Strategic Project Portfolio Management: an Empirical Investigation

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Abstract

The mission of project portfolio management (PPM) is seen in evaluating, prioritising, and selecting project in line with the business strategy. Alignment of all on-going projects with the overall business strategy is generally recognised as very important for most modern organisations. The aim of this paper is to develop a conceptual framework embracing a number of key variables of PPM and corresponding interrelations, derived from the extant body of literature, and to test it empirically. We conducted a survey among experienced portfolio managers representing a wide range of organisations possessing established PPM mechanisms. Data obtained in this tailor--made survey was tested in the framework using Structural Equation Modelling. Our results provide support to most of the formulated hypotheses. On the basis of our findings, we formulate several managerial implications.

Key words: Project portfolio management; Strategy realisation; Multi-project management

1 Introduction

Acting in dynamic and turbulent environments, modern organisations strive to achieve excellence and sustain competitive advantage on the market. Design of a business strategy, specification of the organisation's mission, vision and objectives, developing policies and plans are viewed by strategic management discipline as a necessary precondition for organisations to remain competitive and fit. While this message receives virtually universal recognition, real practices are far from being perfect. According to Mankins and Steele (2005), firms realise only 63% of their strategies' potential value, and Johnson (2004) reports that 66% of corporate strategy is never implemented. As Grundy (1998) vividly states, strategy implementation is often the graveyard of strategy.

Traditionally, the company's business strategy was meant to be realised through on-going activities, or functional operations. A modern trend is proliferation of projects as an environment for business activities, as more and more modern organisations adopt projects as the

main organisational form of conducting their business operations. As projects are used in a wide spectrum of business operations, they are becoming a vehicle of business strategy implementation, and a topical area of professional examination and application (Hauc and Kovac, 2000). Shenhar et al (2001) emphasise that projects are "powerful strategic weapons" as they can be considered as a central building block in implementing the intended strategy.

However, this "projectification", if not managed properly, may lead to "project overload", inefficient and ineffective use of the company's resources, and in fact, distraction from the company's strategic goals. Managers are increasingly concerned about getting better results from the projects under way in their organisations in getting better cross-organisational cooperation (Englund and Graham, 1999). One of the most common complaints of project managers is that projects appear almost randomly – "the projects seem unlinked to a coherent strategy, and people are unaware of the total number and scope of projects" (Englund and Graham, 1999: 52).

Englund and Graham (1999: 52) suggest that "selecting project for their strategic emphasis... is a corner anchor in putting together the pieces of a puzzle that create an environment for successful projects". Project portfolio management (PPM) emerges as a mechanism to manage this puzzle. Its mission is seen in evaluating, prioritising, and selecting project in line with the business strategy (Archer and Ghasemzadeh, 2004; Cooper et al, 2001). The concept of strategic fit, or strategic alignment, has been studied in the management literature. The strategic fit of the project portfolio is the degree to which the sum of all projects reflects the business strategy (Meskendahl, 2010).

Although the idea of the strategic fit is broadly understood and shared among scholars and practitioners, the literature on it is still limited (Srivannaboon and Milosevic, 2006), specifically, empirical studies are not common. A number of in-depth case studies have been published (e.g. Filippov et al, 2010). Nonetheless, results of these case-studies can hardly be generalised over a wider population of organisations. Available quantitative empirical evidence is still insufficient.

This is the objective of this paper, namely, to investigate empirically the relationship between strategy alignment and the overall performance of project portfolio management, as well as between different mechanisms and processes that contribute to strategic alignment. A critical note is that we aim to study whether projects are aligned with the current business strategy, not their contribution to the overall business performance.

The main method is quantitative study. Data is collected in a self-administered survey, among a population of portfolio managers from a range of organisations. This data is then used to test a number of hypotheses derived from academic literature. The paper is structured as follows. Next section provides a theoretical background, serving as a general introduction to the field. Section 3 presents hypothesis development. Section 4 introduces data and methodology. Results are reported in Section 5. Section 6 offers a discussion of obtained results and conclusions.

