A HOLISTIC STUDY OF BUSINESS PROJECT FAILURES AND THE DEVELOPMENT OF BUSINESS PROJECT MANAGEMENT DOMAIN MODEL USING UNIFIED MODELLING LANGUAGE

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FIRM-BASED INVESTIGATION INTO BUSINESS PROJECT FAILURE AND DEVELOPING BUSINESS PROJECT MANAGEMENT DOMAIN MODEL USING UML

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ABSTRACT

Despite the efforts to improve the maturity of the project management profession, the failure rate of business projects remains high. It was realized that current project management standards do not take contextual requirements into consideration and business project management really has not been addressed in totality. The purpose of this interdisciplinary study therefore, is to obtain a better understanding of the subject matter by investigating why business project fails from the organisation's perspective; and to specify the acquired knowledge in a format that facilitates future expansion and application.

Based upon the open systems model, 3 case studies were conducted to examine the moderating effect of the types of organisation structure and Project Management Information System (PMIS) support on the causal relationship between project management competency and business project success. It was found that business project success should be measured in terms of meeting both project and organisation objectives; and the essential components of business project management were identified to be (1) "Core business project management competencies"; (2) "Integrated programme management" and (3) "Integrated PMIS". It was conclusive that organisational factors do pose a significant impact in attainment of business project success in all 3 cases; and a theory that business project is likely to fail if it is not managed as an integral part of business enterprise with equal emphasis as its business-as-usual operations has been proposed. This implies that the way business project management is executed today should be reviewed; the role of IT in support of project management work should be reassessed; and a clear distinction between business project management and traditional project management should perhaps be made.

The specification of the acquired knowledge on the other hand, was achieved by developing a domain model using Unified Modelling Language (UML); based on a domain modelling approach which was devised by modifying the conceptualization step of conventional ontology engineering process. Using the theoretical framework that captures the essential business project management components as the starting point, the model was constructed in 4 steps namely (1) defining the scope of work by expanding each component in the framework using prevailing standards; (2) integrating the defined scope with reusable existing work; (3) developing; and (4) testing the UML specifications which describe both structural and behavioural aspects of the subject matter. The successful creation of the domain model and the demonstration of how it can be used directly in the development of the desired PMIS and project knowledge ontologies showed that the approach of building a common semantic foundation to support both application system modelling and ontology modelling is workable and

effective. Furthermore, since the modelling approach has built in the ability to reuse existing work, the domain model can be used as a foundation that accumulates domain knowledge progressively. This opens up a new horizon where software systems could be built based on domain model which is a direct reflection of basic research findings; and software systems in the future would compete primarily from the non-functional perspective as a result.

Keywords:
Business project management; systems theory; knowledge specification; UML; enterprise modelling.

KAJIAN HOLISTIK TENTANG KEGAGALAN PROJEK PERNIAGAAN DAN PENGHASILAN MODEL DOMAIN UNTUK PENGURUSAN PROJEK PERNIAGAAN MENGGUNAKAN UML

WONG SIAW MING

Oktober 2010

ABSTRAK

Kadar kegagalan projek perniagaan tetap tinggi walaupun pelbagai usaha telah dilakukan untuk meningkatkan kematangan profesi pengurusan projek. Adalah didapati bahawa piawaian pengurusan projek yang ada kini tidak mengambil kira keperluan kontekstual dan pengurusan projek perniagaan sebenarnya belum lagi dikaji secara menyeluruh. Oleh itu, tujuan kajian antara bidang ini adalah untuk mendapatkan pemahaman yang lebih mendalam berkenaan subjek ini dengan menyelidik mengapa projek perniagaan gagal menurut perspektif organisasi; dan untuk menspesifikasikan pengetahuan yang diperolehi dalam format yang memudahkan aplikasi dan pengembangan selanjutnya.

Berdasarkan Model Sistem Terbuka, 3 kajian kes telah dijalankan untuk menyelidik pengaruh moderasi struktur organisasi dan sokongan Sistem Maklumat Pengurusan Projek (SMPP) terhadap hubungan kausal antara kompetensi pengurusan projek dan kejayaan projek perniaagan. Hasil kajian mendapati bahawa kejayaan projek perniagaan harus diukur dari segi pencapaian matlamat projek serta matlamat organisasi. Hasil kajian juga telah mengenalpasti komponen-komponen penting dalam pengurusan projek perniagaan adalah (1) "Kompetensi pengurusan projek perniagaan utama"; (2) "Pengurusan program bersepadu"; dan (3) " SMPP bersepadu". Kesimpulan kajian adalah faktor organisasi memang menimbulkan kesan yang penting dalam pencapaian kejayaan projek perniagaan dalam ketiga-tiga kes; dan mencadangkan sebuah teori bahawa projek perniagaan mungkin akan gagal jika ia tidak diuruskan sebagai sebahagian bersepadu dalam organisasi dan diberikan perhatian yang sama dengan operasi perniagaan harian. Ini bermakna cara pengendalian pengurusan projek perniagaan hari ini harus dikemas kini; peranan IT dalam menyokong pengurusan projek perniagaan perlu disemak semula; dan perbezaan jelas antara pengurusan projek perniagaan dan pengurusan projek tradisional mungkin perlu dilakukan.

