Leadership competency profiles of successful project managers

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Abstract

This study examines the leadership competency profiles of successful project managers in different types of projects. Four hundred responses to the Leadership Development Questionnaire (LDQ) were used to profile the intellectual, managerial and emotional competences (IQ, MQ and EQ, respectively) of project managers of successful projects. Differences by project type were accounted for through categorization of projects by their application type (engineering & construction, information & telecommunication technology, organizational change), complexity, importance and contract type. Results indicate high expressions of one IQ sub-dimension (i.e. critical thinking) and three EQ sub-dimensions (i.e. influence, motivation and conscientiousness) in successful managers in all types of projects. Other sub-dimensions varied by project type. Comparison was made to existing profiles for goal oriented, involving and engaging leadership styles. Implications derived are the need for practitioners to be trained in the soft factors of leadership, particular for their types of projects. Theoretical implications include the need for more transactional styles in relatively simple projects and more transformational leadership styles in complex projects.
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1. Introduction

Managers are more likely to perform better or to stay longer in their position if their personal characteristics meet the requirements of the position (Mumford et al., 2000). A popular way to identify these characteristics is by profiling the personalities of successful managers.

Profiling provides the idiosyncratic combination of behavioral, temperamental, emotional and mental attributes of a leader, in order to derive a person's particular leadership style. Profiles are often used to relate the profile dimensions to success or failure in a person's leadership position, or alternatively select or develop managers from the match between existing profiles of successful mangers and those of candidates for appointment to management

positions. We conducted the present study to identify the leadership profiles of successful managers of projects of different type, which can then be used in the way described above.

Profiling has been popular for leadership roles in political science, to predict presidents' performance over time, such as Simonton's (2006) profiling of 42 US Presidents to forecast George W. Bush's leadership performance, or Immelman's (1998) comparison of Bill Clinton and Bob Dole. Other profiling focuses on individuals, such as Steinberg's (2005) profile of Indira Ghandi or Kunich and Lester's (1994) profile of the Swedish senator Raoul Wallenberg.

Some studies profile cultural differences, such as Kowske and Anthony (2007) profiling mid-level managers in twelve countries, or the Globe study with its attempt to profile managers in particular regions (Javidan et al., 2006). Others profile leadership differences by gender (e.g. Robinson and Lipman-Blumen, 2003). Yet others profile mangers by geographical region (Hetland and Sandal,

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2003), industry (e.g. Egri and Herman, 2000 for the North American environment sector) or role in a company, such as Dahlgaard et al. (1997) study on leaders in Total Quality Management (TQM).

Throughout these studies a variety of dimensions were used for measuring and assessing correlations of leadership dimensions with performance indicators, and profiling of leaders and their leadership styles. Reference to particular leadership theories is infrequently done. However, if done, then transformational leadership style appears to be the dominant theoretical perspective.

1.1. Leadership theories

Reviewing the leadership theories of the last 80 years shows that early theories started from a focus on the individual leader and his or her traits. Subsequently leadership theory developed:

(a) First by taking into account the context of the leadership situation.
(b) Then by shifting focus from the observable behavior of personal attributes to the intellectual exchange and interpersonal relationships.

Several authors present this development as stages of Schools of Leadership (Partington, 2007; Turner and Müller, 2005). Historically they started in the 1930–1940s, by focusing on leaders' traits, such as their physical appearance, capabilities and personalities. These studies are often categorized as the *trait school* of leadership. Representatives of this school in recent times include Kirkpatrick and Locke (1991) for general leadership, as well as Turner (1999) for leadership in project management. The 1940s brought the *behavior school* of studies, which emphasized the styles adopted by leaders for their particular leadership task. The new underlying assumption of this school was that leadership can be learned, and is not a trait people are born with. The popular 2×2 matrices by Blake and Mouton (1978) or Hersey and Blanchard (1988) are among the representative models of that school. They emphasized leadership differences in concern for people versus concern for production. In the 1960s the *contingency school* was developed, which was concerned with the appropriateness of different leadership styles in different leadership situations by matching the personal characteristics of a leader to the leadership situation. Representative for this school is, for example Robbins' (1997) with the four styles of directive, supportive, participative and achievement oriented leadership, contingent on the personality of the person being led and the situational ambiguity. The *visionary and charismatic* school came in the 1980s, developed with a focus on organizational change. Representative of that school is the distinction between transformational and transactional leadership styles (Bass 1990). Here the former emphasizes follower rewards contingent on meeting specified performance targets, while the latter emphasizes the

development of visions, presence of charisma, respect and trust. Following this move towards ever more soft factors in leadership the *emotional intelligence school* emerged shortly before the year 2000. This school focuses on self management and interaction management. Daniel Goleman (1995) as the most prominent representative of this school hypothesized that emotional capabilities are more important for leadership than intellectual capabilities. Together with Boyatzis and McKee (2002) he identified six leadership styles, namely visionary, coaching, affiliative, democratic, pacesetting, and commanding. This order of styles moves from very democratic via supportive to authoritative. Pacesetting and commanding is only suggested in cases of emergency, because of their inherent thread for long-term relationship between leader and follower (Goleman et al., 2002). Most recently the *competence school* emerged, which encompasses all the earlier schools. Competence is hereby meant as a specific combination of knowledge, skills and personal characteristics (Boyatzis, 1982; Crawford, 2003). Representative for that school are Dulewicz and Higgs (2005) who did an extensive review of existing theories and their assessment tools, and identified 15 leadership dimensions, which they then clustered under three competences of intellectual (IQ), emotional (EQ) and managerial (MQ). These dimensions are listed in Table 1 and described in the Appendix A.