2 Theoretical Backgrounds

2.1 Project portfolio and project portfolio management

Archer and Ghasemzadeh (1999: 208) defined project portfolio as "a group of projects that are carried out under the sponsorship and/or management of a particular organisation".

The Project Management Institute (PMI) offers a more elaborate definition in "The Standard for Portfolio Management", placing the emphasis on strategy, "a collection of projects (temporary endeavours undertaken to create a unique product, service, or result) and/or programmes (a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually) and other work that are grouped together to facilitate the effective management of that work to meet strategic business objectives" (PMI, 2006: 4).

PPM is a systematic approach to manage project portfolios. Other terms include "multi-project management" or "multiple project management" (Dietrich and Lehtonen, 2005). Dooley (2004: 468) defines the role of PPM as "… to maintain control over a varied range of specialist projects, balance often conflicting requirements with limited resources and coordinate the project portfolio to ensure the optimum organisational outcome is achieved". Blichfieldt and Eskerod (2008: 358) view PPM as a set of the managerial activities "that relate to (1) the initial screening, selection and prioritisation of project proposals, (2) the concurrent reprioritisation of projects in the portfolio, and (3) the allocation and reallocation of resources to projects according to priority".

A formal definition by PMI provided in "The Standard for Portfolio Management" is as follows – it is "an approach to achieve goals by selecting, prioritising, assessing, and managing projects, programs and other related work based upon their alignment and contribution to the organisation's strategies and objectives. Project portfolio management combines (a) the organisation's focus of ensuring that projects selected for investment meet the portfolio strategy with (b) the project management focus of delivering projects effectively and within their planned contribution to the portfolio" (PMI, 2006: 5).

Hence, PPM is meant to address two key aspects – "doing the right projects" (the portfolio strategy) and "doing the projects right" (the project management focus). In other words, PPM's mission is not only about initial selecting the right projects, but also ensuring an effective and efficient execution of projects and their alignment with the organisation's goals and objectives. Not only does PPM enable an organisation to get an oversight of all its on-going projects and get a better grip on their execution, but it also provides information for the organisation how to stay in tune with the demands of the marketplace and emergent situations in the business (Pennypacker et al, 2009).

2.2 Features of successful PPM

Success is a broad concept that in a most straightforward sense simply means meeting or exceeding expectations and goals (Dietrich and Lehtonen, 2005). In the project context, success is often conceptualised through a variety of success criteria and success factors. While success criteria refer shortly to the measures by which success or failure of a project or business will be judged, and success factors are defined as inputs to the management system leading directly or indirectly to the success of the project. The management approaches in a multi-project environment generally distinguish between (1) management efforts directed to single projects and (2) management activities that focus on groups of projects (McDonough and Spital, 2003). The latter is the focus of PPM. The salient feature of a successful PPM is that this collective synergetic mechanism provides opportunities for reaping benefits that would not be available if projects were managed individually (LaBrosse, 2010).

On the basis of formal definitions of PPM, Pennypacker and Retna (2009: 5) formulate five questions that a successful PPM should answer positively.

1. "Are we investing in the right things?" Since capital is a limited resource, organisations must figure out a way to invest in the right things. This is a balancing act between the desire to fulfil the business strategies, the limited available money to invest, and knowing the right time to start a project or terminate an unsuccessful one, and consequently allocate recovered capital to other projects.

2. "Are we optimising out capacity?" Capacity optimization can also be called portfolio resource optimisation with two key principles: (1) balance the demand for resources with the supply, and (2) create an open dialogue, based on factual analysis, between the portfolio management office and the business project sponsors (the decision makers). Resource optimisation is achieved through a balanced management of resources by understanding, managing, and balancing the demand side and the supply side.

3. "How well are we executing?" PPM enables the company management to receive necessary information on the current status of all on-going projects; it also provides information to stay in tune with the demands of the marketplace and emergent situation in the business. It is important to know how well PPM is performing, e.g. maturity, efficiency and effectiveness of PPM practices.

