Some existing guidelines for managing "non-traditional" projects

By Alan Stretton

INTRODUCTION

Although we have many guidelines for managing projects in the forms of bodies of knowledge, competency standards etc, (traditional guidelines), these generally do not cover anything like the whole range of project-related processes, or of project types.

With regard to types of projects, traditional guidelines appear to be most relevant to projects which have relatively low complexity levels. In Stretton 2017c I discussed differences some writers have made between complicated and complex programs/ projects, particularly associating elements of uncertainty with the latter. Traditional guidelines are relevant to complicated projects, but only up to a point, as increasing numbers of components, with near-exponential levels of interconnectedness, create their own distinctive type of complexity.

There is substantial agreement in the broader PM literature that traditional guidelines are simply inadequate for complex programs/projects, particularly large ones. However, there are some guidelines for such programs/projects (which I will call "non-traditional" projects) in the wider program/project management literature, and this article will be looking at some of these.

TURNER & COCHRANE

Turner & Cochrane's goals-and-methods matrix

Turner & Cochrane 1993 were concerned with two types of uncertainty dimensions, namely those associated with project goals, and/or methods of achieving them. They developed a goals-and-methods matrix in an article subtitled "Coping with projects with ill defined goals and/or methods of achieving them" (i.e. at the start of the project), which is illustrated in Figure 1 below.

It can be seen that Turner & Cochrane's matrix results in four types of projects, which are described as follows.

- Type 1 – Both goals and methods are initially well defined
- Type 2 – Goals are initially well defined, but methods of achieving them are not
- Type 3 – Goals are not initially well defined, but the methods are
- Type 4 – Neither the goals, nor the methods of achieving them, are well defined

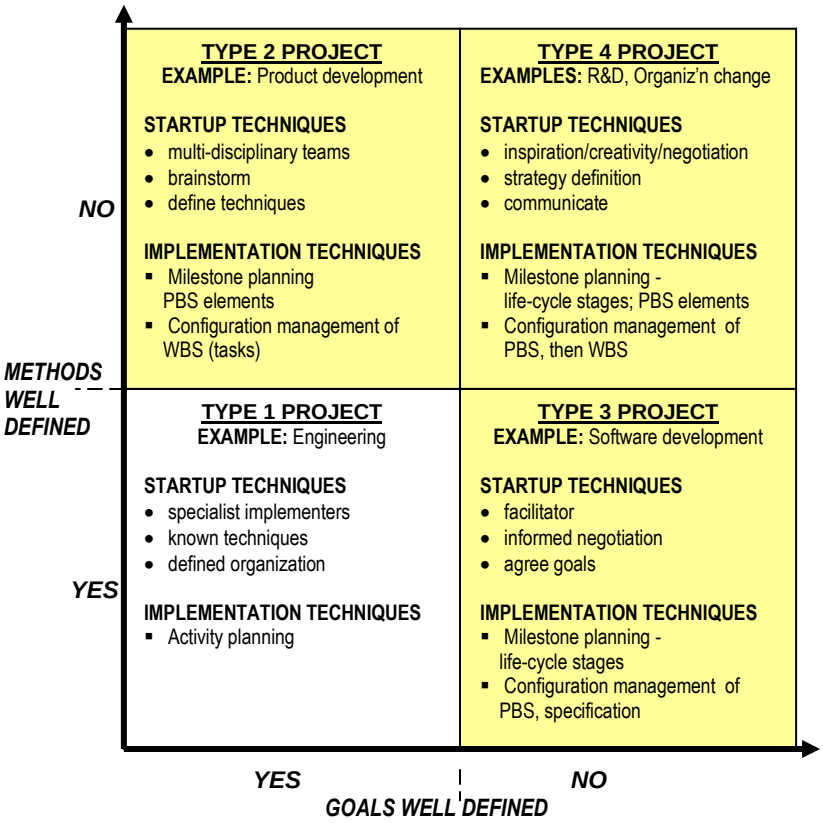

Figure 1: Based on Turner & Cochrane 1993 – Goals-and-methods matrix

As Turner & Cochrane have said, the traditional view of projects is characterised by the existence of clear well defined goals at the outset, together with well defined methods. In other words, the traditional paradigm is firmly represented by Type 1 projects in Turner & Cochrane's matrix model, and we have had well established and widely used guidelines for Type 1 projects for very many years.