Using these 15 dimensions they identified three leadership profiles for organizational change projects (Table 1), which they call goal oriented, involving and engaging, and which are appropriate depending on the level of change to be achieved within an organization (p. 114):

Table 1
Fifteen leadership competencies and three styles of leadership after Dulewicz and Higgs (2003).

Group	Competency	Goal oriented	Involving	Engaging
Intellectual (IQ)	1. Critical analysis & judgment	High	Medium	Medium
	2. Vision and imagination	High	High	Medium
	3. Strategic perspective	High	Medium	Medium
Managerial (MQ)	4. Engaging communication	Medium	Medium	High
	5. Managing resources	High	Medium	Low
	6. Empowering	Low	Medium	High
	7. Developing	Medium	Medium	High
	8. Achieving	High	Medium	Medium
Emotional (EQ)	9. Self-awareness	Medium	High	High
	10. Emotional resilience	High	High	High
	11. Motivation	High	High	High
	12. Sensitivity	Medium	Medium	High
	13. Influence	Medium	High	High
	14. Intuitiveness	Medium	Medium	High
	15. Conscientiousness	High	High	High

- *Engaging* being a style based on empowerment and involvement in highly transformational context. This leadership style is focused on producing radical change through engagement and commitment.
- *Involving* being a style for transitional organizations which face significant, but not necessarily radical change of their business model or way of work.
- *Goal oriented* being a style focused on delivery of clearly understood results in a relatively stable context.

If different leadership styles are appropriate in organizational change projects, then we should expect it to be the same for other types of projects (Müller and Turner, 2007). This study extends the work of Dulewicz and Higgs (2005) by going beyond organizational change projects and defining leadership profiles also for engineering & construction projects, as well as information & telecommunication technology projects. Through that a framework of leadership profiles of successful project managers is developed, which serves as a template for the development of project managers in their particular type of projects. With the competence school originating from research in permanent organizations, the present paper also attempts to assess which leadership profile comes closest to leadership in projects.

That leads to our research question:

What leadership competency profiles are exhibited by the project managers of successful projects of different type?

1.2. Leadership in projects

Traditionally project management is understood as using the right tools and techniques for being successful, regardless of a project manager's match of personality with project type (PMI, 2004). This is contrary to the results of the studies mentioned earlier and the chronological development of leadership theories. Parts of the project management literature used the well known team roles tests like Myers-Briggs (Briggs-Myers, 1987), or Belbin (1986), etc. as measures of leadership. However, these measures are not leadership measures in terms of project managers' leadership capabilities. Research has shown that these tests are only weakly related to leadership performance (Dulewicz and Higgs, 2003; Higgs, 2001). This group of literature was therefore excluded.

Earlier investigations on project managers' leadership were done using case studies. Holt (1989) mapped the leadership principles of Peters and Waterman's (1982) "In search of Excellence" against leadership attributes identified through interviews and found that some, but not all of the principles are required for leadership in projects. Another case study used the Blake and Mouton (1978) grid to identify low task and high relationship attitude as appropriate leadership style in Asia (Walker and Kalinowski, 1994). The importance of vision for leadership was outlined by Christenson and Walker (2004), and the importance of creating a supportive environment was shown by Thamhain (2004). The importance of transformational leadership style for project managers was shown by Prabhakar (2005). Along the same line of research Keegan and den Hartog (2004) hypothesized a dominance of transformational leadership style among project managers, but could not statistically proof it.

Research on matching project managers to project types includes Hauschildt et al. (2000) study which categorized project managers as either project star, promising newcomer, focused creative expert, uncreative decision-maker, or thick-skinned pragmatist. For each of these categories they showed the fit to particular combinations of large or small project budgets, high or low project priority, extent of information access and provision, need for technology skills, and level of participation in goal formation. By looking at the construction industry only, Dainty et al. (2004) developed a competency-based framework for performance in projects. Their results reveal some of the variables also found in the competency school of leadership, such as achievement orientation, analytical thinking, as well as impact and influence. It is only recently that the project management literature has acknowledged that projects different from the construction industry may require different approaches to their management, and that both the project management procedures used (Crawford et al., 2005), and the project manager's competence should be selected to meet the needs of the particular type of project. Examples include Turner and Müller (2006) who showed the correlation of specific leadership dimension of the competency school with project success in different types of projects. A number of studies based on the competence school and using the Leadership Development Questionnaire (LDQ) showed the particular leadership competences that relate with success in leadership in general, for example, at the Royal Airforce (Wren and Dulewicz, 2005), the Royal Navy (Young and Dulewicz, 2006), the British Police (Hawkins and Dulewicz, 2007), and in project management in particular, for example, in agile projects (Porthouse and Dulewicz, 2007) or projects in the financial industry (Geoghegan and Dulewicz, 2008). Common across all these studies is that different leadership competences relate to leadership success in different contents. These findings are supported by studies which showed the general importance for emotional competences in projects, such as Dvir et al. (2006). Most recently Turner et al. (2009) compared the leadership profiles of line managers and project managers and identified an even stronger relationship between emotional competences and success in line managers than in project managers. This is line with Goleman's theory that higher levels in the organizational hierarchy require higher levels of EQ.