4. "Can we absorb all the changes?" Given the dynamism of contemporary economic, political, technological and social environments, a modern organisation should be able to adjust to these changes and absorb them. PPM is not a static mechanism and project portfolio is not fixed either. There are different types of change that need to be considered when looking at whole portfolio as well as individual projects – change that impacts technology, change that impacts physical assets, and change that impacts people.

5. "Are we realising the promised benefits?" Effective PPM enables us to know what benefits to expect from a project and to track the realisation of those benefits as the project progresses. To realise benefits in practice, (1) staff need to be trained to use the system and exploit its capabilities, (2) business processes need to be reengineered, and (3) resources need to be redeployed.

Furthermore, an essential pre-condition for a successful PPM is the quality of information supplied to the decision maker, meaning an up-to-date data on the status of projects in the portfolio (Matheson and Menke, 1999; Dietrich and Lehtonen, 2005).

Dooley and O'Sullivan (2003) highlight a number of common problems associated with portfolio management, or rather, developments that may take place if PPM is not carried out professionally. They are (a) poor leadership and direction, (b) poor alignment between goals and projects, (c) poor monitoring of holistic process results, and (d) poor planning and control of action implementation.

3 Hypothesis Development
The section consists of two sub-sections. The first one looks at the project portfolio management success and factors influencing it, particularly, strategic alignment. The second one focuses on the strategic alignment itself.

3.1 Project portfolio management performance

Performance of PPM can be measured through four dimensions: (1) the average single project success of the portfolio regarding the fulfilment of time, budget, quality, and customer satisfaction objectives; (2) the use of synergies between projects within the portfolio, which covers the interdependencies between projects; (3) the portfolio's overall fit with the firm's business strategy; (4) the portfolio's balance (Cooper et al, 2002).

As we have extensively elaborated in Section 2, a key factor in PPM performance is the basics, or foundations of project management. It is more commonly known as "doing the projects right". These foundations of project management include all the tasks, functions and activities aimed at professionalisation of project management. It assures that projects are planned and executed professionally according to clear guidelines, principles and procedures. The focus is on management at the level of individual projects. For example, good project management foundations contribute to the average single project success. We therefore propose the following hypothesis:

Hypothesis 1: The better the project management foundations, the better the project portfolio management performance.

Another key factor in PPM performance is the alignment of project portfolio with the company's business strategy. By contrast to foundations of project management, the focus here is on "doing the right projects". This strategic fit of the project portfolio is the degree to which the sum of all projects reflects the business strategy (Meskendahl, 2010). In a broad sense, strategic alignment involves all the tasks, functions and activities aimed at bringing the project portfolio in tight integration with the business strategy. In other words, this mechanism should assure that only the projects that serve (contribute to) the business strategy are added in the portfolio, and otherwise, prevent projects that do not serve the company strategic goals and priorities from inclusion into the portfolio. This leads to the following hypothesis:
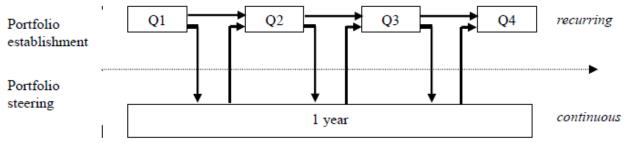

Figure 1 - Portfolio Establishment vs. Portfolio Steering

Hypothesis 2: The better the strategic alignment, the better the project portfolio management performance

3.2 Strategic alignment

Strategic alignment can be achieved by two (interrelated) mechanisms – (1) the initial establishment of project portfolio, and (2) the on-going portfolio steering, calibrating and adjusting of project portfolio. While portfolio establishment takes place cyclically in fixed moments of time, for example four times a year, but can be different, portfolio steering is a continuous process throughout the whole year. Portfolio steering receives input from portfolio establishment, which in its turn provides feedback back to portfolio establishment. This is visualised in Figure 1.