Turner & Cochrane's guidelines for their non-traditional project types

The other three types of projects are markedly different from Type 1, and from each other, and require corresponding different project management techniques for effective start-up and implementation.

In the above figure, I have included summaries of Turner & Cochrane's quite specific recommendations about both start-up and implementation techniques appropriate to each of their four project types, which reflect the above differences.

We now move on to another early model which is concerned with two slightly different complexity dimensions.

SHENHAR AND COLLEAGUES

Shenhar 1995: A two-dimensional taxonomy

From the early 1990s Aaron Shenhar had been working on contingency approaches to the management of projects. The first of his publications that I became aware of was his 1995 paper on "A contingent project management framework", which he presented at PMI's Seminar/Symposium in New Orleans.

The basic framework developed by Shenhar 1995 is shown in Figure 2. It can be seen that he was concerned with two dimensions of complexity/complication. One is an uncertainty dimension, which here is specifically concerned with technological uncertainty, with four levels of uncertainty, which are broadly self explanatory. The other was a system scope dimension, with three levels, which broadly represent increased system complexity from assembly through to array.

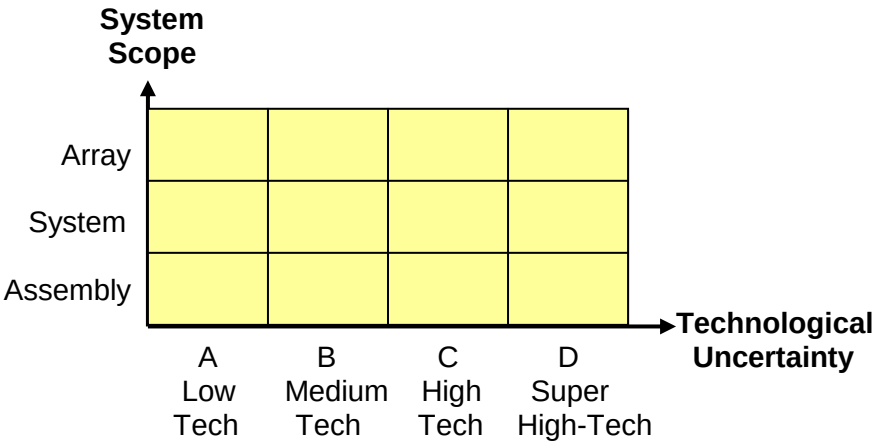

Figure 2: A two dimensional taxonomy of engineering projects and systems
Adapted from Shenhar 1995, Figure 1

Project characteristics/management guideline tables for each dimension

Shenhar attached two tables to his paper, which he described as "*Project characteristics"*, one *according to level of technological uncertainty*, and the other *according to system scope*. Figure 3 below shows the basic format of part of the table for the *Technological Uncertainty* dimension. It can be seen that the five "variables" in the left hand column are all related to managing the project. I have shown the actual entries for *Management style and attitude* for each level to give something of the flavour of the nature of the project characteristics set down by Shenhar. Effectively, these can be seen as guidelines to help effective management of projects at the different levels of technological uncertainty.

The table of project characteristics for the various levels of the *System Scope* dimension has the same broad configuration as for *Technological Uncertainty.* In this case there are six "variables" in the left hand column, namely Form of purchase, payments, delivery; Project organization; Planning; Control and reports; Documents; and Management style and attitude.

Project Type / Variable	**A** Low-tech	**B** Medium-tech	**C** High-tech	**D:** Super high-tech
Development, testing, and prototypes				
Design cycles and design freeze				
Communication and interaction				
Project manager and type of workers				
Management style and attitude	Firm style. Management sticks to the initial plan	Moderately firm style. Ready to accept some changes	Moderately flexible style. Expecting many changes	Highly flexible style. Living with continuous change and 'looking for trouble'

Figure 3: Basic format of part of Table A, Shenhar 1995: Project characteristics according to level of technological uncertainty

The combination of project characteristics for the various levels of the two dimensions of Shenhar's taxonomy gave quite a substantial number of guidelines for managing certain types of non-traditional projects. However, those were early days.