The late acknowledgement of leadership in the project management literature is in stark contrast to the general leadership literature, where for almost 80 years people have tried to identify the traits, behaviors or competencies of leaders, and to determine which traits, behaviors or compe-

tencies are required in different circumstances for leaders to be successful. But what constitutes success in projects?

1.3. Project success

Project success is not a fixed target. Jugdev and Müller (2005) reviewed our changing understanding of what constitutes project success. In the 1980s there was a heavy focus on the use of the correct tools and techniques. In a classic and still widely quoted paper, Pinto and Slevin (1988) listed what they found as the ten most important factors for project success, regardless of project type. In accordance with the understanding of project management by that time, the list did not include the project manager's competence or fit to the project. Wateridge (1995) did suggest that in deciding how to manage their projects, project managers should first identify the important success criteria for their projects, and then identify success factors that will help them deliver those criteria, and then choose tools and techniques associated with those factors. One of the most significant pieces of work from the current decade was developed by Cooke-Davies (2002) who differentiated between project success and project management success, with the former relating to the achievement of planned business results using the project's outcome (typically a new product or service) and the latter to the achievement of time, cost, quality or other goals set for the management of the project. However, the factors identified through the study did not include the project manager's competence, focusing instead on risk management, program and portfolio management and benefits management, and again the one list was offered as being appropriate for all projects.

Müller and Turner (2007) identified the correlations between success and project managers' leadership competences, using the LDQ and a composite measure of project success. Ten different success criteria measured on 7 point Likert scales were used to assess project managers' level of achievement in their projects. The criteria are shown in Table 2.

1.4. Project types

Several project classification systems exist, such as those by Shenhar (2001) or Turner and Cochrane (1993). They classify projects in 2×2 or 3×3 matrices along dimensions of increasing technical uncertainty and project scope (Shenhar) or increasing understanding of the projects goals and methods needed to achieve these goals (Turner and Cochrane). Recently a comprehensive study on project categorization systems was done by Crawford et al. (2005). They categorized projects by their attributes, and defined project types by each attribute type. Their list of possible categorizations is almost infinite, however, some categories are more often found than others. They are listed in Table 3. In their study they suggested that different project management procedures, competency profiles and leadership styles might be appropriate for different types of project.

Table 2
Success criteria used for this study.

Success criteria
End-user satisfaction with the project's product or service
Suppliers' satisfaction
Project team's satisfaction
Other stakeholders' satisfaction
Meeting project's overall performance (functionality, budget and timing)
Meeting user requirements
Meeting the project's purpose
Client satisfaction with the project results
Reoccurring business with the client
Meeting the respondent's self-defined success factor

Table 3
Model of project categorization used in this study.

Project attribute	Project types by attribute
Application area	Organizational change
	Information & telecommunication technology
	Engineering & construction
Complexity	High
	Medium
	Low
Strategic importance	Mandatory
	Repositioning
	Renewal
Contract type	Fixed price
	Remeasurement
	Alliance

The aim with the present study is to develop suitable leadership profiles for the managers of different types of projects, similar to those derived by Dulewicz and Higgs (2005) for different levels of organizational change. In particular, we aim to

- Identify the *extent* different leadership competencies are present in project managers in successful projects of different type.
- Develop project manager leadership competencies profiles related to successful projects.

We derived the following hypothesis from the literature reviewed:

H₁. *There are differences in project manager leadership competency profiles in successful projects of different type.*

In the following sections we describe the methodology used, the analysis done on the data, and then we discuss the results and provide conclusions.

2. Methodology

In order to develop leadership profiles of successful project managers in different types of projects we adopted the competency school perspective as the currently most

advanced understanding of leadership. The concepts were operationalized for

- *Leadership profiles:* by use of the Leadership Development Questionnaire (LDQ). This assessment tool for the competency school of leadership is frequently used in recent studies on leadership in project management (e.g. by Geoghegan and Dulewicz (2008), Müller and Turner (2007), Turner et al. (2009), Young and Dulewicz (2006), Wren and Dulewicz (2005)).
- *Success:* by use of the 10 dimensional project success measure (Table 2) developed by Turner and Müller (2005), based on the Project Excellence Model (Westerveld, 2003).
- *Project types:* by use of the Crawford et al. (2005) categorization system, limited to the most often used categories (Table 3).

2.1. Questions

We used two questionnaires, each with two sets of questions. The first questionnaire asked the respondent to judge on their last project's success and identify the project's type.

