electronically and located one paper copy of the 2005 edition. For prior versions, we had to rely on the comments of Wideman (2002). Also, any relevant concept that impacts projects and is contained in its companion product MSP (Managing Successful Programmes) will be referenced, where appropriate.

4.2   Method of analysis

We analyze key features of PRINCE2 and its definitions of terms that are likely to differ between engineering infrastructure and the ICT area where it originated.

Where appropriate, we compare PRINCE2 with the PMBOK, which has been widely used in engineering infrastructure. We predominantly use the PMBOK 2017 sixth edition but also refer to the previous (fifth) edition. We also compare PRINCE2 with other standards as well as with the Oxford dictionary, where appropriate. Beyond these comparisons, we then rely on our knowledge of practice in that industry, derived from the principal author's practitioner experience and knowledge of its definitions and practices, further informed by having conducted the practitioner interviews that identified the need for this paper. This approach is supported by what has been labeled 'pracademics' (Walker & Lloyd-Walker, 2016) and was also used to identify the key features as definitions for analysis.

We then determine whether the particular feature being considered is actually generic, applicable to all project types, including engineering infrastructure, or something peculiar to the nature or content of ICT.

4.3   Evaluation method

If we cannot find anything that would make an application to engineering infrastructure difficult, then the answer to the research question will be 'none that we have been able to determine.' If we do find some, then the proposition is established that there is some difficulty in applying PRINCE2 to the project management of engineering infrastructure, and we will then assess the degree of difficulty they may cause.

4.4   Presentation method

Many of the features examined are inter-related and the order of reporting has been selected, so there is a flow to the pattern that emerges.

The examination of each feature is presented in a format that generally commences with quotation(s) from PRINCE2, followed by quotation(s) from PMBOK (and occasionally other sources) where appropriate, followed by an analysis of the quotations followed by a discussion and evaluation of them.

This is quite different from the conventional academic paper format of reporting numbers of observations and then discussing them collectively at the end. To have followed that format would have resulted in a disjointed presentation without flow, unnecessary repetition, and irritation for the reader, constantly having to refer many pages back. Consequently, we deal with each feature as a complete unit, discussing the implications of what we have found progressively and proposing possible reasons/ mechanisms before presenting an overall summary table and making observations on the implications holistically at the end. Observations are made throughout the paper in the separate discussion sections under each feature evaluated.

To minimize space and repetition, we at times abbreviate PRINCE2 to P2 and distinguish between its 2009 and 2017 editions by referring to them as P2-9 and P2-17, where the unabbreviated usage would be cumbersome.

An outcome summary is presented in **Table 1** after the last feature is evaluated.

5   Examination of PRINCE2

Seventeen features of PRINCE2 are considered in the following sections.

5.1   The overall structure of the manual

5.1.1   Analysis

PRINCE2 gives seven principles any project must follow to be a PRINCE2 project (continued business justification, learn from experience, defined roles, and responsibilities, manage by stages, manage by exception, focus on products, tailor to suit the project). It then gives seven themes (Business case, Organisation, Quality, Plans, Risk, Change, Progress) followed by seven processes (Starting up a project, Directing a project, Initiating a project, Controlling a stage, Managing product delivery, Managing a stage boundary and Closing a project) (AXELOS, 2017).

The PMBOK has introductory concepts and discussions of the project environment and the role of the project manager, before describing the 10 knowledge areas (integration, scope, schedule (time), cost, quality, resources, communications, risk, procurement). It gives a

process for developing and controlling each, which is similar for each but not identical, adapted for the characteristics of each knowledge area. These processes generally include some form of planning, doing some form of work, followed by combinations of control, monitoring, and means of handling change. The document also includes a new standard which effectively runs through these processes in groups or phases of the project lifecycle, covering all of the 49 processes across the 10 knowledge areas specifying for each its components and giving examples of which project documents would be used and which would be updated (Project Management Institute, 2017).

Analyzing these summary descriptions indicates differences as follows:

- PRINCE2 does not deal with the PMBOK knowledge areas of integration, scope (which it partly addresses through requirements specifications), schedule, cost, communications, or procurement/ contracts. Its processes are based on iterative product development.
- PMBOK does not deal with directing a project or controlling or managing stages. It does not give a specific executive or board guidance. Its processes are based around a generic project lifecycle that accommodates predictive, iterative, incremental, and Agile life cycles.

They represent the same thing (project management) in two different conceptual ways, each having a different focus, terminology, and starting point that produces two different and competing frameworks.

There is some overlap between the PMBOK knowledge areas and PRINCE2 themes, but in general comparison, PRINCE2 omits some of the key knowledge areas whereas PMBOK omits board and executive involvement.

5.1.2   Discussion
Most engineering infrastructure follows a predictive lifecycle and is not iteratively developed. Much of the PRINCE2 stage management process deals with a heavily bureaucratic approvals process based around the iterative development cycle. This may suit ICT product development which requires high levels of user involvement but is much less suited to engineering infrastructure projects where product characteristics are fairly well known. The basic focus of the PMBOK around its project (as opposed to PRINCE2's product) lifecycle better accommodates engineering infrastructure, and PRINCE2's lack of coverage of some of the knowledge areas is a problem for engineering infrastructure. It is more ICT delivery focused, leaving out much of the owner project lifecycle, assuming ICT requirements specifications as inputs and having difficulty handling feasibility studies.

5.2   Project definition

5.2.1   Analysis
PRINCE2 defines a project as "a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case" (AXELOS, 2017, p. 8).

PMBOK defines a project as "A temporary endeavor undertaken to create a unique product, service, or result" (Project Management Institute, 2017, p. 715).

PRINCE2 defines a project as an organization, omits services and results, admits only business products, and requires an agreed business case.

5.2.2   Discussion

PRINCE2 provides a highly restricted definition of a project that successfully excludes practically all of them. Its definition as an organization rather than as an activity has to be ignored for it to even include some small ICT projects, which are then the only ones likely to satisfy all of the rest of the definition. An organization may sometimes be referred to as a project, so this mistake actually sounds credible, but it is loose, describing a project in terms of one facet of its delivery rather than reaching into, going beyond self-absorption with how we do what we do, and describing its essence.

A project has to have some sort of purpose to create some end result and it is the realising or the delivering of that purpose, in other words, the activity or the endeavor to produce it that is its essence, not the incidental organization that happens to become an administrative necessity to deliver anything of any size. The existence of an organization provides evidence that a project exists at the time the asset, product, service, or result is being created; but this is not the essence of what it is. A project does not have to have an organization associated with it to be a project; a personal project that one works on privately does not become not a project just because there may be no recognized organization attached to it. Of course, the important matter of studying projects from an organizational perspective is a completely different matter to defining them as their organizations.

Furthermore, many small activities, such as a person organizing a party or personal event or a school organizing a speech night or fete, can be delivered as projects without any formal business case. It is not unheard of for even some large ´politically imperative´ projects to be delivered without one; and maintenance or special works before an election rarely have one, at least in terms of an overall return on investment to the community; and many project outputs are not normally referred to as business products.

While some engineering projects could be considered a 'business product', referring to them as such is a peripheral abstraction in defining what physical infrastructure projects actually are. The terminology has an introspective ICT and accounting focus that is irrelevant in much of what is done in engineering infrastructure projects. Public engineering projects focus on achieving a community objective, and the 'business product' considerations, although not completely irrelevant, are narrow, focusing on particular aspects of the wholistic project. It appears that someone in PRINCE2's long history must have thought this was generic, and subsequent followers have confidently asserted this to the rest of the world. But as John Stewart Mill said:

> It would, however, be a complete misunderstanding… to think that because a name has not at present an ascertained connotation, it is competent for anyone to give it such a connotation at his own choice. The meaning of a term actually in use is not an arbitrary quantity to be fixed, but an unknown quantity to be sought… To fix the connotation of a concrete name, or the denotation of the corresponding abstract, is to define the name. When this can be done without rendering any received assertions inadmissible, the name can be defined in accordance with its received use (Mill, 1874, pp. 469-470)

The PRINCE2 definition of a project is, therefore, obviously not generic. The best that can be said of it is that it does not well accommodate engineering infrastructure. The PMBOK definition is much better suited to engineering infrastructure projects.

This is not an encouraging start when the definition of the very thing PRINCE2 is supposed to be about is so fundamentally flawed. It tempts the question that if PRINCE2 does not even know what a generic project is, how can it possibly be generically useful for any project at all, let alone for the whole project management world? However, to admit the possibility this may be a simple mislabelling, having little effect on the actual method, we will continue, but we will also consider the suitability for ICT of the remaining features examined. Given that it has taken this examination to bring this extraordinary fact to light, the suspicion arises as to what other non-generic things may have been assumed in long-forgotten times in PRINCE2 history and propagated to the current day, and whether any of these might also not be generic to ICT practice. Of course, full examination of its genericity for ICT in any other of its features is outside the scope of this investigation.