Initial portfolio establishment groups all the tasks, functions and activities aimed at initial identification, screening and actual selection of projects, and their prioritisation in accordance with pre-defined strategic targets and objectives. This initial process is considered as recurring, as it repeats in certain pre-defined periods (e.g. once in a year, every quarter of a year, etc.), and describes the firm's ability to integrate PPM into its existing strategic processes. Jonas (2010) identifies four tasks that are initially undertaken to set up a target portfolio derived from the business strategy of an organisation: strategic portfolio planning, definition of long-term target portfolio, evaluation of project proposals, and selection of projects. Consequently, the following hypothesis is suggested:

Hypothesis 3: The better the initial portfolio establishment, the greater the strategic alignment

The second mechanism is the on-going portfolio steering, calibrating and adjusting of the previously established project portfolio. Dooley et al. (2005) point out that decisions concerning which project proposal should join the portfolio may be influenced by issues such as the success of existing projects within the portfolio. Thus only a mechanism for evaluating prospective projects is not enough to effectively manage multiple projects. There should be also continuously reviewing on-going projects relative to their suitability to the current environment and also relative to the other projects in the portfolio.

Portfolio steering includes all the continuous tasks that are necessary for a permanent coordination of the portfolio (Müller et al., 2008), such as continuously monitoring, screening and adjusting projects in the current portfolio. This screening aims to ensure that all initially selected and launched projects still contribute to the business strategy and they still fit the portfolio. It seeks to enhance synergies between these individual projects. The tasks of portfolio steering include: (1) monitor and evaluate the current portfolio status in terms of strategic alignment and capacity utilisation, (2) development of corrective measures in case of deviations from the target portfolio, (3) coordination of projects across organisational units to identify synergies between comparable projects, and (4) identify and abort obsolete projects (Jonas, 2010). This leads to the following hypothesis:

Hypothesis 4: The better the continuous portfolio steering, the greater the strategic alignment

Further, these two mechanism – portfolio establishment and portfolio steering, contributing to a stronger strategic alignment are interrelated, as explained above and shown in Figure 1. Portfolio establishment provides necessary input for portfolio steering, and then receives certain feedback. These two processes are two sides of the same coin, mutually reinforcing each other. Organisations are expected to have a similar degree of maturity in both processes. Hence, the following hypothesis is proposed:

Hypothesis 5: Initial portfolio establishment and continuous portfolio steering are mutually positively related.

"Doing the projects right" and "doing the right projects" are two key aspects of PPM in any organisation. As we discussed in Section 2.2, and postulated in Hypotheses 1 and 2, they are both equally important and professionalism in both of them is considered vital for PPM performance. It is reasonable to assume then that these two variables are positively related to each other and mutually reinforcing. However, empirical evidence (e.g. Filippov et al, 2010)

suggests that this is not necessarily the case. Organisation doing the right projects may not necessarily do them in a right way, and by contrast, organisations doing the wrong projects in a right way. Artto and Dietrich (2004) present these two dimensions as a trade-off – "for the successful management of multiple projects, it is important to distinguish whether the projects are established for effectiveness or for efficiency. Effectiveness refers to doing the right thing, and efficiency refers to doing the thing right. Effectiveness often means creating something new; efficiency means perfecting something that is already known" (Artto and Dietrich, 2004, p. 18). It entails that effectiveness may be achieved at the cost of efficiency and vice versa.

While the interplay between "doing the projects right" and "doing the right projects" remain controversial, we suggest that it is the relationship between "doing the projects right" and the process of continuous, on-going portfolio steering that should be examined. Expertise in on-going portfolio steering as an act of a day-to-day management may be complementary to the foundations of project management which involves routinely processes of management of projects as well. In line with this reasoning, the following hypothesis is proposed:

Hypothesis 6: Continuous portfolio steering and foundations of project management are mutually positively related.