2.1.1. Project success

We asked the respondents to judge the success of their last project against the ten dimensions (Table 2) on a five point Likert scale from *disagree* to *agree*. From this we determined a composite measure of the success of that project.

2.1.2. Project type

We asked the respondents to categorize their last project using the four attribute areas and twelve project types in Table 3. Respondents could categorize their project against several attribute area, but choose only one project type in each area.

The second questionnaire was the LDQ developed by Dulewicz and Higgs (2005), which assessed the respondents' leadership style and gathered demographic data:

2.1.3. Leadership questions

This questionnaire contained 189 questions on the fifteen competency dimensions shown in Table 1. A five point Likert scale from *never* to *always* was used to identify respondents' behavior in respect to the fifteen competency dimensions, and its organizational context.

2.1.4. Demographic questions

We also asked the respondents about their job function, level of education, nationality, age, and gender.

2.2. Respondents

A worldwide, web-based questionnaire was used to collect data. To ensure quality in responses, the aim was to make the questionnaire global, sending it to professionals in project management worldwide. Members of professional organizations in project management were targeted. An introductory email, together with a web-link to the online questionnaire was sent to Presidents of the PMI® (Project Management Institute) Chapters and Special Interest Groups, and to all country representatives of IPMA (International Project Management Association) and the Presidents of APM (Association of Project Management) and ASAPM (American Society for the Advancement of Project Management). They were asked to forward the questionnaire to their members. The questionnaire was also sent to masters students on project management programs at universities in the UK, Ireland, Australia, New Zealand, the US and Canada. Altogether 400 usable responses were obtained. A conventional response rate can not be calculated due to the snowball approach to sampling.

The sample demographics showed 65% were male and 34% female (1% did not answer the question); 21% were from Europe, 56% from North America, 12% from Australia/New Zealand, and 12% from other parts of the world. Age distribution showed that 12% were 35 years old or younger, 14% between 36 and 40, 21% between 41 and 45, 23% between 46 and 50, 15% between 51 and 55, 14% older than 55 years. Sixty-seven percent worked in the private sector, 28% in the public sector, and 5% in not-for-profit organizations. Occupation distribution showed that 43% worked in a technical job role, 18% in general management, 6% in R&D, 5% in marketing, Human Resources, or Finance, and 5% in manufacturing, 21% worked in other roles. Educationally, 38% had a professional qualification, 32% a higher degree, 24% a first degree, and the remaining 16% a different education.

The validity of the LDQ as assessment tool was repeatedly shown, for example in Dulewicz and Higgs (2004, 2005). Minimization of mono-source bias, due to self rated performance, was addressed in several ways, through a variation of Podsakoff et al. (2003) suggestions. The introductory text confirmed anonymity of the respondents and that there are no right or wrong answers. Two different surveys with different layout and scales were used. The first survey resided on a server in Sweden and asked for project characteristics and success, the second survey (LDQ) resided on a server in the UK and assessed the leadership competencies of the respondent. An unrotated factor analysis of the 15 leadership competencies variables and the ten success variables showed that leadership variables loaded on the first factor and success measures on the second factor (at cutoff = .5), except for *Intuitiveness* (a leadership competency) and the success measure *Reoccurring Business*, which both loaded on their own factor, see Table 4. Mono source bias was therefore assumed not to be an issue.

3. Analysis

We selected the best performing projects to identify the leadership competencies of the most successful project

Table 4
Unrotated factor analysis.

	Component matrix[a] Component				
	1	2	3	4	5
MQ-managing resources	**0.818**	−0.182	−0.024	−0.005	−0.044
IQ-critical analysis	**0.782**	−0.246	0.076	−0.116	0.163
MQ-communication	**0.767**	−0.213	0.035	−0.028	−0.062
IQ-strategic perspective	**0.755**	−0.289	0.177	−0.098	0.220
MQ-empowerment	**0.753**	−0.217	0.096	−0.266	0.047
EQ-self-awareness	**0.722**	−0.259	−0.272	0.179	−0.229
EQ-sensitivity	**0.722**	−0.144	−0.031	−0.229	0.243
IQ-vision	**0.702**	−0.294	0.175	0.069	0.042
MQ-developing	**0.696**	−0.302	0.090	−0.019	−0.030
EQ-motivation	**0.673**	−0.235	−0.145	0.133	−0.201
EQ-conscientiousness	**0.667**	−0.198	0.031	−0.234	0.141
EQ-influence	**0.647**	−0.131	−0.191	0.322	−0.376
EQ-emotional resilience	**0.613**	−0.237	−0.461	0.154	−0.228
MQ-achieving	**0.584**	−0.316	0.321	0.053	0.185
Projres_customer satisfaction	0.428	**0.697**	0.110	0.246	0.014
Projres_achieving purpose	0.382	**0.684**	0.045	0.087	0.142
Projres_achieving user requirement	0.447	**0.681**	0.072	0.005	−0.072
Projres_enduser satisfaction	0.422	**0.644**	−0.084	0.028	−0.051
Projres_team satisfaction	0.333	**0.611**	0.138	−0.325	−0.228
Projres_overal results (time, cost, quality)	0.350	**0.601**	0.254	−0.025	−0.077
Projres_stakeholder satisfaction	0.461	**0.565**	−0.047	−0.262	−0.228
Projres_self defined criterion	0.466	**0.539**	0.202	0.123	−0.071
Projres_suplier satisfaction	0.340	**0.411**	−0.363	−0.002	0.384
EQ-intuition	0.079	−0.139	**0.540**	**0.670**	0.056
Projres_reoccurring business	0.296	0.363	−0.446	0.340	**0.508**