5.3   Lifecycle definition

5.3.1   Analysis

PRINCE2 defines a project lifecycle as "The period from initiation of a project to the acceptance of the project product" (AXELOS, 2017, p. 381). It defines project lifecycle but not product lifecycle. Figure 13.1 labels the project lifecycle as excluding anything that is "pre-project" (AXELOS, 2017, p. 158). This includes the "starting up a project" process, which includes preparing a business case (AXELOS, 2017, p. 172). It also says, "The term 'project mandate' applies to whatever information is used to trigger the project, be it a feasibility study or the receipt of a 'request for proposal' in a supplier environment" (AXELOS, 2017, pp. 166,167). This means that the lifecycle excludes both the feasibility study and business case and does apply to delivery. It also says, "Although PRINCE2 does not prescribe the use of any particular project lifecycle, it does require that one is used" (AXELOS, 2017, p. 176). It also notes that "lifecycle models frequently address only one aspect of a project's scope" (AXELOS, 2017, p. 108).

PMBOK defines the project life cycle as "The series of phases that a project passes through from its start to its completion" (Project Management Institute, 2017, p. 716). It also states, "all projects can be mapped to the generic life cycle shown in **Figure 1-5**" (Project Management Institute, 2017, p. 19). This does not exclude 'pre-project' activities and so actually refers to the full project lifecycle. The PMBOK also says:

> Project life cycles can be predictive or adaptive. Within a project life cycle, there are generally one or more phases that are associated with the development of the product, service, or result. These are called a development life cycle. Development life cycles can be predictive, iterative, incremental, adaptive, or a hybrid model (Project Management Institute, 2017, p. 19)

ISO 21500 2.12 defines the project life cycle as a "defined set of phases from the start to the end of the project" (Australian Standards, 2016).

The PMBOK and ISO definitions are quite similar in referring to phases of the whole project. However, the P2 definition is actually quite different, defining it as a period of time rather than as a series or set of phases. This contains the same basic error as its definition of a project, failing to define in terms of essence, resulting in defining it as something it is not. Any lifecycle takes a time period as does any other activity, and this does not capture the essence of the term. A lifecycle covers some sort of growth or development or phases of life for which the time period is an incidental consequence.

The P2 definition also refers to the project product. This can be read to mean either the total, the wholistic output of the project, or to every individual product the project may produce. The only circumstance where this project lifecycle is the same as the product lifecycle is where the project requires the production of only one product. Where a project produces more than one product, the two are not the same. The P2 process flow, analyzed in a separate section below, accommodates multiple iterations of the development of multiple products and is therefore based on an iterative, incremental, or adaptive product development lifecycle rather than on a predictive or sequential project development lifecycle.

5.3.2 Discussion

This indicates that PRINCE2 adopts as its basic process model the delivery part only of the lifecycle for production of each of the project's products and not the lifecycle of the whole project itself. This confirms that the observations of Wideman (2002) in the literature review are still current.

The generic nature of the words used in Chapter 14 tempts the reader into thinking it applies to the full project lifecycle. P2, therefore, blurs the distinction between project and product lifecycles. The P2 lifecycle is the equivalent of the PMBOK process groups – initiating, planning, executing, monitoring & controlling and closing, which PMBOK does not refer to as a lifecycle – applied to the delivery part of the project lifecycle. P2 is, therefore, not a project lifecycle model. It is a micro-product lifecycle that fits within a macro project lifecycle that it does not specify. It effectively gives the steps that an ICT shop would go through in producing computer code.

Using the PMBOK categorization of development lifecycles under the project lifecycle enables what P2 labels as a 'project lifecycle' to be seen as a (micro) (product) development lifecycle within a full project lifecycle. The P2 basic process model can find a place within the iterative, incremental, and adaptive lifecycles that occur within ICT delivery organizations but not within the predictive full project lifecycle. This carries the interesting implication that P2 is unsuitable for 'waterfall' application and that it has fallen for the trap as expressed in Project Management Institute (2013, Section 2.4) that "The project life cycle can be determined or shaped by the unique aspects of the organization, industry, or technology employed."

The requirement in P2 for the user to use its project lifecycle plus another perhaps acknowledges its own lifecycle definitional difficulty. But this begs the questions of how and where this is supposed to fit with P2's own project lifecycle, and why any practicing project manager would want to use two different ones together in the same place on the same project - one whole one with one deficient one. P2 then advises organizations developing their methodology by saying "Standardization of project lifecycles can go a step further and, rather

than just describing a generic project, can be made to reflect particular types of the project by including the specialist activities in the appropriate stages" (AXELOS, 2017, p. 276). This is rather disingenuous as P2 has an ICT specialty already inbuilt that may be quite inappropriate to many of the projects it may be applied to, and this inappropriately asserts that it is generic.

References to a lifecycle in PRINCE2 are not generic, and consequently, it is unsuitable for use in managing projects from end to end, such as is necessary engineering infrastructure projects developed by either government or private enterprise or in any ICT project that is not concerned solely with the delivery of code. Being constrained inappropriately by a model covering only the delivery part of the cycle cannot do other than introduce complication and unnecessary confusion for other project types, raising the obvious question of how much the attempted usage of P2 in circumstances it was not designed for has adversely affected the success of ICT and other projects. We conclude that its lifecycle is inappropriate for engineering infrastructure projects.

5.4   Product versus project focus

5.4.1   Analysis
PRINCE2 states:

> Projects that focus on what the project needs to produce are generally more successful than projects whose primary focus is the work activity. This is because the purpose of a project is to fulfill stakeholder expectations in accordance with the business justification and to do this, there must be a common understanding of the products required and the quality expectations for them… Under the principle of focus on products, PRINCE2 requires projects to be output-oriented rather than work-oriented. PRINCE2 calls these outputs 'products' (AXELOS, 2017, p. 25).

P2-09 makes it evident that the products include various project management documents as well as various components of the total project output (Murray, 2009, Section 19.8.1).

P2 originally encouraged separate products to be managed as separate projects Wideman (2002, p. 4).

5.4.2   Discussion
This reason given for success by P2 may be so for ICT projects, although it is asserted rather than substantiated, but it is clearly not the case for engineering infrastructure projects, as discussed below in the section dealing with specifications. P2 does not back up this assertion either and actually encourages the opposite by focusing on management products – that is internally produced documents – instead of what it curiously refers to as "specialist products" which are the actual outputs.

Furthermore, treating products as separate projects may have supported the view of the genericity of project management and the need at the time to convince general management of the need to regard the management of projects differently, but this approach of naïve enthusiasm also leads to convolution in the application, with unnecessary iteration/ repetition of the process, to the point of interminable confusion in attempting to sort out where the real project is and which one is being managed at what level in relation to the others and how multiple boards would relate – quite apart from ignoring its own flawed definition of a project in the first place, which would have required establishment of separate organizations.

This also generates an artificial need for a higher-level method, namely MSP to compensate for the fact that P2 does not deal adequately with the project level.

Treating project management documents as products in the same way as various components of the total project output also fails to separate process from the content.

Such confusion of two words is unnecessary. The need to focus on products may possibly be considered self-evident within an ICT delivery environment, but outside of this part of the ICT environment, it does not make sense to unnecessarily confuse the two by substituting one for the other. The obvious question is why, when the system is supposed to be about projects, P2 would focus somewhere else - on products? That may be quite difficult to answer as, given the long history of P2, whoever made that decision may well be long gone. P2-17 uses the terms product 246 times and project 394 times. A product development lifecycle is shorter than a project lifecycle which, in turn is shorter than a product lifecycle. The confusion of mixing these is unnecessary.

5.5   The PRINCE2 process model

5.5.1   Analysis

The PRINCE2 process model has seven processes and various board requests, notifications, advices and approvals (AXELOS, 2017, p. 161). Its seven processes are Starting up a project, Directing a project, Initiating a project, Controlling a stage, Managing product delivery, Managing a stage boundary and Closing a project. The core of the P2 model is based on developing a product, presuming projects are built around producing products. "The guidance uses the terms 'output' and 'deliverable' synonymously with the term 'product' " (AXELOS, 2017, p. 26).

The PMBOK equivalent is a combination of its project lifecycle and its processes. It has five processes that are initiating, planning, executing, monitoring, and controlling and closing (Project Management Institute, 2017, p. 18)., which applies to all of its ten knowledge areas. "The output of one process generally becomes an input to another process or is a deliverable of the project or project phase… Process groups are not phases… the Process Groups interact within each phase" (Project Management Institute, 2017, p. 555). Nevertheless, it's mapping of the process areas against the knowledge areas does effectively provide a process flow that approximates a methodology for the full project lifecycle (Project Management Institute, 2017, p. 556).

Four processes are common to both - initiating, controlling, closing, and P2's managing product delivery equates to PMBOK's executing. P2's starting a project is in the PMBOK's lifecycle rather than in its processes. P2 does not have a planning process and has the extra processes of directing a project and managing a stage boundary.

The two key differences between these two groups of processes are that PMBOK does not attempt to specify the minutiae of all the bureaucratic, hierarchical steps involved and PRINCE2, in choosing to do that and to use it as the base building block of its iterative product development process flow, takes a bottom up approach whereas the PMBOK approach is top-down, starting with the project lifecycle. There is a third difference with implications beyond process that concerns the 'stage' terminology which is considered in a separate section below.