Spesifikasi pengetahuan baru tentang pengurusan projek perniagaan ini pula, telah dicapai dengan menghasilkan sebuah model domain dalam format UML; dengan menggunakan pendekatan model domain yang diubahsuai dari langkah konseptualiasasi dalam proses kejuruteraan ontologi konvensional. Dengan menggunakan rangka teori yang merangkumi komponen-komponen penting pengurusan projek perniagaan sebagai permulaan, model ini dibina dalam 4 langkah iaitu (1) menetapkan skop kerja dengan mengembangkan setiap komponen di dalam rangka teori dengan menggunakan piawaian lazim; (2) menyepadukan skop kerja dengan kerja sedia ada yang boleh digunakan semula; (3) membina; dan (4) menguji spesifikasi UML yang menerangkan subjek kajian dari aspek struktur dan juga kelakuan. Kejayaan penghasilan model

domain ini dan demonstrasi bagaimana ia dapat digunakan secara langsung di dalam pembinaan SMPP yang diingini dan ontologi pengetahuan projek menunjukkan bahawa kaedah membina dasar semantik umum untuk menyokong kedua-dua pemodelan sistem dan pemodelan ontologi boleh dilaksanakan dan berkesan. Selain daripada itu, memandangkan pendekatan model domain ini berkemampuan menggunakan semula kerja sedia ada, model domain ini juga boleh dipakai sebagai asas untuk mengumpul pengetahuan domain secara progresif. Ini membuka suatu dimensi baru di mana sistem perisian boleh dibina berdasarkan model domain yang mengambarkan penemuan penyelidikan asas. Sebagai hasilnya, sistem perisian di masa depan dijangka akan bersaing dari segi perspektif bukan-fungsian.

Kata Kunci:
Pengurusan projek perniagaan; teori sistem; spesifikasi pengetahuan; UML; pemodelan syarikat.

ANALYSE DES CAUSES D'ECHEC DES PROJETS D'AFFAIRES A PARTIR D'ETUDES DE CAS EN ENTERPRISES, ET PROPOSITION D'UN MODELE DE DOMAINE EN LANGAGE UML

WONG SIAW MING

Octobre 2010

RÉSUMÉ

En dépit des efforts destinés à accroitre la maturité de la profession dans le domaine de la gestion de projet, le taux d'échec des projets d'affaires (par opposition aux projets techniques) reste élevé. On s'est aperçu que les standards actuels en matière de gestion de projet ne prenaient pas en compte les contraintes liées au contexte d'exécution des projets, et que de ce fait, la gestion de projets d'affaires n'avait pas été étudiée en profondeur. L'objectif de ce travail de recherche transdisciplinaire est donc d'abord d'obtenir une meilleure compréhension du sujet en essayant de comprendre pourquoi l'échec d'un projet d'affaires est considéré comme un échec du point de vue de l'organisation, puis de formaliser la connaissance acquise dans un format qui permette par la suite de l'enrichir et de l'appliquer.

En nous appuyant sur le modèle des systèmes ouverts, trois études de cas ont été conduites, avec pour objectif d'étudier l'effet modérateur des différents types de structures des organisations et des systèmes d'information pour la gestion de projet sur la relation causale entre la compétence en gestion de projet et le succès des projets d'affaires. Il résulte de ce travail que le succès des projets d'affaires devrait être mesuré en termes de réalisation des objectifs du projet mais aussi de l'organisation. Ce travail a également permis d'identifier les composants essentiels de la gestion de projets d'affaires : (1) "Compétences de base pour la gestion de projet "; (2) "Gestion intégrée de programme" et (3) "Système d'information intégré pour la gestion de projet". Dans les trois études de cas, il apparait également de manière déterminante que les facteurs d'ordre organisationnel ont un impact significatif sur la réussite du projet. Une théorie est proposée, qui postule qu'un projet d'affaires a de grandes chances d'échouer s'il n'est pas géré comme une partie intégrante de l'entreprise, en le traitant comme une opération courante au sein de l'entreprise. Cela signifie que la manière dont les projets d'affaires sont gérés aujourd'hui devrait être revue. Le rôle de l'informatique dans l'assistance à la gestion de ces projets devrait également être revu. Et il faudrait sans doute aussi faire une plus grande différence entre les projets d'affaires et les projets « traditionnels » plus techniques.