3.3 Analytical framework

Five variables can be defined on the basis of the six hypotheses developed previously, namely, (1) PPM performance PMP, (2) strategic alignment SA, (3) foundations of project management PM, (4) initial portfolio establishment PE, and (5) on-going portfolio steering PS. All six hypotheses and corresponding five variables are visualised in Figure 2. Boxes represent five variables. Single--headed arrows represent causal relationships between variables, while double-headed arrows visualise co-variations. References to respective hypotheses are placed above the arrows.
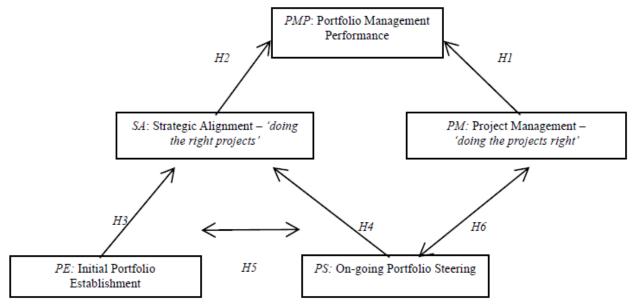

Figure 2 - Analytical Framework

4 Data and Methodology

This section presents introduces our data collection method (a self-administered survey), description of the obtained sample and the methodology – Structural equation modelling (SEM) – to be used in further analysis

4.1 The survey instrument

The data was collected in a self-administered survey tailored to the research objective and developed hypotheses and variables. A questionnaire was designed to collect data. Its content was decided with reference to the objectives of the project and theoretically anchored in the project management and strategic management literature. More specifically, several publications were consulted (e.g. Jonas, 2010), questionnaires developed by professional consultancy organisations (Dutch subsidiary of Nolan, Norton & Co), and other.

Before the questionnaire was administered, it was qualitatively pretested in pilot interviews with projects and portfolio managers, scholars and business strategy consultants. As a result, minor changes were made to eliminate or alter ambiguous questions and phrasings and to remove indicators not capturing the constructs for which they were designed. This procedure increased face validity of our measures.

4.2 Data collection

The data collection was a two-step strategy. The first step was a traditional face-to-face data collection, executed at the event of the Dutch branch of the International Project Management Association (IPMA), "Project Management Parade" in Nieuwegein (The Netherlands) in April 2011. That was a professional meeting of project and portfolio managers from a variety of organisations. Visitors were kindly asked to contribute to this research and fill in the questionnaire. Approximately half of the sample was collected at this venue. Because the survey was held in the Netherlands, a version of the questionnaire in Dutch was developed. As it was more convenient for respondents to read and answer the questions. Before the survey took place, both versions of the questionnaire were cross-checked to avoid any misinterpretation in translation. The second step is an online web-based survey. Professional social network LinkedIn was used to invite respondents. An announcement was posted in a group of portfolio management professionals with an invitation to proceed to a web-site on which an electronic questionnaire was located.

Table 1 - Operationalization of the Variables

Construct	Mean	St.Dev.	Label
Project Portfolio Management Performance			**PMP**
Compliance of the business strategy in PPM is considered as business success.	3.19	1.014	PMP1
There is an integral overview of all the projects in the portfolio.	3.87	1.024	PMP2
There is a balance in the portfolio between high risk projects and less risky projects.	3.10	1.012	PMP3
There is synergy present between projects in the organisation.	3.58	.848	PMP4
Introducing PPM lead to an increase of the average success of individual projects.	3.71	.783	PMP5
How many projects in the total project portfolio are pursuing the strategic goals of the organisation? (1 < 10%, 2 = 10-25%, 3 = 25-40%, 4 = 40-55%, and 5 >55%).	3.68	1.137	PMP6