5.5.2   Discussion

The bottom-up approach of PRINCE2 does not provide a macro focus and encourages a micro-focus on technical details. This may be appropriate where the features of the product are dependent upon user acceptance, and there is a continual feedback loop with users/ customers, but this is not a universal characteristic of all projects. It effectively encourages users to focus on incidental bureaucratic processes rather than on producing the actual product, providing scope for unnecessary iterations and micro-management.

This choice of the basic process assumes that a process applicable to one particular part of an ICT project (an ICT shop writing code for user acceptance) will be suitable and applicable to all aspects of all other projects. This is a bold assumption that accepts proof by induction. The starting logic does have some appeal - the bigger activity (project) will be simply a summation of all the processes on all of the micro activities, and when every product is produced, the project is finished. As P2-05 noted, and later editions did not, "Product is used to describe everything that the project has to create or change" (Office of Government Commerce, 2005, p. 6). However, the problem with P2 arises from the choice of the basic process of producing each such product. ICT products can be produced iteratively but structural products cannot; iteration 'until we get it right' isn't an option and the product has to be right the first time otherwise people's lives will be lost and those involved subjected to litigation. No engineering standards dealing with safety depend upon user opinion. They are written by experts in the field. There will be a certification process by designer and verifier, not some stage authorization process by some project board, containing people who don't really know, and which in many cases will not even need to exist. The ICT focus on the bureaucracy associated with getting multiple stakeholders/ users to agree on the features of an ICT project product is understandable, but not generic to all product types. By adopting this as its basic process, P2 requires all users to accept that the generic process with all its requests, notifications, advices, and approvals are actually generic to every other activity. This is a big ask with a big documentation overhead that is unnecessary for predictive projects. No amount of dressing up an inappropriate micro-model with surrounding generic terminology actually makes extrapolation of it generic. It just makes it appear to be so and risks causing confusion for other types of projects attempting to apply it.

Under a heading "What PRINCE2 does not provide" it rather immodestly claims:

> PRINCE2's strength is in its wide applicability. It is entirely generic and excludes industry-specific or type-specific activity. Engineering models, project lifecycles, agile methods or specific techniques (such as organizational change management or procurement) can readily be used alongside PRINCE2. PRINCE2 categorizes all these aspects of project work as 'specialist' in contrast to 'management products', which relate to those required to manage the project. This means that the specialist products concerned need to be identified and included within the project scope and plans (AXELOS, 2017, p. 408).

This means that the inclusion of an industry-specific micro-model within its basic process, as detailed above, is denied, leaving potential non-ICT users empty-handed with nothing but unsubstantiated claims of genericity to contend with. It also does not address the question of why anyone who was not compelled to do so would want to use two parallel systems. This may be of great interest to theoreticians and marketers attempting to maintain a place for a

commercial product, but the benefit to busy practitioners, subject to time constraints, is not apparent. It also begs many questions such as why or how a project lifecycle, which is much broader than the P2 ICT micro-process, would be regarded as 'specialist' and falling under a P2 micro-process? Why would procurement be regarded as a specialist product when it is something that practically every generalist project manager outside an ICT shop needs to attend to? Why would a system purporting to be about project management arbitrarily start somewhere else – at the product level?

P2 leaves out much of what matters for generic project management. As Wideman (2002, p. 4) noted:

> The PRINCE2 project life cycle does not start with an original need, solution generating, and feasibility studies – these are considered as inputs to the project life cycle, perhaps as separate projects in their own right… Indeed, PRINCE2 assumes that the project is run within the context of a contract and does not include this activity within the method itself. However, it suggests that since contracting and procurement are specialist activities these can be managed separately using the method.

This reference to the project running within the context of a contract was in P2-05 Office of Government Commerce (2005, p. 8) but was removed in 2009. Note that we were unable to locate any version of PRINCE2 earlier than 2005 and so had to rely on Wideman for information on these. Also, superseded versions can still be in use, affecting current practice, and still form part of the history of the PRINCE, indicating its earlier reasoning.

While it may not be completely impossible to manage engineering infrastructure projects using PRINCE2, much of it would have to be ignored and it is difficult to see any benefit from enduring the difficulty of attempting to do so as much of what is necessary is not to be found in PRINCE2. It would require iterating micro activities, all with their openings and closings, paperwork, and board approvals that would be quite inimical to the completion of engineering infrastructure projects. Engineering infrastructure projects need so little of this as to make the PRINCE2 process almost superfluous.

The obvious response from P2 advocates that this can all be cut down begs the question of why bother to do that for a system that will still be incomplete after all that is done, when there is an alternative system, namely the PMBOK, readily available that does not have the same deficiencies. It covers both engineering infrastructure and ICT projects, whereas PRINCE2 takes the approach that its terminology and the ICT iterative product development life-cycle are generic and all other project types should conform.

Further evidence of the over-reach of P2 can be found in Chapter 3 detailing the seven principles that any project must follow to be a P2 project. It states:

"PRINCE2 is designed so that it can be applied to any type of project… without burdening it with bureaucracy. The themes, processes, and product descriptions describe what should be done but, in general, not how" (AXELOS, 2017, p. 20). This assertion is contradicted by having based the process flow at the very core of its method upon a highly bureaucratic process that specifies in great detail how administrative things should be done. This appears

to be a marketing attempt to deflect criticism of its bureaucratic overhead. It appears to adopt a strategy similar to that proclaimed by Joseph Goebbles, who once said:

> If you tell a lie big enough and keep repeating it, people will eventually come to believe it. The lie can be maintained only for such time as the State can shield the people from the political, economic and/or military consequences of the lie. It thus becomes vitally important for the State to use all of its powers to repress dissent, for the truth is the mortal enemy of the lie, and thus by extension, the truth is the greatest enemy of the State (ThinkExist, 2018).

P2 continues:

> PRINCE2 is principle-based rather than prescriptive; the principles are:
>
> - universal in that they apply to every project
> - self-validating in that they have been proven in practice over many years
> - empowering because they give practitioners of the method added confidence and ability to influence and shape how the project will be managed.
>
> The PRINCE2 principles provided a framework of good practice for people involved in a project and were developed from lessons taken from both successful and failed projects (AXELOS, 2017, p. 20).

Whatever these 'self-validating' feel-good words actually mean, they set the scene for P2 to be able to claim anything anybody else has developed. Its seven principles are continued business justification, learn from experience, defined roles and responsibilities, manage by stages, manage by exception, focus on products, and tailor to suit the project. It states, "To be following PRINCE2, these principles must be adopted when managing a project" (AXELOS, 2017, p. 20). Apart from managing by stages and focusing on products, these things will be present in the management of almost any infrastructure project using any method. However, the managing by stages and focusing on products should set PRINCE2 apart from other truly generic methods as these principles are not generic, as indicated by this investigation. One also wonders how a process that encourages work methods to be taken to board level can truly be regarded as managing by exception.

It is therefore evident that the PRINCE2 process flow and terminology is generic only to some aspects of ICT and not generic to engineering infrastructure. It, therefore, cannot be accepted as either generic or universal and cannot represent best project management practice.

5.6   Specifications

5.6.1   Analysis
PRINCE2 does not define the term specification in its glossary. It regards it as being associated with quality in its definition of "quality criteria" (AXELOS, 2017, p. 382). The closest it comes to a definition is in saying "user assurance responsibilities include… ensuring that the specification of the user's needs is accurate, complete and unambiguous" (AXELOS, 2017, p. 346), effectively saying specification equates to user needs. Under the heading "Writing product descriptions," it mentions "If a detailed requirements specification for a product is already available" (AXELOS, 2017, p. 108) and says nothing about the

process of developing them. The only references to 'requirements specification' in the whole document occur on that page. P2, therefore, appears to use "product description" and "detailed requirements specification" interchangeably.

There are no occurrences of either of the terms 'business requirements specification' (BRS) or 'business process analysis' (BPA) in P2-17. This means that PRINCE2 regards them as inputs, which again clearly indicates that its focus is on ICT delivery rather than on business projects from an overall owner's perspective. This again confirms the observation of Wideman (2002) identified in the literature review.

It does not define specification but does define "off-specification" as "Something that should be provided by the project, but currently is not (or is forecast not to be). It might be a missing product or a product, not meeting its specifications. It is one type of issue" (AXELOS, 2017, p. 378).

PMBOK6 defines specification as "A precise statement of the needs to be satisfied and the essential characteristics that are required. This also accepts it equates with user needs.

5.6.2 Discussion

In historical terms, the ICT field is relatively new, and ICT projects have come relatively recently into project management. P2 takes on the engineering usage of the word but ascribes a totally different emphasis to it in ICT terms as being 'what the users want' - which may change during delivery of the project. This is totally different from the essence of engineering specifications, which are fixed so that users' and suppliers' wants and commercial pressures do not compromise safety or functionality. Engineering layout drawings are used to depict what will be delivered, and these are used in communication with stakeholders. Specifications are generally not used for this purpose. Apart from the technical engineers in owner and delivery organizations, there are few stakeholders who take or need to take any interest whatsoever in engineering specifications.