Extraction method: principal component analysis.
[a] Five components extracted.

managers. For that we first calculated a performance level by project, which was the mean of the ten success questions. The top, average, and low performing projects were found by dividing the sample at the top 30% ($n = 133$) and bottom 30% ($n = 118$) of the mean of the performance level variable. We were then able to determine the *extent* the 15 leadership competencies are present in project managers in various types of successful projects. For that we followed a six step explorative process:

(1) Identification of leadership competencies which are significantly stronger in project managers of top performing projects (top 30% in performance).
(2) Identification of competencies which differ significantly in strength between the different types of projects.
(3) Normalization of the measures of the fifteen dimensions and comparison of the sample with a control group.
(4) Categorizing the scores of the fifteen competencies into high, medium or low.
(5) Identifying the leadership profile of the managers of top performing projects for different project types.
(6) Comparing the identified leadership competency profiles with the three leadership style profiles defined by Dulewicz and Higgs (2003) to validate the results for

organizational change projects and to identify the closest fit of the three styles to the project types used within this study.

3.1. Identifying differences in competencies

Differences in competencies by performance level were tested using ANOVA. Top performing projects scored significantly higher than low performing projects in all leadership competencies ($p = .000$, $n = 400$), except intuitiveness which was insignificantly different.

3.2. Comparing project types

Further analysis focused only on the top performing projects. Here ANOVA was used to assess competency differences by project types. ANOVA analysis by project application area, (engineering & construction, information & communication technology, and organizational change projects respectively) showed no differences in competency strengths. Similarly, an ANOVA analysis on leadership competencies by project importance, (mandatory, repositioning and renewal respectively) showed no differences. Table 5 shows the differences in the strength of competencies of project managers in successful projects of

Table 5
Competence differences by project type.

ANOVA Competences	Posthoc Scheffe Group differences	Group coding
Differences by complexity		
EQ-influence[*]	1 > 2[*]	1 = high
EQ-motivation[**]	1 > 2[*]	2 = medium
	1 > 3[*]	3 = low
IQ-vision[**]	1 > 2[**]	n = 133
Differences by contract type		
IQ-critical analysis[*]	1 > 2[*]	1 = fixed price
IQ-strategic perspective[*]	1 > 2 (p .055)	2 = remeasurement
MQ-developing others[**]	1 > 3[*]	3 = alliance
MQ-empowerment[**]	1 > 2[*]	n = 109

[*] Significant: <.05.
[**] Significant: <.01.

Table 6
Sten scores.

Competence	Sten scores			
	Min	Max	Mean	Standard deviation
EQ-conscientiousness	1	10	6.09	1.73
EQ-emotional resilience	1	10	5.37	1.77
EQ-influencing	1	10	5.46	1.68
EQ-intuitiveness	1	10	5.54	1.86
EQ-motivation	1	10	5.44	1.71
EQ-self-awareness	1	9	5.46	1.70
EQ-sensitivity	1	10	5.73	1.70
IQ-critical analysis	1	10	5.75	1.70
IQ-strategic perspective	1	10	5.49	1.75
IQ-vision	1	10	5.36	1.79
MQ-achieving	1	10	5.52	1.55
MQ-communication	1	9	5.21	1.84
MQ-developing	1	9	5.27	1.85
MQ-empowering	1	10	5.61	1.78
MQ-managing resources	1	9	5.40	1.73

- *High, medium and low complexity.* Vision (an IQ competence), influence and motivation (both EQ competencies) are significantly higher among managers of high complexity projects than in those of medium complexity projects and motivation higher in high complexity projects than in low complexity projects.
- *Fixed price, remeasurement, and alliance contracts.* Critical thinking (IQ), strategic perspective (IQ), and empowering (MQ) are higher in managers of fixed price than in remeasurement contracts with strategic perspective being at the borderline to insignificance. The developing competency was also significantly higher in fixed price contracts than in alliance contracts.

The results partly support hypothesis H_1: there are differences in project manager leadership competency profiles in some different types of successful projects.

3.3. Normalizing scores

The first step in identifying the profiles of project managers in different types of successful projects was to normalize the sample data and compare it with the control group of the normalized sample of managers, developed by Dulewicz and Higgs (2005).

The normalized control group sample has a range of 1–10 for each competency, with a mean of 5.5, and standard deviation of 2. Normalized scores are called *sten codes*. The control group consists of data from 1009 managers and senior officers. Data are collected with the questionnaire described above. The sample comprises data from 772 males and 237 females, with 483 being managers from the private sector and 526 senior officers working in the public and not-for-profit sectors (Dulewicz and Higgs, 2004).