Foundations of Project Management			PM
There is a Benefit Management System present to identify, model, quantify, plan, and monitor the total benefits of the project portfolio.	2.60	1.143	PM1
Project Management tools are utilized during the execution of projects (e.g. PRINCE2, PMBoK, CCPM, etc.).	3.97	.857	PM2
During execution of projects, administrative processes are structurally achieved.	3.49	.853	PM3
There is sufficient project expertise to execute the projects.	3.86	.912	PM4
There is sufficient capacity to execute projects (manpower/ project members).	3.31	.993	PM5
There is a certain system/mechanism present to allocate resources to different projects in the portfolio.	3.60	1.063	PM6
Strategic Alignment			**SA**
The business strategies are formulated clearly to translate them back into themes and projects.	3.62	.922	SA1
Strategic themes and strategic projects are clearly appointed on the management/board level.	3.71	1.115	SA2
The objectives of single projects are consistent with the objectives of the organisation.	3.41	.821	SA3
Projects that are in line with the strategic goals of the organisation are allowed to continue, while the current business case deviates from the original business case.	3.50	.826	SA4
You are capable to assess what the projects contribute to the business strategy.	3.47	.992	SA5
Initial Portfolio Establishment			**PE**
There is a standardised methodology for the assessment of a business case (if any) or utility and necessity of projects.	3.85	.821	PE1
There are defined procedures (rules) for the definition, approval, selection and start of all the projects.	4.24	.496	PE2
There is separate procedure present for selecting those specific projects that are pursuing strategic goals of the organisation.	3.18	1.141	PE3
The objectives of an organisation (business strategy) are always taken into consideration when accepting a project.	3.82	.869	PE4
Priorities of projects are determined based on the strategic goals of the organisation.	3.62	1.015	PE5
There are methodologies present for translating the business strategy to projects.	2.91	.965	PE6
On-going Portfolio Steering			**PS**
Strategic goals are propagated consistently and regularly by the management i.e. clear communication with employees/project members.	3.28	.991	PS1
Decision making, concerning the progress of a project in the PPM process, is explicitly traced back to the contribution it has to the business strategy.	3.13	1.040	PS2
There is a methodology present that continuously assesses the business case when it deviates from the business strategy.	2.84	1.167	PS3
Projects are linked together when a possible synergy is recognised during monitoring.	3.59	.979	PS4
There is parallel coordination between projects from different business units.	3.16	.954	PS5

From 1 = totally disagree to 5 = totally agree.

4.3 Sample description

A total of 35 observations formed the sample. The respondents are professional and experienced portfolio managers from a variety of organisations. The collected sample varies from companies that were founded hundreds of years ago to companies founded in the past decade. In terms of their organisational forms and sectors, they ranged from NGO's and governmental organisation to financial institutions and high-tech companies. 74% of companies were Dutch (but not necessarily acting only on national market), 17% were of other origin, and 9% did not specify it. 40% of the sample are organisations where projects serve as a primary business. 43% of the sample are organisations that practice PPM because projects are considered as a secondary business supporting the core business. For example, the core business of a bank is

providing financial services to customers, while its IT department practices PPM because they need projects to innovate on their IT system to secure and support their financial services. The remaining 17% are organisations where projects function as primary and secondary businesses.

4.4 Measures

The operationalization of our variables is shown in Table 1. Most items in our scales were purposely developed for the project, building on previous research and theory. They can be considered to be reliable and valid measures. The questionnaire includes 28 closed multiple choice questions. All indicators were measured using 5-item Likert scale. Likert-scale allows respondents to express the degree of agreement with the formulated questions.

4.5 Data analysis technique

We analysed the data using a structural equation modelling (SEM) technique. Considering our analytical framework (Figure 1), involving numerous regressions and interdependencies, SEM is regarded as the most appropriate statistical technique for estimating it in a single model. SEM is a statistical technique for testing and estimating causal relations using a combination of statistical data and qualitative causal assumptions. SEM involves series of multiple regression equations – all equations are fitted simultaneously. Recently, SEM became increasingly popular among researchers in social sciences, as it allows to model complex social systems with multiple variables and interrelations between these variables.