Nevertheless, it is difficult to imagine how else the ICT field could have adopted this term, as showing users a few lines of code does not have the same visual impact as an engineering layout. Agile/ prototyping perhaps comes closest to having this capability to depict a completed product.

However, specifications of what users might want do not really compare with mature engineering specifications. Engineering projects require people with technical competence who know the characteristics of the materials or processes and are in a position to make decisions on them and accept the consequences. They do not need to run repeating surveys of opinions of people who do not know.

Basing a process for infrastructure upon such a non-generic process is introducing a convoluted loop that returns inappropriately to its origin in a way that can only cause confusion for engineering infrastructure projects. Engineering specifications are generally relatively stable and have associated processes for quality assurance and safety. The necessary testing is generally routine and will be called in without any "next stage plan" in accordance with some already existing form of the quality plan covering all aspects of the output to be produced. Iteration or going over the same thing more than once is only necessary in engineering infrastructure projects if there's been a failure to get it right the first

time. Conformance with specifications, as well as the form of the output, is something that engineering project managers routinely manage without needing to re-invent a process by tailoring something inappropriately re-proposed from another field.

Having mature aspects of infrastructure project management over-ruled by the relatively adolescent ICT project management concept, inappropriately applied, is not a reasonable proposition.

P2 also mentions, "a design is derived from a specification" (AXELOS, 2017, p. 316). This is not the case for infrastructure where the design is derived from the functionality required and is constrained by the specification requirements for stability, safety, etc.

A further aspect of the peculiarity of the ICT circumstance is highlighted in P2-09 in Section 19.8.2 titled "The evolving project," which says:

> *Rethinking Project Management* (Winter and Smith, 2006) identified that today's projects tend not to start with a predefined specification, but have specifications that evolve as the project progresses. Furthermore, the specifications are often contestable and open to negotiation throughout the project's life. The implication is that because the specification is driven by the Business Case, a project may not start with a predefined Business Case (Murray, 2009, Section 19.8.2).

This contradicts its own definition of a project and means that not only is the business case outside the project lifecycle, but it also may not even have one. Note that this is not present in P2-17. This would appear to be referring to the business requirement specifications (BRS), which effectively scope ICT projects. This would apply to very few infrastructure projects because their specifications have to be well developed beforehand. Otherwise, lives can be lost, and litigation pursued. Scoping for infrastructure projects is not done through specifications. Once a contract is let, specification versions are locked in, and an owner must pay (dearly) if any change in the specification is deemed necessary after the contract is signed.

Having requirements and consequently scope varying during the project must make cost almost impossible to predict - which would seem to suggest a circumstance where the nature of the undertaking itself could be the principal cause of cost over-runs on ICT projects, rather than any of the failure/ success factors commonly researched. This would support the view expressed in one of the references identified in the literature review which rather fatalistically proposed to "argue the futility of the prevention narrative and present a more pragmatic approach recognizing that failure within IS projects is inevitable at some level" (Hughes et al., 2017, p. 787).

The change in specifications during a project then leads to consideration of the rather odd term "specification-led" projects used in MSP 2011 referring to engineering infrastructure projects. This term was not used in any of the three PRINCE2 editions we had access to, but its usage in MSP is indicative of the non-generic ICT way of thinking in PRINCE2. Infrastructure projects are not led by their specifications. They are led by some form of community need that they will fill. From an ICT perspective where the BRS may be continuously variable, it may seem that the difference between project types relates to the characteristics of engineering specifications being fixed in advance. These projects may only

appear from an ICT perspective to be led by their fixed specifications, but the term is not one that would be used or even recognized by engineering infrastructure project managers.

So, in summary, assuming that 'specification' means user needs is not generic to infrastructure. The use of the unqualified term will cause confusion for infrastructure users. However, where qualifiers like 'user requirements' are used before the term, this confusion would be avoided. In engineering projects, the user needs and project purposes such as health and safety are often simple and predictable, not requiring user opinions. Where user opinion is necessary, the impacts are generally known and obvious.

5.7   Stage

5.7.1   Analysis

P2-17 defines a 'stage' as a 'management stage', which in turn is defined as:

> The section of a project that the project manager is managing on behalf of the project board at any one time, at the end of which the project board will wish to review progress to date, the state of the project plan, the business case and risks and the next stage plan, in order to decide whether to continue with the project (AXELOS, 2017, p. 377).

P2-09 had previously defined a stage as a management stage or a technical stage, where a management stage was defined as above, and a technical stage was defined as:

> A method of grouping work together by the set of techniques used, or the products created. This results in stages covering elements such as design, build, and implementation. Such stages are technical stages and are a separate concept from management stages (Murray, 2009, Glossary).

P2-17 does not mention the 'technical stage.'

PMBOK does not define stage, and its index lists only two occurrences of the term 'stage-gate,' which equate it with a phase gate or phase review (Project Management Institute, 2017, pp. 21, 545). It uses the term phase many times.

The PRINCE2 stage would, therefore, appear to come under a PMBOK phase, but this is denied in P2-17 which says "Project lifecycles are often described in terms of project phases, where the term 'phase' is used as an alternative to 'stage' or 'management stage' " (AXELOS, 2017, p. 96).

5.7.2   Discussion

While this usage of the term "management stage" is clear when the qualifier is used, the use of the unqualified term "stage" normally means something different to project managers with an infrastructure project background. It has the connotation that some significant amount of work has been or will be completed - covering many of the steps that PRINCE2 refers to as stages. It is not just any component. In engineering infrastructure terms, a stage may have useful output and/or the possibility of a significant time lag for the following stage, to the point where the stages may be managed as completely separate projects. The P2 usage is clearly from an ICT perspective, and its micro focus is not generic to infrastructure. In itself, this is unlikely to cause too much confusion.

The removal of reference to a "technical stage" in P2-17, removes a possible conflict with PMBOK phases, while not explicitly mentioning that latter term.

PRINCE2 also allows for stages to be managed as separate projects, but in a quite confusing way – encouraging the application of the whole process recursively at smaller levels, leaving the conundrum of where to stop the recursion, which can produce confusion and convolution of paperwork and board approvals. This also requires ignoring its own definition of a project, as, at some point, the repeated establishment of new, separate organizations would start to become so contorted as to be impossible to apply. In PRINCE2, the term stage can refer to the completion of every single micro-product through the PRINCE2 process. It is dependent on its product lifecycle model, which, as shown above, is not generic. Its propensity to generate useless recursion requires every potential user to be constantly on the lookout for something that may well not exist in their project management world.

5.8   Phase

5.8.1   Analysis
The term 'phase' is undefined in the glossaries of both P2-09 and P2-17. P2-17 simply refers to a "phase of its life" (AXELOS, 2017, p. 375) or a "phase of development" (AXELOS, 2017, p. 389), but also says "the term 'phase' is used as an alternative to 'stage' or 'management stage' " (AXELOS, 2017, p. 96).

PMBOK defines a project phase as "A collection of logically related project activities that culminates in the completion of one or more deliverables" (Project Management Institute, 2017, p. 716), and "Phases are generally time-bounded, with a start and ending or control point. A life cycle can be documented within a methodology" (Project Management Institute, 2013, Section 2.4).

5.8.2   Discussion
PRINCE2 ignores phases, which is perhaps unsurprising, given that it was designed for an iterative product lifecycle rather than a project lifecycle.

As noted in the discussion of the term 'stage' P2 regards its 'stage' as being interchangeable with a phase rather than a subset of it. This appears to be incorrect. In P2 terms, a stage may equate to a phase where there is only the minimum number of stages, but stages will be subsets of a phase where there are more stages than phases.

5.9   Relationship to PMBOK and standards

5.9.1   Analysis
PRINCE2 differentiates itself from PMBOK and other bodies of knowledge (BOKs) by saying, "A method, such as PRINCE2, provides not only a set of activities to be done, together with roles but also techniques for undertaking these activities. A body of knowledge looks at what a competent project manager should know and focuses on what and how to do it" (AXELOS, 2017, p. 14). This implies that not being a BOK, P2 doesn't tell competent project managers what to do and how to do it. That is hardly credible.

P2-09 was more specific, adding PRINCE2 provides "a framework of **what** needs to be done, by **whom** and by **when**" (Murray, 2009, Section 19.10). So the **what** in P2-09 overlaps with P2-17 and the difference is apparently in being told by **whom** and **when**. PRINCE2 also

differentiates itself from standards by saying "A standard provides rules, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose; it does not, however, state how activities should be carried out to achieve this" (AXELOS, 2017, p. 14). This cannot be fully correct as engineering standards can be either process or outcome based. Furthermore, the standard now included with the PMBOK orders knowledge area activities into process groups giving an order for them to occur in, effectively saying when activities should be done.

5.9.2 Discussion

The distinction between these types of documents (BOK, method, and standard) therefore, seems somewhat artificial and tenuous. This is not helpful in assisting project managers struggling to figure out what the real differences are and to implement the assertion that these documents can or should be used together.