The *sten* codes in Table 6 shows project managers as a relatively homogeneous group of managers, with a lower standard deviation in each competency compared to the control group. Among the project managers communication (MQ) and developing (MQ) scored lowest, and consci-

entiousness (EQ), critical analysis (IQ), and sensitivity (EQ) scored highest. Thus, project managers appear to be slightly more analytical, sensitive and conscientious, and less communicative and developing, when compared with the control group of other managers.

3.4. Individual profiles

For the identification of project manager profiles in different types of successful projects the sub-sample of high performing projects ($n = 133$) was used. Responses in the fifteen competencies were categorized in high, medium and low in accordance with Dulewicz and Higgs (2005). For that:

(a) Sten code values between 1 and 4 were categorized as Low, those between 5 or 6 as Medium, and 7 or higher as High.
(b) Project manager profiles per project type were identified through identification of the particular strength in each competency, by calculating the percentage of sten codes being categorized as Low, Medium or High for each competency in each project type.
(c) The profile for a set of competencies in a project type was then determined by assigning a profile level of Low, Medium or High. This was done by taking Medium (sten code levels 5 and 6) as a basis (because it's the mean of sten codes for all dimensions) and assigning levels the following way:
- If less than 25% of the responses were in each of the categories Low or High, the assigned profile level was Medium.
- If more than 25% of the sten codes in a competency were classified as High then the overall profile level assigned was High (and Low if more than 25% were in the low category).

- If both Low and High categories had more than 25%, but were less than 5% points apart, the profile level assigned was Medium. Otherwise the more populated of the two categories was taken to assign a respective profile level of either Low or High.

Results are shown in Table 7, with all profiles of project managers, the expression of the leadership competencies in successful project managers of the different project types, and the associated sample sizes.

4. Results

4.1. Profiles by project application area

This identified the different leadership profiles of engineering & construction, information & telecommunication technology, and organizational change projects, see Table 7. This industry related distinction has been found important by researchers who identified differences in project management approaches or maturity between different industries (e.g. Ibbs and Kwak, 1997). The results from this analysis are therefore of interest for organizations with a cross-industry portfolio of projects, when training or assigning project managers to different types of projects.

Project managers of most successful engineering projects show strong competencies in critical thinking (IQ), developing (MQ), as well as influence, motivation, and conscientiousness (three EQ competencies). Their competencies in the human resource management related dimensions rank medium.

Project managers of the most successful information & telecommunication technology projects are strong in all competencies, except vision (IQ), which is at a medium strength.

Project managers of the most successful organizational change projects are strong in all competencies but developing, achieving (both MQ), and intuitiveness (EQ).

4.2. Profiles by complexity

This analysis focused on the differences in leadership profile by complexity of projects (Table 7). The results should be of interest for organizations with a relatively homogeneous set of projects (in terms if industry or application type), but variation in terms of perceived project complexity. Profiles of project managers of most successful projects having low complexity were not developed because of the small sample size of only 6 responses.

Managers of the most successful projects having medium complexity are strong in critical thinking (IQ), managing resources, empowering, and developing (three MQ competencies), as well as self-awareness, sensitivity, influence, and conscientiousness (four EQ competencies).

Table 7
Project manager profiles for importance and strengths in leadership competencies in different types of top performing projects.

		Application type			Complexity			Importance			Contract type		
		Engineering & construction	Information & telecommunication technology	Organizational change	Low	Medium	High	Mandatory	Renewal	Repositioning	Fixed price	Remeasurement	Alliance
n		19	89	65	6	69	58	13	43	52	56	41	12
IQ	Critical thinking	High	High	High		High	High	High	High	High	High	High	High
	Vision	Low	Medium	High		Low	High	Medium	Low	Medium	High	Low	Medium
	Strategic perspective	Medium	High	High		Medium	High	Medium	High	Medium	High	Low	Low
MQ	Managing resources	Medium	High	High		High	High	High	High	High	High	High	High
	Communication	Medium	High	High		Medium	High	Medium	High	High	High	Medium	High
	Empowering	Low	High	High		High	High	High	High	High	High	Medium	Medium
	Developing	High	High	Medium		High	High	High	High	Medium	High	High	Low
	Achieving	Medium	High	Medium		Medium	High	Medium	High	Medium	High	Low	High
EQ	Self awareness	Medium	High	High		High	High	Medium	High	Medium	High	High	High
	Emotional resilience	Low	High	High		Medium	High	Medium	High	High	High	High	Medium
	Intuitiveness	Low	Medium	Medium		Medium	High	Medium	Medium	High	Medium	Medium	Low
	Sensitivity	Medium	High	High		High	High	High	High	High	High	High	High
	Influence	High	High	High		High	High	High	High	High	High	High	High
	Motivation	High	High	High		Medium	High	High	Medium	High	High	High	High
	Conscientiousness	High	High	High		High	High	High	High	High	High	High	High

Managers of the most successful projects with high complexity scored high in all dimensions.

4.3. Profiles by importance

This analysis focused on the differences in leadership profiles by strategic importance of a project, that is, whether it is a mandatory project that has to be done, often for legal reasons, or a renewal project for further development of an existing product or service, or a repositioning project to move the product or service within an existing or into a new market segment (see Table 7). Results of this analysis should be of interest for organizations with a homogenous application area of their projects, but variance in project importance.