Structural equation modelling is a flexible and powerful extension of the general linear model. Like any statistical method, it features a number of assumptions. One of them is a reasonable sample size. A good rule of thumb is 15 cases per predictor in a standard ordinary least squares multiple regression analysis. Because SEM is closely related to multiple regressions, 15 cases per measured variable in SEM seem reasonable. Bentler and Chou (1987) note that researchers may go as low as five cases per parameter estimate in SEM analyses, but only if the data are perfectly well-behaved. Lower sample sizes are generally accepted for simpler models, models with no latent variables, models where all loadings are fixed, etc. These are indeed characteristics of our explorative model. As we discussed in Section 4.2, every single effort was made to collect a large sample, however, we have managed to obtain only 35 observations. Considering the argumentation above, in this explorative state of research, a total sample of 35 respondents is still sufficient to create an overview of the current practice in organisations.

We use IBM SPSS AMOS software package to estimate our model. AMOS enables to easily perform SEM to build models with more accuracy than with standard multivariate statistics techniques.

5 Results

First we present descriptive statistics and internal consistency analysis of the variables used in our analysis. Further, we discuss the model fit. Lastly, we report regression estimates and covariances (hypothesis testing).

Table 2 - Descriptive Statistics

Label	Construct	Number of items	Cronbach's α	Item Means	
				Mean	Variance
PMP	PPM Performance	6	.763	3.522	.095
SA	Strategic Alignment	5	.792	3.541	.014
PM	Project management	6	.703	3.471	.240
PE	Initial Portfolio Establishment	6	.708	3.603	.234
PS	On-going Portfolio Steering	5	.742	3.200	.074

5.1 Internal consistency analysis

Collected data allows us to construct five variables for the SEM model (Table 2). Each of the variables consists of 5-6 items (shown in Table 1). All Cronbach's α values are above 0.7 indicating a very good internal consistency and meaning that specific questionnaire items essentially represent the same thing and can be grouped into respective variables. It allows us to calculate variables as mean values of respective items, where individual items have the same weight. All variables are on a 5-item Likert scale.

5.2 Model fit

Fit refers to the ability of a model to reproduce the data. Assessment of fit is a basic task in SEM modelling. A good fitting model is one that is reasonably consistent with the data and so does not require re-specification. The output of SEM programmes includes matrices of the estimated relationships between variables in the model. Assessment of fit essentially calculates how similar the predicted data are to matrices containing the relationships in the actual data.

Formal statistical tests and fit indices have been developed for these purposes. Individual parameters of the model can also be examined within the estimated model in order to see how well the proposed model fits the driving theory.

Saturated and Independence models refer to two baseline or comparison models automatically fitted by AMOS as part of every analysis. The Saturated model contains as many parameter estimates as there are available degrees of freedom or inputs into the analysis. The Saturated model is thus the least restricted model possible that can be fit by AMOS. By contrast, the Independence model is one of the most restrictive models that can be fit: it contains estimates of the variances of the observed variables only. The independence model is in fact the null model in AMOS terminology.

Table 3 present an overall model fit. The chi-square test is reported, along with its degrees of freedom and probability value.

Table 3 - Model Fit

Model	Distinct parameters to be estimated	Chi-square	df
Saturated model	15	.000	0
Specified model	11	22.223	4
Independence model	5	79.042	10

In our model: the number of distinct sample moments is 15, the number of distinct parameters to be estimated is 11, and df=4. Chi-square is equal to 22.223. All the reported values lie closer to the saturated model than to the independence one. They are deemed as acceptable.

Other commonly reported measures are the Comparative Fit Index (CFI), the Bentler--Bonett Index or Normed Fit Index (NFI), the Incremental Fit Index (IFI). These indices compare the absolute fit of the specified model to the absolute fit of the Independence model. The greater the discrepancy between the overall fit of the two models, the larger the values of these descriptive statistics. Next, it is Akaike information criterion (AIC), a test of relative model fit. As a rough rule of thumb, models having their AIC within 1-2 of the minimum have substantial support and should receive consideration in making inferences. Table 4 reports these indices for the specified model. CFI, NFI and IFI are all above 0.7 indicating a good fit. Similarly, AIC is within 2 of the minimum.