Further developments from two- to a four-dimensional NTCP model

Since then, Shenhar and colleagues have expanded the model in Figure 2 into four dimensions. First, a *Pace* dimension was added. Somewhat later, a *Novelty* dimension followed. The System Scope dimension was re-named Complexity, and the resultant model named the NTCP (Novelty, Technology, Complexity, Pace) model. In the last version that I know of (Shenhar et al 2016), each of the four dimensions has four levels, as indicated in Figure 4.

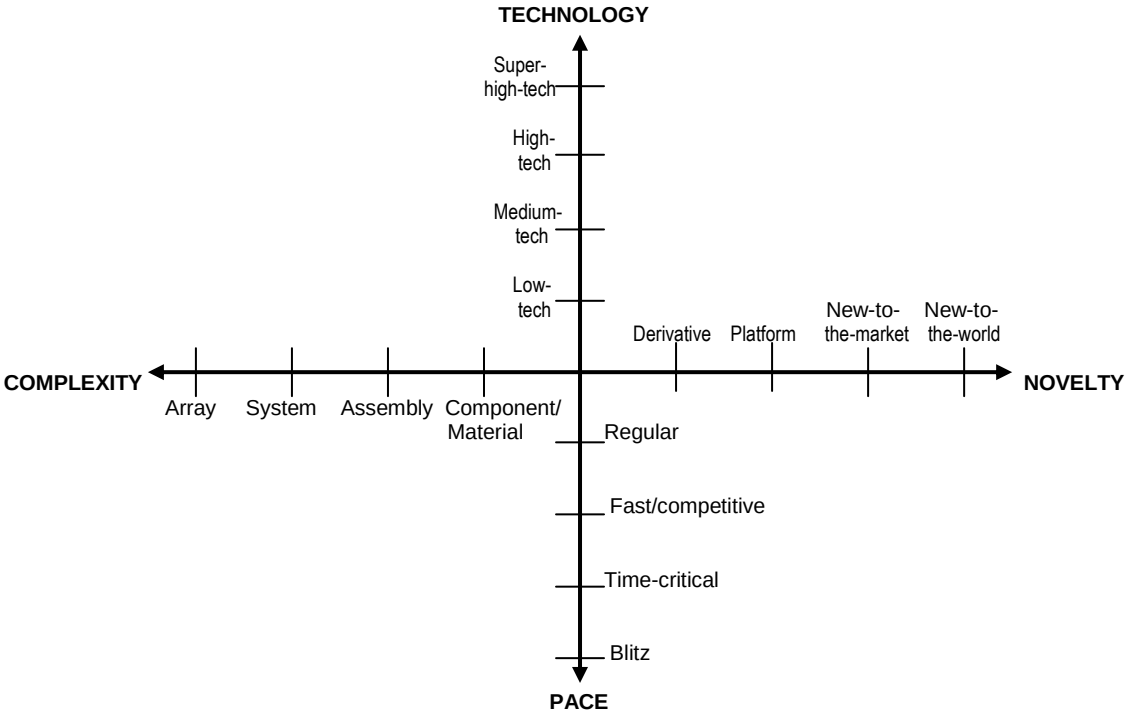

Figure 4: The NTCP model, adapted from Shenhar at al 2016

Expanded project characteristics/guidelines for each NTCP dimension

Further, the Project Characteristics tables for the various levels of the *Technology* and *Complexity* dimensions have been updated and expanded, and equivalent tables developed for the *Pace* and *Novelty* dimensions. The latest versions of these tables that I know of are in the book by Shenhar & Dvir 2007, Tables 4-3, 5-3, 6-3 and 7-2. I also know that these have been expanded further since then, as will no doubt be seen in the second edition of this book. All told we are probably talking of the order of one hundred separate characteristics, which are broadly equivalent to guidelines for managing the four different levels of four different project dimensions.

But that is far from all that Shenhar and colleagues have developed in the domain of project management guidelines.