Managers of most successful projects that are mandatory are strong in critical thinking (IQ), managing resources, empowering, developing (three MQ competencies), sensitivity, influence, motivation, and conscientiousness (four EQ competencies).

Most successful projects of the renewal type are led by managers being strong in all competencies, except vision (IQ) and intuition (EQ).

Managers of most successful projects of repositioning type are strong in all competencies, except vision and strategic perspective (both IQ), achieving (MQ), and self-awareness (EQ).

4.4. Profiles by contracts

This analysis focused on the differences in leadership profiles by fix-price, remeasurement, or alliance contract for a project (Table 7). The results should be of interest for managers assigning project managers from a governance perspective of transaction costs economics or agency theory (Müller and Turner, 2005), thus organizations with relatively homogenous portfolios of projects in terms of application area, but variance in the types of contracts used with their clients.

Managers of most successful projects and fixed-price contracts show strength in all competencies, except intuitiveness (EQ).

Managers in most successful projects with remeasurement contracts show strength in most competencies, but not in vision and strategic perspective (both IQ), communication, empowering, achieving (three MQ competencies), and intuitiveness (EQ).

Managers of most successful projects with alliance contracts show also strength in most of the competencies. Only vision and strategic perspective (both IQ), empowering, developing (both MQ competencies), emotional resilience and intuitiveness (both EQ competencies) were lower than 3. The results for these projects are, however, based on a small sample size of only 12 responses.

4.5. Validation and comparison of leadership competency profiles

Differences in measuring EQ, IQ and MQ in studies which are based on other schools than the competence school, or even the use of team roles instead of leadership measures does not allow to compare the results of the present studies with studies using other definitions and data collection tools. Most of the studies in the competence school of leadership, however, look at the importance of individual leadership dimension for leadership success. That leads to a scarcity in studies that look at the expression of leadership competences in project managers, that is, the relation among the leadership competences, thus the leadership profiles. So far only Dulewicz and Higgs (2005) developed a set of profiles, and only for organizational change projects.

The following step in this study validated the findings by (a) comparing the leadership competency profiles of successful project managers from organizational change projects with the leadership profile identified by Dulewicz and Higgs (2005) for these types of project, then (b) comparing the leadership competency profiles of all project types with those defined by Dulewicz and Higgs in order to identify the leadership profile that comes closest to leadership in projects.

We calculated the differences between the three leadership profiles defined by Dulewicz and Higgs (goal oriented, involving, engaging) and the leadership profiles of the 11 different project types shown in Table 7 by grading each of the 15 leadership sub-dimensions as 1 for low, 2 for medium and 3 for high for each leadership profile. For each of the 11 project types we calculated their difference with the goal oriented, involving, and engaging profile by calculating the differences by each of the 15 leadership competencies, and then summated the differences for each sub-dimension. The span of differences lies between 0 (no difference) to 30 (maximum difference of 2 in all 15 sub-dimensions). From that we defined a summated difference between 0 and 9 as being a good fit between a project type's leadership profile and the Dulewicz and Higgs defined profiles, a difference between 10 and 19 as a mediocre fit, and between 20 and 30 as no fit. Table 8 shows the results. The three leadership profiles of Dulewicz and Higgs for organizational change projects are validated as they all fall into the "good fit" category (<10).

Results indicate the *engaging* leadership profile as the most suitable profile for project work through a good fit with almost all leadership profiles for the different project types, except for engineering and construction projects, where an involving profile might be slightly better suited.

The profile of the engaging style shows high expression of all EQ and some MQ sub-dimensions (Table 1). This is supported by research results from Müller and Turner (2007), which showed a strong correlation between EQ competences and project results, except for engineering and construction projects.

Table 8
Distance between successful project managers' leadership profile and the three styles defined by Dulewicz and Higgs (2003).

	Goal oriented	Involving	Engaging
Engineering & construction	12	11	12
Information & telecommunication Technology	10	11	6
Organizational change	9	8	7
Medium complexity	14	9	6
High complexity	8	9	6
Mandatory	13	10	5
Renewal	10	11	8
Repositioning	10	9	4
Fixed price	9	10	7
Remeasurement	15	10	7
Alliance	13	12	11
Sum of all differences	123	110	79
Mean	11	10	7

5. Conclusions

The study used a worldwide, web-based questionnaire to identify the leadership competency profiles of successful project managers in projects of different type. By focusing on the leadership profiles of successful managers only, we identified differences in the strength and presence of leadership competencies of managers in different types of projects. The results support the hypothesis that project manager leadership competency profiles differ in some project types in order to be successful. A profiling method was used to identify the most eligible leadership profile of project managers of different project types. Results indicate high expressions of one IQ sub-dimension (i.e. critical thinking) and three EQ sub-dimensions (i.e. influence, motivation and conscientiousness) in successful managers in all types of projects. Expression of other sub-dimensions differs by project type. The results support and validate those of Dulewicz and Higgs (2005), who identified different profiles of leadership competence in organizational change projects of different complexity. The present study extends these findings to engineering & construction, information & telecommunication technology projects (Table 7). The leadership styles of successful project managers resemble the Engaging style as defined by Dulewicz and Higgs (2005), which builds on empowerment and involvement in highly transformational contexts.