Table 4 - Model Fit

Model	CFI	NFI	IFI	AIC
Saturated model	1.000	1.000	1.000	30.000
Specified model	.736	.719	.757	44.223
Independence model	.000	.000	.000	89.042

Another popular measure of model fit that is now reported in most papers is RMSEA, an absolute measure of fit is based on the non-centrality parameter. However, the RMSEA can be misleading when the df are small and sample size is not large; this is exactly the case in our model. For this reason, Kenny et al (2011) argue to not even compute the RMSEA for such models.

To sum up, we have obtained a model that fits reasonably well (considering the limitations in the sample size) and, what is more, is theoretically consistent.

5.3 Estimates

This model has several features. First, it contains manifest (observed) variables; second, it contains both causal relationships among latent variables, represented by single-headed arrows, and correlational or bi-directional relationships among several of the residuals.

AMOS reports the unstandardised estimate, its standard error, critical ratio and p-values. Standardised estimates allow to evaluate the relative contributions of each predictor variable to each outcome variable. The standardised estimates for the fitted model appear in Table 5.

The standard measure of a critical ratio greater than 1.96 creates significance – values for all estimates are higher than that, except for the last one (PE↔PM). Likewise, p-values of estimates 1 to 5 were smaller than .05 (or .01), indicating statistical significance.

Our results indicated that hypotheses 1 to 5 (Section 3) are supported – the estimates are both positive and significant. The estimate 6 is positive, in line with the respective hypothesis, yet, it is not statistically significant. Therefore, Hypothesis 6 is not supported.

Table 5 - Regression Weights and Covariances

				Estimate	C.R.
1	PM	→	PMP	.263* (.108)	2.427
2	SA	→	PMP	.311** (.097)	3.218
3	PE	→	SA	.545* (.228)	2.389
4	PS	→	SA	.462** (.147)	3.148
5	PE	↔	PS	.178** (.060)	2.979
6	PE	↔	PM	.007 (.057)	.117

Standard error in parenthesis.   * p 0.05; ** p 0.01 (based on a Student $t_{(499)}$ distribution with one tail).
→ stands for regression; ↔ stands for covariances

6 Discussion and Conclusions

Strategic alignment has emerged as key topic in project portfolio management literature, and more globally, in the whole discipline of project management.

We find empirical support to the majority of our hypotheses. Our empirical evidence supports the claim that PPM performance is directly influenced by enhancing the foundations of project management ("doing the project right") and by strengthening the strategic alignment between projects and business strategy ("doing the right projects").

In order to achieve a higher degree of strategic alignment, two mechanisms should be designed and deployed in an organisation – initial portfolio establishment and continuous portfolio steering. These two mechanisms are found to be both contributing positively to strategic alignment. Moreover, they are mutually complementing, meaning that expertise in one mechanism reinforces that in the other.

We do not find any significant relations between the mechanism of on-going portfolio steering and foundations of project management, meaning that capabilities and expertise in these two fields are unrelated.

Perhaps the main implication is that organisations should recognise the value of PPM in achieving their strategic goals. In order to achieve it, it is reasonable to start with the development and improvement of portfolio establishment processes. It is recommended to create an integrated system or procedure involving screening, selection, and prioritising of project proposals. This also gives the portfolio manager an overview of all the project proposals and how to prioritise them according to the strategic intention, available resources, or financial benefits. Another set of procedures and methodologies should be designed and implemented for continuous portfolio steering.

Project / portfolio managers and top executives should both recognise the importance of strategy realisation through PPM in their organisation. Portfolio managers should then be given sufficient authority and autonomy for this on-going steering without unnecessary time-consuming communication with upper management level. They should be able to immediately intervene when they detect significant deviations of projects from their business case and/or strategic business priorities of the organisation.

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