D'autre part, la formalisation de la connaissance acquise au cours de ces études de cas a été effectuée en développant un modèle de domaine à l'aide du langage de modélisation UML. Et l'approche de modélisation du domaine a été élaborée en modifiant l'étape de conceptualisation dans le processus traditionnel d'ingénierie d'ontologie. En prenant comme point de départ le cadre théorique qui prend en compte l'essentiel des composants de la gestion de projets d'affaires, le modèle a été construit en quatre étapes : (1) définition de la portée du travail en développant chaque composant à partir

des normes en vigueur ; (2) intégration de ces développements en réutilisant les travaux réalisés et proposés par d'autres chercheurs ; (3) développement et (4) évaluation des spécifications UML décrivant aussi bien les aspects structurels que dynamiques du sujet traité. Le fait d'avoir réussi à développer un modèle du domaine et à montrer de quelle manière il pouvait être mis en œuvre directement pour développer un système d'information pour la gestion de projet ainsi que des ontologies portant sur les connaissances liées à la gestion de projet a montré que l'approche consistant à construire une base sémantique commune permettant de travailler à la modélisation de systèmes applicatifs et d'ontologies est à la fois réalisable et valide. De plus, le modèle de domaine proposé peut servir de socle permettant d'accumuler progressivement la connaissance du domaine, dans la mesure où l'approche de modélisation a pris en compte la possibilité d'intégrer des travaux et propositions antérieurs. Ce résultat ouvre de nouvelles perspectives de développement de logiciels s'appuyant sur un modèle de domaine qui est directement issu de travaux de recherche. Et de ce fait, ces logiciels pourront à l'avenir être utilisés dans une perspective non fonctionnelle.

Mots-clés:
Gestion de projets d'affaire; théorie des systèmes; spécification de connaissance; UML; modélisation d'entreprise.

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CHAPTER 1

INTRODUCTION

Project can be defined as a temporary endeavour undertaken to achieve specific objective(s), given limited time and resources. Since the project duration has a definite beginning and end, its existence is expected to be temporary. There may be other similar definitions but most of them are conceptually equivalent to the above despite the differences in phrasing (GAPPS, 2007).

From a narrow technical speciality of delivering unique product and/or services to external clients by the project based industries such as engineering and constructions, project has since evolved into a mechanism deployed by business enterprises to effect internal changes and used as a template for operational and strategic redesign (Cicmil, 1997). It is also evident that it is playing an increasingly important role in the organisation. As reported by PriceWaterhouseCoopers (PWC)'s cross sectors survey, 200 companies from 30 countries are running a total of 10,640 projects a year worth in excess of US $4.5 billion (Maylor et al, 2006).

The temporary nature of projects stands in contrast to business as usual (or operations) which are routine, repetitive and functional in nature. Thus in practice, it is acknowledged that project management requires distinct technical skills and as a result, the demand for certified project managers has been on the rise over the last decade. These certifications can be obtained through project management professional bodies all

around the world which include international bodies such as the Association of Advancement of Cost Engineering (AACE), International Project Management Association (IPMA), Project Management Institute (PMI), International Association of Project and Programme Management (IAPPM); as well as country-specific associations such as Australia Institute of Project Management (AIPM), Project Management Association of Japan (PMAJ) and Association of Project Management (APM) of United Kingdom.

Given AACE's emphasis in cost engineering, the European-based IPMA is technically the oldest project management professional organisation. US based PMI on the other hand, has the widest reach with close to half a million members worldwide (see Appendix C for details). Each of these professional bodies has their own version of project management standards and/or framework based on which the certifications are conferred. The more internationally acclaimed certifications are IPMA's certification based on IPMA Competency Baseline standards (ICB, 2006); PMI's PMP certification based on Project Management Body Of Knowledge (PMBOK Guide, 2008); and IAPPM's CPM examination based on the Certified Project and Program Management Guide (CPPM Guide, 2007). Amongst the national standards, "PRojects IN Controlled Environments" version 2.0 (PRINCE2, 2003) introduced by the Office of Government Commerce (OGC) has also managed to gain some ground due primarily to the worldwide presence of UK based multinational companies. Consequently, the practice of project management in the industry is largely influenced by these international standards.