The four NTCP dimensions and PMBOK knowledge areas

As I have already noted in a previous article in this journal (Stretton 2017d), Shenhar and colleagues have developed tables for each dimension of their NTCP model which has the (then) nine knowledge areas of the PMBOK Guide (PMI 2004) down the vertical axis, the three or four levels (or types) pertaining to each dimension on the horizontal axis, and a summary of how each of these different levels can affect (or impact on) traditional project management processes in each of the PMBoK knowledge areas. The format of the four tables in the book by Shenhar & Dvir 2007, Appendices 4, 5B, 6B, and 7, is as follows.

PMBOK Guide Knowledge Area	DIMENSION:			
	Level:.....	Level:.....	Level:.....	Level:.....
Integration				
Scope				
Time				
Cost				
Quality				
Human resources				
Communications				
Risk				
Procurement				

Figure 5: Format of Shenhar & Dvir 2007 tables in Appendices 4, 5B, 6B, and 7

This adds well over one hundred additional guidelines for managing non-traditional dimensions of projects to those already tabled in the project characteristics section above. I do not currently have more up-to-date information on the latest developments of Shenhar and colleagues in this domain, but expect that this will be covered in the second edition of Shenhar & Dvir's book, or other upcoming books or publications by Shenhar.

PRIETO 2015

"Theory of management of large complex projects"

In his recent book with the above title Prieto 2015:119 says (his emphasis),

> Large complex projects differ from those that comprise the traditional domain of projects as defined and served by the Project Management Institute and its Project Management Body of Knowledge (PMBOK). Remember its admonishment that PMBOK provides a management framework for ***most projects, most of the time.*** Large complex project appear to live outside these boundary conditions.

Following up on the last sentence of this quotation, Prieto 2015 is concerned with developing a theory which is distinctive to the management of large complex projects, evidently based on his own vast experience in engineering / construction.

> The large complex projects contemplated in this book are large, complex engineering and construction projects but others may judge its conclusions to apply equally in other domains. (p.88)

With regard to guidelines for managing large complex projects, Prieto's book has so many directly and indirectly relevant materials that it is impossible to adequately summarise them in this short article. Some of these materials appear in comparisons of differing attributes between what he describes as "classical theory of projects" and his "theory of large complex projects". Others focus on specific attributes of the latter.

Comparison tables

We start with an example of a comparative table which is very directly concerned with an important aspect of management – i.e. leading.

Management of large complex projects requires changed leadership behaviours	
Traditional Leadership Behaviours	**New Leadership Behaviours**
Individual leadership	**Group leadership**
Control and order	**Motivation and movement**
Scientific management	**Transformative leadership**
Outputs focus	**Shared outcomes focus**
Assignment and directive	**Agreement and acceptance of goals**
Hierarchical and siloed	**Flat communication & information structures**
Acceptance of normative	**Questioning (assumption, process, outputs)**
Adversarial/ transactional	**Collaboration & information sharing with stakeholders**
Management of tasks	**Management of flows**
Centralised decisions	**Engaged and decentralised decision making**

Figure 6: Adapted from Prieto 2015, Table 12-1

Other relevant comparison tables from Prieto 2015 include his detailed Table 8-1: Theory of Project Attributes, and Table 13-1: Extended Focus of the Theory of Large Complex Projects.

Attributes of large complex projects

Moving on to attributes of large complex projects, Prieto's Chapter 9 describes twelve aspects of large complex projects in substantial detail, under the headings of Project time scale; Outcomes; Stakeholder role; Boundary; Flow across boundary; Flows; Requirements; Scope; Tasks; Project organization; Knowledge management; and Execution Focus. These are summarized in Prieto's Table 9-1, but are then further discussed in substantial detail. All aspects have materials that are relevant to their management. Perhaps the most explicitly management-related materials are in Table 9-4, which is part of Prieto's discussion on Project organization, as follows.