The real difference appears to spring from the assumed starting model, with P2 using a product model and PMBOK using a project model. This results in PRINCE2 going to a micro-level of bureaucracy, specifying who does what on each product development iteration or stage, whereas PMBOK keeps to the macro project lifecycle level. This leads P2 into directing, board, and executive approvals. PMBOK does not presume a board exists for every project and so does not risk generating confusion around who (project manager, executive or board) approves what in every circumstance.

The tenuous distinctions offered are more relevant to the branding of two competing commercial products attempting to keep out of each other's way while both expanding adoption and attendant training revenue. Practitioners ignoring this confusion are unlikely to suffer an adverse consequence. It may become problematic if attempting to satisfy multiple documents.

5.10 Configuration management

5.10.1 Analysis

P2-17 defines a 'configuration item' as "An entity that is subject to change control" and 'configuration management' as the "Technical and administrative activities concerned with the controlled change of a product" (AXELOS, 2017, p. 373). The (Oxford) dictionary defines configuration as "an arrangement of parts or elements in a particular form, figure, or combination. "

5.10.2 Discussion

This is particularly important in ICT projects, but the terminology is unused in relation to engineering infrastructure projects where the terms 'change management' or 'variations' are more commonly used.

Again, the PRINCE2 terminology is not generic.

5.11 Product / Work breakdown structure.

PRINCE2 uses a product breakdown structure rather than a work breakdown structure, noting "PRINCE2 requires a product-oriented approach to decomposing the project product description into a product breakdown structure... Where an agile delivery approach is being used, the product breakdown structure could be represented by epics or user stories" (AXELOS, 2017, p. 97).

5.11.1 Analysis & discussion

Showing this section of the PRINCE2 manual to engineering infrastructure project managers is highly likely to generate a reaction somewhere between astonishment and contempt, dismissing P2 as being completely inappropriate for their purposes. This is of no use to infrastructure project managers whose products are fairly obvious and not dependent on user opinion, requiring iterations of board approvals and diminution of the authority of the project manager. For infrastructure project managers, a work breakdown structure (WBS) is necessary, whether product related or not.

P2-17 makes a condescending attempt to get around this difficulty by saying, "Users of PRINCE2 from a PMI background might find it useful to substitute the phrase 'product-oriented work breakdown structure' when they see product breakdown structure in the PRINCE2 manual". It then continues to irritate engineering infrastructure project managers with persistent expectation for them to use non-generic terminology by saying, "PRINCE2 recommends, but does not require, that an additional product is created and maintained: the product flow diagram. This is a diagram showing the sequence of production and interdependencies of the products listed in a product breakdown structure" (AXELOS, 2017, p. 98). Any infrastructure WBS or Gannt chart cannot help but have that in it.

Again, the PRINCE2 terminology is not generic.

5.12 Project Plan

5.12.1 Analysis

PRINCE2 does not initially embrace the project plan terminology. To get the full sense of how it treats this subject, it is necessary to follow it through in page order. After noting "the project tolerances (time, cost, quality, scope, benefits and risk) defined in the PID (Project Initiation Diagram)" (AXELOS, 2017, p. 14), it says "The PID should describe how PRINCE2 has been tailored for that particular project so that all those involved on the project understand how PRINCE2 is to be used and how to carry out their particular responsibilities" (AXELOS, 2017, p. 27).

It starts to introduce the term in saying

> A project manager may need to use specific product naming terminology (e.g., to reflect customer needs or practice within their own organization). Examples include:
> ● the use of PMI's 'project management plan' instead of PRINCE2's 'PID' … Care should be taken when changing management product names to ensure that they still reflect the intended PRINCE2 purpose (AXELOS, 2017, p. 32).

P2 then differentiates between the PID and a contract as follows:

> The PID and contract fulfill different purposes. One aspect of a contract is to describe who is liable if either party fails to fulfill its contractual obligations. The content of the PID should focus on practical management arrangements to make sure that each party can fulfill its obligations: the PID must reflect the contract conditions. Try to avoid including the PID as part of the contract documentation, as it may limit the project manager's ability to adapt it if the PID has to go through a formal contractual review for each change (AXELOS, 2017, p. 36).

It then notes:

> PRINCE2 requires that two products are produced and maintained for the organization theme," one of which is the "PID In the context of the organization theme, this provides the single source of reference for how the project is to be managed. The PID sets out the project management team structure and roles (AXELOS, 2017, p. 62).

P2 then defines a project plan as:

> A high-level plan was showing the major products of the project, when they will be delivered and at what cost. An initial project plan is presented as part of the PID. This is revised as information on actual progress appears. It is a major control document for the project board to measure actual progress against expectations" (AXELOS, 2017, p. 95).

However, P2 then actually appears to use the project plan, saying, "The project plan is created during the initiating a project process and updated towards the end of each management stage during the managing a stage boundary process" (AXELOS, 2017, p. 99). It continues:

> A Stage Plan is required for each management stage. The Stage Plan is similar to the project plan in content, but each element is broken down to the level of detail required for day-to-day control by the Project Manager… A stage plan is required for each management stage… stage plans are produced near the end of the current management stage. This approach allows the stage plan to:
> - be produced close to the time when the planned events will take place
> - exist for a much shorter duration than the Project Plan, overcoming the planning horizon issue
> - be produced with the knowledge of the performance of earlier management stages (AXELOS, 2017, p. 99).

5.12.2 Discussion

There is obvious internal confusion here in PRINCE2 in the relationship between a project plan and a PID. The term 'initiation document' has the connotation of being fixed, not something that is updated, and it seems rather strange to expect an initiation document to be used as the ongoing project plan.

Also, the requirement for a multiplicity of stage plans may be necessary when it is not known what the products are going to look like but is unnecessary when they are known. This invites the production of unnecessary and unhelpful documentation. Formal updates in infrastructure projects are usually done continuously, periodically, or at milestones rather than at the end of 'management stages', albeit that a management stage may correspond with a milestone. These updates will usually just be to schedule, cost, and scope/ variations, as the products are neither unknown nor iteratively developed.

The requirement for the PID to detail how P2 has been tailored will also be unnecessary where an organizational methodology is used. This requirement seems to indicate an internal focus, again risking the production of unnecessary documentation.

P2 also does not distinguish between work management and project management as it regards management documents as products like physical outputs. These two are quite distinct in engineering infrastructure projects.

The requirement for a PID to reflect contract conditions also indicates that P2 is designed for the delivery part of the project life-cycle and not the whole lifecycle. Any initiation document in an infrastructure project will be prepared well in advance of any delivery contract being signed.

It is again evident, therefore, that the PRINCE2 terminology is not generic. Perhaps P2 would do better to adopt generic terminology so that anyone managing a project as distinct from producing products would not have to translate from its specific product naming terminology.

5.13 Governance Requirement for a project board

5.13.1 Analysis

PRINCE2 does not give an option to not have a project board. It appears to assume that all projects need one, stating that "Tailoring requires the project board and the project manager to make proactive choices and decisions on" (AXELOS, 2017, p. 27). This does not appear to leave room in tailoring for small projects to not have one. "The board delegates day-to-day control to the project manager on a management-stage by management-stage basis" (AXELOS, 2017, p. 159).

The PMBOK is silent on the need for a project board and the terms 'project board' and 'steering committee' are not included in its glossary. It gives priority to the authority of the project manager, with a separate chapter (3) on the subject, which includes sections on leadership and the exercise of power. Its **Figure 3-1** and Standards **Figure 1-4** do however, include a generic reference to steering committees (Project Management Institute, 2017, pp. 53, 551).

5.13.2 Discussion

P2 requires all projects to have a board and to make decisions on what stages will have board involvement. This is inappropriate for many routine infrastructure projects where a board is not used as it would be an unnecessary and counter-productive overhead. It can also potentially lead to micro-management by an over-zealous board or the diminution of the authority of the project manager or both.

PMBOK makes no presumption that there must be a board or steering committee, thereby accommodating engineering infrastructure projects. It also supports infrastructure practice by placing accountability with and reinforcing the role of the project manager, rather than potentially undermining it with multiple board approvals and attendant paperwork being required at every stage for every product the project produces.

5.14 (Project board) accountability/ responsibility

5.14.1 Analysis

PRINCE2 in Section 5.3.2.2 lists the first duties of the Project Board as "Being accountable for the success or failure of the project in terms of the business, user and supplier interests" (Murray, 2009). It also states under the heading of Authority that "the Project Board is accountable for the project" (Murray, 2009). However, having asserted this accountability, it

then goes on to say under the heading of Executive that "Although the Project Board is responsible for the project, the Executive (supported by the Senior User(s) and Senior Supplier(s)) is ultimately accountable for the project's success and is the key decision-maker. The Project Board is not a democracy controlled by votes. The Executive is the ultimate decision-maker" (Murray, 2009). This is clearly contradictory and while the latter statement distinguishes between accountability and responsibility, the earlier statements confuse these concepts. The contributing committee roles and the committee itself have responsibilities but no accountabilities.