5.1. Practical implications

The practical implications of the results are

(1) Leadership competencies should be taken into account when assigning project managers to projects. Aim is a fit of the individual project manager's competencies with those shown in the Table 7 for different project types.

(2) Project manager training and development should focus not only on technical and management skills, but also on development of leadership competencies.

Therefore we suggest organizations to adopt a five step process:

Step 1: Recognize the types of project the organization undertakes, and the appropriate leadership styles for your types of projects.
Step 2: Assess the leadership styles of the project managers. Tools such as Leadership Development Questionnaire (LDQ), developed at Henley Management College, UK, by Dulewicz and Higgs (2005) can be used to assess leadership styles.
Step 3: Develop these leadership areas in accordance with the projects leadership profile of successful managers. This can be achieved through training and experience.
Step 4: Where the organization undertakes several types of project, then the profiles of individual project managers needs to be maintained centrally and appropriate project managers chosen when projects are resourced.
Step 5: Value your project managers.

5.2. Theoretical implications

With increasing project requirements, however measured (complexity, project type, duration, etc.), there is an increasing need for emotional competencies in the manager. Thus transactional leadership, and concern for process, is more important on relatively simple projects, but transformational leadership, and concern for people, is necessary on more-demanding projects.

Project performance can be impaired on some types of project if project managers don't adapt their leadership style to the type of project. Project managers progressing from a junior level to a middle, and then to a senior level will manage projects of different type as part of their career development. As they progress they will need to enhance their leadership competencies, particularly developing the emotional dimensions.

The present study's strength lies in its focus on high performing projects and its managers, which allows identifying the leadership profile most likely successful in a given type of project. Improvements can be done in further studies by using larger sample sizes in order to investigate low complexity projects and those with alliance contracts projects in more detail.

Future studies could build on and validate the current results by assessing the role of organizational or national culture in the different profiles, as well as the interaction of managers with different profiles with their teams and stakeholders in the project.

We showed that profiling is frequently used to identify a most suitable person for a role or position in an organiza-

tion. In this paper we presented the leadership profiles of successful project managers. This provides managers of project managers with a target profile for their project managers in projects of different type. Developing the project managers' leadership styles towards these target profiles will contribute to better project results and personal success of the individuals.

Appendix A. Fifteen leadership competencies, after Dulewicz and Higgs (2005)

This appendix contains a brief description of the fifteen competency dimensions of Dulewicz and Higgs (2005), as listed in Table 1.

A.1. Intellectual competence

They suggest there are three intellectual components of leadership competence:

1. *Critical analysis and judgment*: the leader gathers relevant information from a wide range of sources, probing the facts, identifying advantages and disadvantages. Sound judgements and decisions making, awareness of the impact of any assumptions made.
2. *Vision and imagination*: the leader is imaginative and innovative. He or she has a clear vision of the future and foresee the impact of changes on implementation issues and business realities.
3. *Strategic perspective*: the leader is aware of the wider issues and broader implications. He or she balances short and long-term considerations and identifies opportunities and threats.

A.2. Managerial competences

They suggest there are five managerial dimensions to leadership competence:

4. *Resource management:* the leader organizes resources and co-ordinates them efficiently and effectively. He or she establishes clear objectives and converts long term goals into action plans.
5. *Engaging communication:* the leader engages others and wins their support through communication tailored for each audience. He or she is approachable and accessible.
6. *Empowering:* the leader gives direct reports autonomy and encourages them to take on challenges, to solve problems and develop their own accountability.
7. *Developing:* the leader encourages others to take on ever more-demanding tasks, roles and accountabilities. He or she develops others' competencies and invests time and effort in coaching them.

8. *Achieving:* the leader shows an unwavering determination to achieve objectives and implement decisions.

A.3. Emotional competencies

Finally they suggest there are seven emotional dimensions to leadership competence:

9. *Self-awareness:* the leader is aware of his or her own feelings and able to recognize and control them.
10. *Emotional resilience:* the leader is able to maintain consistent performance in a range of situations. He or she retains focus on a course of action or the need to obtain certain results in the face of personal challenge or criticism.
11. *Intuitiveness:* the leader arrives at clear decisions and is able to drive their implementation in the face of incomplete or ambiguous information by using both rational and 'emotional' perceptions.
12. *Interpersonal sensitivity:* the leader is aware of, and takes account of, the needs and perceptions of others in arriving at decisions and proposing solutions to problems and challenges.
13. *Influence:* the leader can persuade others to change a viewpoint based on the understanding of their position and the recognition of the need to listen to this perspective and provide a rationale for change.
14. *Motivation:* the leader has drive and energy to achieve clear results and make an impact.
15. *Conscientiousness:* the leader displays clear commitment to a course of action in the face of challenge and matches 'words and deeds' in encouraging others to support the chosen direction.

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