ADAPTIVE PROJECT ORGANIZATION FRAMEWORK		
Organizational Capacity	**Practices**	**Requisite Skills**
Identity	Strategic Business Outcomes; Vision & Mission Goals; Scope; Requirements Planning Evaluation (Management and control) Change management	Strategic thinking; Visioning Mobilization of resources (people, systems, processes) Scenario based evaluation; Risk identification & modelling; Contingency planning and strategy Big analytics; Pattern recognition; Root cause analysis Organizational change management; Dealing with disruption
Information	Flow monitoring and assessment; Assumption tracking; Coupling and interfaces Decision making (Management)	Data analysis; Technology Communication
Relationships	Trust; Connectedness Communities of practice Stakeholder networks Disputes and distrust	Team building Partnering; Collaboration Partnering; Collaboration; Conflict management Conflict management and resolution

Figure 7: Adapted from Prieto 2015, Table 9-4 – Adaptive Project Organization Framework

Other tables which are particularly relevant include Table 10-1: Possible construct for theory of large complex projects, and Table 11-1: Core concepts. However, it should be said that the whole of Prieto's book is really concerned with providing an overall framework for the management of large complex projects, so that most of its materials are relevant to a greater or lesser extent.

In this regard, Prieto's concerns are at a much more generalised level than those of Turner & Cochrane, and of Shenhar and colleagues, who are both concerned with guidelines for managing various specific dimensions of project complexity.

We now turn to another set of guidelines for managing non-traditional projects, namely the very specific project management methodology of Agile.

AGILE

Agile and software development projects

Morris 2013:90 describes Agile as follows.

> The difficulty of accurately specifying 'software projects' requirements ….. led, around 2000-2001, to a group of software project managers essentially abandoning the traditional project management paradigm and declaring, in the Agile Manifesto (2001) – see box – the principles of Agile Project Management.

The Agile Manifesto includes:

- Highest priority is to satisfy the customer through early and continuous delivery of valuable software.
- Welcome changing requirements, even late in development.
- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference for the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Build projects around motivated individuals.
- Face-to-face conversations improve efficiency and effectiveness.
- Continuous attention to technical excellence and good design enhances agility.
- The best designs etc. come from self-organising teams.
- Teams should reflect regularly on how to become more efficient and change accordingly.

As Morris 2013:91 says of the Agile approach to overcoming the problem of specifying the requirements,

> Agile is based on the premise that because it is so difficult to specify requirements using traditional methods, it would be better if they were specified through close interactions ('coupling') between the user and the software developer; …..

Agile project management methodology has really taken off in the IT sector, and has had such an impact that PMI introduced an Agile Project Management Certification in 2011.

Linking Agile with Turner & Cochrane's model

It appears that we can very directly link Agile with Turner & Cochrane's goals-and-methods matrix, and specifically with their Type 3 group of projects. All the ingredients are there. Turner & Cochrane specifically name Software as an example of Type 3 projects. Software development methods are well defined at the outset. However, the requirements – i.e. the project goals – are not well defined at the outset, and Agile is specifically concerned with handling this situation.

So, we have a whole new methodology that was specifically developed for software development projects, which lies within Turner & Cochrane's Type 3 category. I have

not been too sure about how best to represent this diagrammatically, but hopefully Figure 8 will give some idea of where Agile could sit in Turner & Cochrane's model.

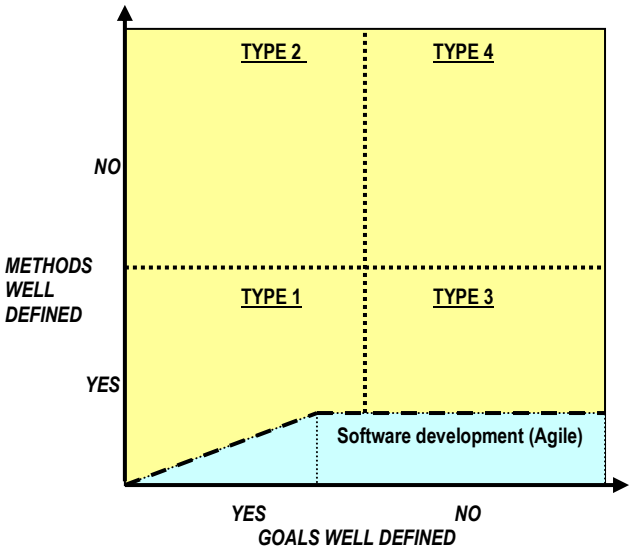

Figure 8: Tentatively representing Agile in Turner & Cochrane's model

Agile and other types of projects

It should also be noted here that Agile is being used on other types of projects. Gustavsson 2016 has done a literature review on the (mainly successful) use of Agile in non-software development projects. He reports on 21 such case studies, on a wide variety of project types, which can be broadly grouped as follows:

- Manufacturing, various products – 5
- Industrial and product design – 4
- Education course development – 3
- Management, strategy, in-house consultancy – 2
- Top level strategic mgt; supply chain mgt; library mgt; simulation modelling; internal change project; hospital mgt; public relations – 1 each

Gustavsson notes that the main benefits reported from these case studies were related to team work, customer interaction, productivity, and flexibility. However, he also notes that more research is needed to be able to generalise from these results.

SUMMARY

This article has looked at some of the existing guidelines in the literature for managing "non-traditional" projects. We started with Turner & Cochrane's 1993 goals-and-methods matrix, and their guidelines for start-up and implementation techniques for their "non-traditional" project Types 2, 3, and 4 in their matrix.

We then moved on to the work of Shenhar and colleagues, starting with Shenhar's 1995 two-dimensional taxonomy, and his tables of project characteristics for each level

of these two dimensions. Most of these can be seen as essentially guidelines to help effective management of certain aspects ("variables") of each dimension. The basic format of the two relevant tables was indicated.

After briefly outlining further developments from this model to a four-dimensional NTCP model, it was noted that expanded project characteristics/guidelines for each dimension are in place, and are being continuously updated (which is one reason I cannot reproduce any of these tables in detail).

It was further noted that Shenhar and colleagues have developed tables for each dimension of their NTCP model which has the knowledge areas of the PMBOK Guide on the vertical axis, the levels (or types) pertaining to each dimension on the horizontal axis, and a summary of how each of these different levels can affect (or impact on) traditional project management processes in each of the PMBoK knowledge areas. The format of the four tables in the book by Shenhar & Dvir 2007 was outlined.

We then moved on to Prieto's 2015 book "Theory of management of large complex projects", which essentially provides an overall framework for the management of large complex projects. These are based on engineering and construction mega- and giga-projects, but Prieto is hopeful that they may apply in other project domains. Out of the plethora of materials which are directly or marginally less directly relevant, I replicated a couple of the more obviously directly relevant tables, and pointed to several others which struck me as also being particularly relevant.

Finally, we went on to discuss Agile and software development projects. After linking Agile with Turner & Cochrane's goals-and-methods model, I also pointed to its apparently emerging applicability to other types of projects.

I conclude by noting that, with Agile, we have moved away from the large complex project context of Prieto, from the many dimensions of Shenhar and colleagues, and the fewer dimensions of Turner & Cochrane, to a specific set of guidelines for managing the non-traditional group of projects which are broadly classed as software development projects.

This is a very significant development, and my hope is that we will see the development of other methodologies along similar lines to Agile, tackling some other important groups of non-traditional projects.

However, I also look forward to further developments in the broader contexts visited by Shenhar and colleagues, and by Prieto.

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Alan Stretton is one of the pioneers of modern project management. He is currently a member of the Faculty Corps for the University of Management & Technology (UMT), USA. In 2006 he retired from a position as Adjunct Professor of Project Management in the Faculty of Design, Architecture and Building at the University of Technology, Sydney (UTS), Australia, which he joined in 1988 to develop and deliver a Master of Project Management program. Prior to joining UTS, Mr. Stretton worked in the building and construction industries in Australia, New Zealand and the USA for some 38 years, which included the project management of construction, R&D, introduction of information and control systems, internal management education programs and organizational change projects. He has degrees in Civil Engineering (BE, Tasmania) and Mathematics (MA, Oxford), and an honorary PhD in strategy, programme and project management (ESC, Lille, France). Alan was Chairman of the Standards (PMBOK) Committee of the Project Management Institute (PMI®) from late 1989 to early 1992. He held a similar position with the Australian Institute of Project Management (AIPM), and was elected a Life Fellow of AIPM in 1996. He was a member of the Core Working Group in the development of the Australian National Competency Standards for Project Management. He has published over 180 professional articles and papers. Alan can be contacted at alanailene@bigpond.com.au.

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