AXELOS (2017) contains similar statements; "The project Board is accountable to corporate, programme management or the customer for the success of the project, and has the authority to direct the project within the remit set by corporate, programme management or the customer as documented in the project mandate" (AXELOS, 2017, p. 338). Again, having asserted this accountability, it goes on to say, "The Project Board is not a democracy controlled by votes. The Executive is the ultimate decision-maker and is supported by the Senior User and Senior Supplier" (AXELOS, 2017, p. 340).

5.14.2 Discussion
In P2, the Executive is the one who makes decisions on the project based on the commitments given by the other two, who have full authority to make decisions in their own domain but none in the Executive's. However, just because people who can be labeled as decision-makers in some circumstances happen to be together at a committee meeting where decisions are made by the Executive does not mean that the committee itself actually makes the decisions and can be labelled as such. Decisions may well come out of such a meeting but the committee meeting just provides the forum for the person with authority to make decisions and labeling such a committee as decision-making is a misnomer. Project boards are different from company boards, which are properly constituted with statutory accountabilities. The analogy with company boards breaks down for projects in hierarchical organizations when it comes to voting and accountability.

The misconception of project boards or steering committees having accountability is a problem both accidentally created and denied in PRINCE2, as just demonstrated. This is a simple definitional error that has contributed to confusing governance in the project management field generally through application of the P2 model as universal best practice beyond ICT, leading to confusion through arrangements being established where committees were thought to have accountabilities.

5.15 Generic Nature
We examined all occurrences of the term 'generic' in both P2-17 and P2-09.

5.15.1 Analysis
PRINCE2 justifies its genericity on the basis of:

- Separating the management of project work from specialist contributions, such as design or construction. The specialist aspects of any type of project are easily integrated with the PRINCE2 method and, used alongside PRINCE2, provide a secure overall framework for the project work.

- Focusing on describing what needs to be done, rather than prescribing how everything is done (AXELOS, 2017, p. 2).

It states that it "can be applied to any type of project and can easily be implemented alongside specialist, industry-specific models (e.g. 'engineering models' or 'development life cycles')" (AXELOS, 2017, p. 2). It them boldly claims "organizations adopting the method as a standard can substantially improve their organizational capability and maturity across multiple areas of business activity, such as business change, construction, IT, mergers and acquisitions, research and product development" (AXELOS, 2017, p. 2). It further states under Section 1.2, "What PRINCE2 does not provide":

> **Specialist aspects**: PRINCE2's strength is in its wide applicability. It is entirely generic and excludes industry-specific or type-specific activity. Engineering models, project lifecycles, agile methods, or specific techniques (such as organizational change management or procurement) can readily be used alongside PRINCE2. PRINCE2 categorizes all these aspects of project work as 'specialist' in contrast to 'management products', which relate to those required to manage the project. This means that the specialist products concerned need to be identified and included within project scope and plans (AXELOS, 2017, p. 42).

P2-09 also says that "PRINCE2 is truly generic: it can be applied to any project regardless of project scale, type, organization, geography or culture" (Murray, 2009, 1.5).

5.15.2 Discussion

Having examined all occurrences of the word, it is evident that the claims to genericity are asserted rather than substantiated.

While distinguishing generic process from the content that it is applied to is fundamental to the existence of project management as a field, this only works if the material considered to be generic is actually fully independent of its area of application or content. PRINCE2 also contradicts its own claim to not deal with 'how' by including a great deal on 'how in its bureaucratic stage-management process that prescribes in painful prescriptive detail how everything is to be done, as described in the process section above. The same contradiction is also present in the section above on its relationship to PMBOK, where it says it is a method that does specify how. Many other areas where non-generic assumptions have also been made are identified in the sections above.

5.16 Claims of applicability to engineering infrastructure

5.16.1 Analysis

We searched for all occurrences of infrastructure in P2-17 for evidence demonstrating this.

An example is given of a "Major infrastructure company ensuring scope integrity and quality" (AXELOS, 2017, p. 280). It mentions a set of directive handbooks having been produced, which presumably satisfied the paperwork requirements of PRINCE2 but there was no mention of actual outcome. There is also a curious reference to other paperwork concerning product descriptions which would drive whether the product was needed or not. This would be most unusual for a project producing a physical product to start without knowing whether it was required or not. This must therefore refer to more paperwork output, and it is not clear at all whether this related to any particular product(s) or to a process for, as

the sub-heading says "Ensuring scope integrity and quality" (AXELOS, 2017, p. 280). This therefore appears to concern delivery of an ICT system within an infrastructure organization and gives no evidence of application to delivering physical engineering output. It also appears from the text that the physical products were produced using a method independent of PRINCE2.

Similarly (AXELOS, 2017, p. 286) describes "a major infrastructure company" which amalgamated eight previous organizational methods into one through internal negotiation. The impact and contribution of PRINCE2 to the system development and implementation is unclear, as is the outcome, apart from "the organization achieved P3M3 maturity level 3 as a result".

A further example given in (AXELOS, 2017, p. 287) describes the development of a project management method for a "major engineering programme" which on the next line is referred to as "major system engineering programme," i.e., it was an ICT method transferred to other parts of the organization. No details are given of its success, with the only success measure mentioned being that the Project Implementation Document (PID) "need only refer to the appropriate part of the method, rather than describe everything in full" and that "very few significant changes" were needed to make it applicable enterprise wide. There is very vague wording concerning how long it was actually in operation and no detail of the effectiveness of its implementation. It says it was used within three years of becoming available but did not say whether this was by compulsion or not.

5.16.2 Discussion

The infrastructure examples given in PRINCE2 are therefore quite weak and do not demonstrate the genericity of the material to engineering infrastructure projects.

We also searched for the terms construction and all were references in passing, such as:

> ● a waterfall approach where each of the delivery steps to create the products takes place in sequence (e.g., in a construction project where requirements gathering and design take place before building begins) and the product is made available during or at the end of the project (AXELOS, 2017, p. 15).

We, therefore, conclude that PRINCE2 claims of suitability for engineering infrastructure are unsubstantiated.

5.17 Summary of findings

The results of this examination are summarised in **Table 1** below.

Table 1

Summary of examination of PRINCE2

PRINCE2 feature	Suitability/ Genericity for engineering infrastructure (EI)	Suitability/ Genericity for ICT
Overall structure	Prescriptive, iterative & heavily bureaucratic approvals process unsuited to the predictive infrastructure lifecycle. Omits several PMBOK knowledge areas. Deals with deliverer rather than owner project management.	Its processes are based around iterative product development, suitable for ICT projects having high levels of user determination. Less suited to those that do not.
Project definition	Inappropriate definition as an organization, with a limiting focus on micro-organizational aspects rather than on macro purpose.	Inappropriate but suits an introspective micro-view of the organizational mechanics of an ICT project with an accounting perspective.
Lifecycle	Unsuitable for predictive endeavors such as engineering infrastructure projects.	Suits iterative/ incremental/ adaptive ICT endeavors but not predictive ICT endeavors.
Product versus project focus	Produces unnecessary confusion.	Produces unnecessary confusion for ICT projects not in the delivery phase.
Methodology	Confused definition but with little adverse consequence to practitioners.	Confused definition but with little adverse consequence to practitioners.
Process model	Inefficient as every 'stage' has to be determined on every application when there is a fairly predictable set of activities.	Suitable for micro-iteration.
Specification	Inapplicable - Specifications are mature and do not scope the project.	Specifications do scope the project. However, the absence of a BRS and the assumption that they are inputs does not assist owner project delivery.
Stage	Inappropriate to EI where stage refers to a significant amount of work having been completed and a major milestone reached, whereas here it refers to every single micro-product or iteration through the PRINCE2 process.	Usage may not be confusing where the traditional software development lifecycle is followed.
Phase	Used (infrequently) as an alternative term to stage.	Usage may not be confusing.

Relationship to PMBOK & Standards	Confusing but of no consequence if ignored. Problematic if attempting to satisfy multiple documents.	Confusing but of no consequence if ignored. Problematic if attempting to satisfy multiple documents.
Configuration management	Inappropriate & irrelevant.	Suitable for ICT.
Product Work Breakdown Structure	Superfluous to the WBS.	No comment
Project Plan	Confused application equating it with its PID in places, requiring both as well as separate stage management plans.	No comment
Governance requirement for a Project Board	Inappropriate for many projects that don't have or need one.	Inappropriate for small projects not needing one.
Project Board accountability/ responsibility	Inappropriate, confusing accountability and responsibility.	Inappropriate, confusing accountability and responsibility.
Claim for genericity	Unsubstantiated. Contains self-contradicting claims that it avoids 'how to'.	Generic for ICT shop delivery.
Infrastructure examples	No evidence of successful application to actual engineering infrastructure projects given. All references seem to be to the ICT area of engineering companies.	N/A

The above table can be further summarised as follows: PRINCE2 assumes:

- a product development rather than a project lifecycle
- a delivery process is a suitable model for all other project phases
- an iterative product development process.

None of these are generically appropriate to engineering infrastructure. It uses many ICT definitions that are not generic to other fields, such as project, specification and stage. It also assumes a non-generic governance model that confuses accountability.