Most of these project management standards are similar in nature and differ only in terms of focus, coverage and approach. PRINCE for example, was first developed by the UK government as a standard for IT project management. PRINCE2 is the second version of this process-based approach for project management which can be tailored for the management of all types of projects. PMI's PMBOK on the other hand, is a standard accepted by ANSI and IEEE which describes the sum of knowledge within the profession of project management. It expects the practitioners and academics to apply and advance it upon possession of this body of knowledge, as with the other professions such as law, medicine and accounting. The focus of PMBOK is the 9 Knowledge Areas (KAs) which refer to the key competencies required to manage any project namely 'Project Integration Management', 'Project Scope Management', 'Project Time Management', 'Project Quality Management', 'Project Communication Management', 'Project Cost Management', 'Project Human Resources Management', 'Project Procurement Management' and 'Project Risk Management'. Thus in comparison, the life-cycle based PRINCE2 standard is more of an implementation methodology providing guidance on how to run a particular project (Wideman, 2002), whilst PMBOK imparts project management knowledge as a complete discipline.

In addition to establishing project management standards, these project management professional bodies and associations actively promote further development in the field through publication of journals and hosting of conference to facilitate exchange of ideas. The notable ones are IPMA's International Journal of Project Management (IJPM) which is published eight times a year in collaboration with Elservier; and PMI's Project Management Journal (PMJ) which is a peer-refereed academic and research quarterly. In terms of conferences, IPMA organizes global congress annually to offer a platform

for discussions among practitioners and academia; whilst PMI hosts biennially research and education conference to provide the opportunity to present and discuss new project management research findings and teaching methods. These new ideas, findings and way of practice in turn, become key inputs to the new releases of the project management standards. As such, project management standard can be viewed as a consolidated form of project management knowledge.

1.1 Problem Statement

Despite the availability of comprehensive standards and the continued efforts in developing the field, business project failure rate is still unacceptably high. Based on the survey conducted by PIPC (a global project management specialist firm), one in three projects fails to deliver on time or within budget; and 60% fails to deliver the benefits as set out in business case (PIPC, 2004). Standish Group's 3rd Quarter 2004 Research on the IT industry indicated that 18% of all surveyed projects have failed i.e. cancelled prior to completion or delivered and never used; while 53% are challenged i.e. late, over budget and/or with less than the required features and functions (Dinsmore, 2006). Evidently, the current emphasis on the qualifications and competency dimension of the project managers alone is insufficient. Furthermore, the call for a project manager to be proficient in all 9 knowledge areas as specified by PMBOK is difficult to achieve in reality.

It is noted that most project management standards do acknowledge that project management effectiveness can be affected by elements and conditions in the operating environment. PMBOK for example, refers to them as "Project Management Context" which comprises project stakeholders, organisational systems, culture, styles and

structure. But since the targeted audiences of the standards are project managers at large and in support of project management as an independent discipline, not much interest has been placed on incorporating context-specific requirements into the standard project management practices and processes. From this perspective, none of the general standards today are found to have adequately addressed the subject of "managing business projects" with due considerations to the influencing organisational factors and their collective effects on the attainment of business project success.

In view of the above, the investigation into why business project fails must look beyond the project boundary into the organisational settings for answers; and there is a need to consolidate the understanding of what comprises an effective business project management.

In addition, research have shown that while theoretical developments typically lag behind practical innovations, the mismatch between theories and practice could also be attributed to practice lagging behind theories developed by academic research (Bryde, 2003b). This gap is currently filled by the project management standards and research literatures that reach out to the industry. In either case, the knowledge is expressed in the form of natural language descriptions which are subject to individual's comprehension, and application of which may or may not yield results. Therefore it is also important that the acquired knowledge about business project management is represented in a manner where it could be easily incorporated into potential solutions that could be implemented systematically by the industry. At the same time, this new form of knowledge representation is expected to maintain the ability to assimilate new ideas and research findings as in the case of project management standards. In order to

meet these requirements, the expression of knowledge must be unambiguous in order to prevent misinterpretation and ideally, in a machine readable form so that it can be used directly in the development of software solution(s).

1.2 Research Objectives

In view of the problem statement, the objectives of the research are:

1) To obtain a better understanding of business project management by investigating why business projects continue to fail based on a more holistic approach, i.e. from the organisation's perspective.

2) To develop a more explicit specification of the new gained insight of business project management in order to facilitate future expansion and applications.