Given the number of areas of difficulty identified, the answer to the RQ is clearly yes, there many features of PRINCE2 that make it difficult to apply to engineering infrastructure projects. Some of the difficulties identified also extend to some ICT projects as well.

6   Observations

This analysis of the PRINCE2 document identified many deficiencies that cannot have failed to adversely affect its implementation and operation, particularly in areas outside ICT, but also within ICT. The PRINCE2 project definition and claims to universality have produced a totally credible belief for those within ICT promoting the product as completely generic, while simultaneously producing a 'Catch 22' situation for any non-ICT project managers attempting to use it – who must ignore its definition of a project and all the other difficulties

identified here, or risk being considered in some quarters to have failed to adopt so called 'best practice'. They are left with the comfort of following 'best practice' and looking elsewhere for reasons contributing to failure which could not possibly be due to the 'best practice' itself. This appears to be a wonderfully successful business model and outstanding marketing practice that seems heavily supported by an introspective ICT view of its own genericity. With the spread of PRINCE2 world-wide, this has the potential to have confused and mislead the entire project management field.

In our view it is most unfortunate that PRINCE2 has assumed so many things are generic to all project types that are only generic to ICT delivery projects. We are reminded of a similar initiative that attempted to mandate a PMM from a building construction state government department to all other departments in that government. That attempt foundered because doors and windows, which are vitally important to any building and upon which the whole project management system had been based, were a little hard to find on roads, bridges, railway lines and computer programs. Given the obvious inappropriateness and lack of success of that initiative, it is not difficult to understand why it went undocumented.

The major concerns with PRINCE2 identified above have very successfully hidden behind the pay-wall of commercial training. We only discovered them by accident, having not ever found it necessary to use PRINCE2 in our practice nor having observed it successfully used anywhere in the industries we work in. We just happened to be researching project methodology effectiveness, have a focus on definitional matters, which many others would not, and had access to academic sources not generally accessible to practitioners (meaning we were able to access the materials without having to pay for and attend additional training that would have otherwise been unnecessary to us or to industries outside ICT). This graphically highlights the dangers of de-facto standards being under commercial control and not being readily accessible to general critical scrutiny. There was little chance of any engineering practitioners paying for and then spending days attending training in a field they do not practise in, on the off-chance of finding some internal inconsistency in it. Even practitioners in that field needing certificates to gain or retain employment were unlikely to even look at, let alone question, its definitions or the basis of its theory.

Our analysis here indicates that PRINCE2 should be recognized as an ICT delivery product competing for more generic application, rather than the de-facto standard that it has become in the ICT world.

The definitional laxity in PRINCE2 demonstrates the dangers of the philosophical trend initiated by the family resemblance concept of definition Wittgenstein and Anscombe (1958) and continued to this day by Haugaard (2010) and others. This approach treats language as meaning, rather than as just another framework for representing meaning. It consequently excuses definitional looseness and ignores the importance of silent or assumed qualifiers, as pointed out by McGrath and Whitty (2017). It allows anybody to define anything they like without regard for the caution of John Stuart Mill mentioned above. This leads to the circumstance pointed out by Hobbes (1996, p. 24):

> For the errors of definitions multiply themselves, according to as the reckoning proceeds, and lead men into absurdities, which at last they see, but cannot avoid,

without reckoning anew from the beginning; in which lies the foundation of their errors.

There is a further interesting consequence of PRINCE2 confusing the part of the lifecycle dealing with the delivery of the project with the full project lifecycle. That part of the lifecycle may be appropriate for a government in-house ICT delivery shop but is severely lacking and inappropriate for broader government use. This indicates that the people who originally accepted this for universal British government application must not have been aware of this limitation and were not experienced enough in end-to-end project management to recognise that what was being promoted by the ICT area was not generically applicable to all other project types or to all other parts of the full project lifecycle.

PRINCE2 has now been reified to the point where certification is necessary to gain employment in many sections of the ICT industry. This provides an association with the self-assigned 'success' and 'best practice' labels before practitioners can do what really needs to be done. Such association is both false and totally unnecessary in environments outside ICT delivery shops.

Whether the features of using PRINCE2 identified here are viewed as just irritating or constitute show stoppers is up to the individual prospective user or organization attempting to use it. However, given the number and nature of deficiencies identified here, we would certainly not recommend its adoption for infrastructure or for ICT projects either, all of which have to have some pre-delivery work and where the initiating organizations don't deliver in-house, that will be contracted out anyway.

PRINCE2 appears to be a faulty product warranting total recall. We could not recommend it for use outside the ICT code delivery shop circumstance it was designed for.

One cannot help but marvel at such a stunning marketing achievement, as mentioned in the introduction, for a product with so many basic flaws. This leads us to propose the following ten-phase lifecycle showing how an ideological error in a free society can progress from conception to mature solidity and grand disaster, based upon our examination here, combined with our experience and observation in practice:

1. Someone has an idea with some merit in some circumstances
2. The idea spreads within those circumstances
3. Wishful thinking occurs about its applicability to everyone/ everything else
4. The originator or early converts write a book and keep asserting its genericity
5. The idea becomes reified, attracting acolytes and commercial interest
6. Zealous, evangelistic marketing occurs, and niggling difficulties are ignored
7. 'Thinking people', keeping up with modern trends, accept it as fact
8. It becomes a fad and people's livelihoods come to depend upon it
9. General delusion occurs and 'group think' suppresses any questioning
10. A paradigm/ quantum shift is then necessary to dislodge it.

Figure 1 lifecycle of an ideological error/ grand disaster

By the time an idea reaches Phase 10, it has solidified, and a new starting idea becomes quite difficult to generate.

Figure 1 parallels the Model for theory dynamics in Muller and Shao (2013, p. 141), but covers the circumstances where the paradigm has not developed from academic theory and/ or the discourse has not been sufficiently inclusive. It appears that a paradigm at the level of shared beliefs (as opposed to world view, epistemological stance or research model (Muller & Shao, 2013, p. 145)) has been introduced and accepted within the project management field.

The results of this examination of PRINCE2 can perhaps serve as a wake-up call for the industry, both within infrastructure and ICT, as well as within HR, procurement and stakeholder areas of project management and the wider field of general management.

The main lessons to be learned from our examination here of PRINCE2 may well be about the internal governance of the field in general that has allowed this to happen, and the impact of commercial influence upon 'standards' in a field looking to be regarded as a profession. We consider it undesirable for commercial marketing competition between rival products and the associated training industries that surround them to dominate the direction of the project management field. We also acknowledge the principle of caveat emptor. If the field had adopted or 'bought' an approach, it had some sort of responsibility to undertake due diligence.

The engineering infrastructure area did not perceive the slow drift of its suppliers and support staff towards getting more and more out of control, as this was 'staff' and not 'line' activity, which wasn't the main infrastructure game; it was just 'management speak', which determined one's promotion, but there must have been some right answer for that determined by somebody else who knew about such things. That was not where the main procurement game with the big dollars and risks were perceived to be. This blindness by senior engineering infrastructure managers, metaphorically falling asleep at the project management wheel, considering the subject too theoretical and academic, allowed the developing adolescent area of ICT projects, struggling to propagate techniques born from its lack of success in achieving project management outcomes and self-labeling them as best practice for the rest of the field and all other project types to follow. Engineering infrastructure project management was already mature by that time but now has to deal with the confusion of inappropriate specialist ICT practices and terminology having been foist upon it.

The lack of academic scrutiny and failure to detect this trend which, to the principal author's knowledge, has been colloquially known to engineering project managers for nearly two decades perhaps indicates a similar degree of either slumber or blindness within the academic community and supports the need for 'pracademics' as advocated by Walker and Lloyd-Walker (2016).

6.1   Recommendations

In the spirit of its own words "In order to ensure that the project management method continues to be used effectively, the method must be managed on a day-to-day basis, with improvements being introduced, based both on experience in using it" (AXELOS, 2017, p. 40), we recommend that:

1. the PRINCE2 definition of a project be amended from an organization to an activity or undertaking and re-labeled as a definition of an ICT delivery project (for which PRINCE2 was designed),

2. all other occurrences of the word 'project' in PRINCE2 documentation be generally amended to 'ICT delivery sub-project,'
3. the PMI definition of a generic project be inserted as the definition of a fully generic organizational project.
4. the project board be re-labeled as an advisory group or coordinating committee
5. all references to PRINCE2 being generic be replaced with 'generic to ICT delivery sub-projects'.

This would side-step the need to resolve the project-product conundrum and leave it to be dealt with back in the ICT delivery area where it originated.

We also recommend that non-ICT delivery projects use the PMBOK as it provides a much more appropriate framework with a full and clear lifecycle, uncluttered with a product versus project confusion and associated bureaucracy and unnecessary committees. This would also avoid the need for practitioners to resolve confusion over whether they need a guide, a standard or a body of knowledge or a methodology and over what combination of each might work best for them and how to put all that together into a PID and then figure out how that is supposed to work with a project plan. The average busy practitioner has little chance of doing this while delivering a project, and it is not reasonable to expect this of every project manager, just so that one particular book can be used, and its associated training sold.