1.3 Research Questions

In relation to the research objectives, this research aims at addressing the following research questions:

1) Despite the continued effort to improve project management effectiveness, why do business projects continue to fail?

2) What are the organisational factors which must be taken into consideration in the context of business projects?

3) To what extent do these organisation factors affect the relationship between project management effectiveness and business project success?

4) What are the essential components of business project management that must be in place in order to ensure business project success?

5) What is the most suitable format to represent the business project management knowledge where it can be expanded in the future as well as immediately usable in the potential solutioning?

6) How can the business project management knowledge be effectively captured into the desired format?

1.4 Significance of the Study

The research question of why project fails has always been approached from a project perspective and the outcome is a long list of critical success factors. Given a more complete understanding of business project management as a result of adopting a macro view and considering the effect of organisation factors on standard project management practice, a more condensed explanation in a form of a theory could be offered. This will be the first theory ever developed to guide the practice of business project management; and it is hoped that this empirical research will spin off a new direction of studying business project management as a subject matter in its own right.

The delivery of a more explicit form of business project management knowledge on the other hand, provides project management practitioners and solution developers with a

concise reference of the subject matter to guide their work. In addition, since the resulting specification will be in machine readable format, it can be fed directly into the engineering of technical solutions without any lost in translation or interpretation. As a result, the developed system would be of better quality and the time required for its development would be significantly reduced.

By addressing the gap in the body of knowledge and expediting practical implementation as described above, it is anticipated that more business projects would be successful in drawing their expected returns from the project investments.

Last but not least, the devised method of representing knowledge in a more precise manner could potentially be applied to other areas of business management, clearing the path for similar inter-disciplinary studies between social science and computer science in the future.

1.5 Scope of the Study

The key subjects of interest are (1) management of business projects; and (2) knowledge specification format and techniques. To prevent the study from losing focus especially since project management is an integration of various management theories (Koskela & Howell, 2002), the research examines the application of management concepts in the context of project management but does not drill into the fundamentals of these management concepts. Similarly, the research reviews the existing work in the knowledge representation regime to exploit its application in this research and does not go into highly technical discussions.

1.6 Definition of Terms

Two key terms which are used throughout this thesis are defined as follows:

1) "Business project management" refers to the management of business projects. In order for long sentences to be more readable, it may at times be replaced with the short form "BProjM".

2) "Business projects" refer to organisational change projects (Cicmil, 1999). For this research, this definition has been refined to refer to non-standard, cross-functional in-house initiatives that aim at effecting internal changes. These initiatives are expected to lead directly or indirectly to the improvement in organisation performance, nature of which could belong to either one or more of the four quadrants in the balance scorecard namely financials, customer, business process, learning and growth (Kaplan & Norton, 1992). Some examples of business projects in this context are:

   a) Organisation-wide transformation endeavour to improve profitability, reduce cost, uplift quality of customer services, upgrade organisation learning capability and infrastructure, improve work processes in order to increase work productivity and operational efficiency.

   b) Information Technology (IT) initiative to integrate business data and processes across the organisation for better visibility on overall business performance which in turn, enables timely decision making.

1.7 Organisation of the Thesis

Due to its inter-disciplinary nature, this thesis is organized in such a way that all the key components are presented as a separate chapter:

1) Introduction – this chapter introduces the problem under investigation and sets the scene for the research by stating the research objectives and the research questions.

2) Literature Review – this chapter reviews the current state of related research in project management and knowledge specifications; identifies the key concepts that must be examined further and concludes on the desired specification format to capture the BProjM knowledge.

3) Conceptual Framework and Hypotheses – this chapter develops the conceptual framework based on the identified key concepts and lists the hypotheses to be tested by the research.

4) Methodology – this chapter describes how the research is carried out namely by conducting case studies for the firm-based investigations into why business project fails; and by deploying a proposed domain modelling approach that translates the acquired knowledge into the BProjM domain model.

5) Case Study Summary – this chapter provides a summary of each case study and presents the findings in relation to each variable in the conceptual framework.

6) Case Study Findings and Discussions – this chapter discusses and analyzes the findings of the case studies, identifies the essential business project management components, develops the business project management theory and presents the findings in a form of a theoretical framework.

7) Developing the domain model - this chapter describes how the BProjM domain model is developed by expanding on the domain modelling approach specified in chapter 4 and discusses the main findings.

8) Using the domain model – this chapters describes how the resulting BProjM domain model can be used to develop potential solutions that improve the chances of business project success.

9) Conclusions – this chapter summarizes the research, presents the conclusions, discusses the implications and recommends next steps.

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