7   Limitations and future research

The limitation of this work is that it is based upon a document review. We were unaware of any successful infrastructure applications of PRINCE2, but that does not mean it is not possible that they may exist.

It may be of largely academic interest to attempt to determine the scale of possible losses resulting from attempts to apply the non-generic theory. This would be a considerable challenge. Furthermore, surveying past troubled or failed implementations would also require a different paradigm of thinking; one that admitted the possibility that frameworks are fallible and should not be reified. It is likely that much of the necessary data would be unpublished, unavailable and difficult to obtain due to its potential for embarrassment and impact upon career and economic prospects. And if the data were available, it would be difficult to determine a proportion attributable to this cause. We consider it best approached by resolving definitions and standards as the past cannot be re-run, but we can, on the basis of new realization make the future better.

It is also possible that this paper may tempt a commercial response in an alternative direction; by canvassing documented success stories. As observed above, much of the claims to best practise seems to have resulted from assumption, assertion and marketing, and it would be good to see some real data on actual delivery success. This would also test the proposition of Wells (2012) in the literature review regarding whether the frameworks or PMMs themselves may have contributed to project failures.

Observing the PRINCE2 looseness documented above, in not distinguishing between ICT projects in engineering infrastructure organizations and real engineering infrastructure projects, raises the question of whether similar looseness may not have crept into the categorisation of projects in success factor research. It is evident from our examination here

that such research needs to clearly distinguish between true engineering infrastructure projects and ICT/ business type projects that just happen to be conducted within engineering infrastructure organizations. Of course, it is also possible that engineering projects forced to adopt PRINCE2 may be reverting to the ICT success rates.

If the pattern identified in this paper represents a general human tendency, one wonders whether this same tendency for suppliers and support professions to get out of control to the point of seizing control, might not have occurred in other fields as well, where all the management 'stuff' is considered peripheral to the main game, such as in medicine. It is a potential danger in any field where the accountability for injury or loss of life that regulates the base profession, does not provide quite the same drivers to some suppliers and various support callings that may have no real accountability for this and can have the freedom to pursue economic drivers. Future research in that area may be useful.

8   Conclusion

This paper has found that there are quite significant areas of difficulty in applying PRINCE2 to engineering infrastructure projects, confirming the comments resulting from the practitioner interviews that prompted this research. It finds that PRINCE2 cannot claim to be generic in the engineering infrastructure space and therefore, cannot reasonably claim to be considered best practice for it.

References

Appelo, J. (2008). Top five reasons why PRINCE2 sucks. *URL http://www. noop. nl/2008/05/top-five-reason. html.[Online*.

Australian Standards. (2016). AS/ISO 21500:2016 guidance on project management. In. Sydney: SAI Global.

AXELOS. (2017). *Managing successful projects with PRINCE2*. In (pp. 430). Retrieved from http://ebookcentral.proquest.com.ezproxy.usq.edu.au/lib/usq/detail.action?docID=4863041.

Calder, A. (2008). *ISO/IEC 38500: The IT governance standard*. In. Retrieved from http://common.books24x7.com.ezproxy.usq.edu.au/toc.aspx?bookid=34447

Delgado, M. d. l. C., Marcilla, J. S., Calvo-Manzano, J. A., & Vicente, E. F. (2012). Integrando PRINCE2 e ISO/IEC 38500 para la gestión y gobernanza de proyectos. (spanish). *CISTI (Iberian Conference on Information Systems & Technologies / Conferência Ibérica de Sistemas e Tecnologias de Informação) Proceedings*, 360-365.

Haugaard, M. (2010). Power: A 'family resemblance' concept. *European Journal of Cultural Studies, 13*(4), 419-438. doi:10.1177/1367549410377152

Haughey, D. (2014). A brief history of project management. Retrieved from https://www.projectsmart.co.uk/brief-history-of-project-management.php

Hobbes, T.-. (1996). *Leviathan*. Oxford: Oxford University Press.

Hughes, D. L., Dwivedi, Y. K., & Rana, N. P. (2017). Mapping ISs failure factors on PRINCE2® stages: An application of interpretive ranking process (irp). *Production Planning & Control, 28*(9), 776-790.

Joseph, N., & Marnewick, C. (2018). Investing in project management certification: Do organisations get their money's worth? *Information Technology and Management, 19*(1), 51-74. doi:10.1007/s10799-017-0275-y

Joslin, R. (2017). Governance and project success. In R. Muller (Ed.), *Governance and Governmentality for Projects : Enablers, Practices, and Consequences* (pp. 159-172). New York: Routledge.

Joslin, R., & Müller, R. (2015). Relationships between a project management methodology and project success in different project governance contexts. *International Journal of Project Management, 33*(6), 1377-1392. doi:https://doi.org/10.1016/j.ijproman.2015.03.005

Joslin, R., & Müller, R. (2016). The impact of project methodologies on project success in different project environments. *International Journal of Managing Projects in Business, 9*(2), 364-388. doi:10.1108/IJMPB-03-2015-0025

KnowledgeTRAIN. (2017). KnowledgeTRAIN PRINCE2online courses. Retrieved from https://www.knowledgetrain.co.uk/courses/prince2/elearning#how-many-people-have-taken-examinations

Łuczak, J., & Górzna, M. (2012). Evaluation of the effectiveness of the project management methodology PRINCE2 in the public administration. *Research Papers of the Wroclaw University of Economics*(264), 282-299.

McGrath, S. K., & Whitty, S. J. (2017). Stakeholder defined. *International Journal of Managing Projects in Business, 10*(4), 721-748. doi:doi:10.1108/IJMPB-12-2016-0097

McKenna, T., & Whitty, S. J. (2012). *Reconceptualising project management methodologies for a post-postmodern era.* Paper presented at the proceedings of the Annual Project Management Australia Conference Incorporating the PMI Australia National Conference (PMOz), Melbourne, Australia.

Mill, J. S. (1874). *A system of logic, ratiocinative and inductive* (Eighth ed.). New York: Harper & Brothers.

Muller, R., & Shao, J. (2013). A model of the dynamics in theory development. In N. Drouin, R. Muller, & S. Sankaran (Eds.), *Novel approaches to organisational project management* (pp. 136-161): Copenhagen Business School Press.

Murray, A. (2009). *Managing successful projects with PRINCE2, 2009 edition manual.* In N. Bennett & C. Bentley (Eds.). Retrieved from http://ezproxy.usq.edu.au/login?url=http://library.books24x7.com/library.asp?^B&bookid=41539

Office of Government Commerce. (2005). *Managing successful projects with PRINCE2.* London: TSO.

Oxford. Dictionaries online. Retrieved from http://oxforddictionaries.com

Project Management Institute. (2013). *Guide to the project management body of knowledge (PMBOK guide).* In. Retrieved from http://ezproxy.usq.edu.au/login?url=http://library.books24x7.com/library.asp?^B&bookid=51356

Project Management Institute. (2017). *Guide to the project management body of knowledge (PMBOK guide)* (Sixth ed.). Newtown Square PA: Project Management Institute.

Sadeanu, M., Candea, S., & Bodea, C. N. (2013). ISO 21500:2012 vs. Other project management standards. In N. Grau & C. N. Bodea (Eds.), *ISO 21500 Project Management Standard: Characteristics, Comparison and Implementation.* Aachen: SHAKER Verlag.

Sargeant, R., Hatcher, C., Trigunarsyah, B., Coffey, V., & Kraatz, J. A. (2010). Creating value in project management using PRINCE2. Retrieved from https://eprints.qut.edu.au/52853/

Słoniec, J. (2014). Study of applicability of using the project management methodology PRINCE2 in the management of a specific project. *Innowacyjne metody w inżynierii produkcji*, 167-179.

ThinkExist. (2018). Joseph goebbles quotes. Retrieved from http://thinkexist.com/quotation/-if_you_tell_a_lie_big_enough_and_keep_repeating/345877.html

Walker, D., & Lloyd-Walker, B. (2016). Rethinking project management: Its influence on papers published in the international journal of managing projects in business. *International Journal of Managing Projects in Business, 9*(4), 716-743. doi:10.1108/IJMPB-12-2015-0121

Wells, H. (2012). How effective are project management methodologies? An explorative evaluation of their benefits in practice. *Project Management Journal, 43*(6), 43-58. doi:10.1002/pmj.21302

Wideman, R. M. (2002). *Comparing PRINCE2 with PMBOK*. Retrieved from Vancouver, BC, Canada:

Wittgenstein, L., & Anscombe, G. E. M. (1958). *Philosophical investigations* (2nd ed.). Oxford: Basil Blackwell.

Xue, R., Baron, C., Esteban, P., & Zheng , L. (2015). *Analysis and comparison of project management standards and guides.* Paper presented at the Proceedings of the International Conference on Mechanics, Materials, Mechanical Engineering and Chemical Engineering (MMMCE 2015) Barcelona, Spain.

Zandhius, A., & Stellingwerf, R. (2013). *ISO 21500 guidance on project management: A pocket guide* Van Haren Publishing, Zaltbommel.

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