The moderating effect of program context on the relationship between program managers' leadership competences and program success

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Abstract

We investigated the moderating effect of program context on the relationship between leadership competences of program managers and program success. Leadership competence was measured as the combination of intellectual competence (IQ), managerial competence (MQ) and emotional competence (EQ). A worldwide cross-sectional survey using the Leadership Dimensions Questionnaire (LDQ) and a program context and success questionnaire yielded 79 responses. Moderated hierarchical regression analyses (MHRA) were used to test the moderating effect of program context, which is characterized by organizational fit, program flexibility, organizational stability and resource availability. Results showed that program context positively moderates the relationships between program managers' IQ respective MQ with program success. However, the relationship between EQ and program success is lowered to insignificance in the presence of context. Managerial and theoretical implications are discussed.

1. Executive summary

Programs of projects constantly interact with their wider organizational context and markets, including various stakeholder groups. This requires program managers to be sensitive of the interaction between program context and program management activities. This challenges the program managers' leadership competences and makes them an important predictor for program success.

The research presented here explores how leadership competences of program managers relate to program success, and how program context variables moderate this relationship. A post-positivistic epistemological perspective with a deductive approach was adopted issuing a contingency theory perspective. A worldwide web-based survey collected 79 responses from program managers. Existing measurement tools were used, such

as for program success the dimensions of the program's contribution to organizational, delivery, marketing and innovation capabilities of the parent organization (Shao et al., 2012); and for program context the fit of the program to the wider organization, the flexibility, and stability of the organization, as well as the availability of resources to execute the program (Shao and Müller, 2011). Finally, the program manager personality was measured using the Leadership Dimensions Questionnaire (LDQ), to assess the intellectual (IQ), managerial (MQ, and emotional (EQ) leadership competences (Dulewicz and Higgs, 2005). Analysis was done using moderated hierarchical regressions (MHRA).

The results show that a positive correlation between IQ/MQ competences of program managers and program success. This relationship is positively moderated by the program context. However, the relationship between EQ and program success is initially also positive but and significant but becomes insignificant in the presence of the program context variables.

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This indicates that IQ and MQ link to program success in a more immediate, direct and apparent way. EQ contributes to success by influencing people, thus in a more indirect, long-term but fundamental way, which enfolds over time.

The contingency theory perspective was supported through a "fit" between programs and their context, as indicated by the positive moderation effect of program context on the relationship between IQ/MQ and program success. This extends the appropriateness of contingency theory into the realm of program management.

The results from the study allow developing a first model of a theory of program success based on leadership competences, which enriches the existing theories in the field of project and program management.

Theoretical implications of the study are drawn from the different roles of EQ for program managers and project managers. At the program level, EQ plays a more indirect role, while IQ and MQ plays a more direct role; whereas, at the project level, EQ is not only a direct predictor to success, but also statistically more important than IQ and MQ (Turner and Müller, 2006). This difference has implications for theory development in terms of a) the types of success factors, which differ by project and program level, b) the leadership theory for projects and programs, where in projects the direct interpersonal interaction plays a more crucial role for success, whereas at the program level the more rational and traditional managerial competences come to bear.

Managerial implications include that program managers are encouraged to be more open and adaptive to program context, actively interacting with program context through better exerting their intellectual and managerial competences (i.e. their IQ and MQ), and consciously developing their power of influencing (i.e. EQ). This implies the necessity of integrating leadership into program manager training and development curricula. Furthermore, senior managers should take into consideration the program managers' personal traits, in terms of their leadership competences, when choosing program managers according to the climate of the organizations and characteristics of the programs, and make efforts to shape a favorable context for programs.

2. Introduction

About 30% of the global economy is based on project activities, and the majority is in form of programs or portfolios (Turner, 2009). Programs comprise of projects and related ongoing operations to achieve common objectives (Project Management Institute, 2006; Office of Government Commerce, 2007). Programs become increasingly prevalent as they provide a "missing link" between organizational strategies and projects (Partington, 2000; Murray-Webster and Thiry, 2000). This tendency is known as "from projectification to programmification" (Maylor et al., 2006).

Project management professional organizations established standardized methodologies to guide the management of programs, such as The Standards for Program Management developed by Project Management Institute (PMI®) (Project Management Institute, 2006), and Managing Successful Programs developed by the Cabinet Office (Office of Government Commerce, 2007). These methodologies are widely accepted because they provide sound frameworks for program management, including program management principles, elements and processes. However, they are not a panacea for managing all sorts of programs. Beside this, they tend to overemphasize control in managing programs, which may results in insufficient flexibility to synchronize with strategy evolvement, as well as ineffective co-operation between projects within the programs (Lycett et al., 2004; Pellegrinelli, 2002).

Researchers suggested that effective program management should be dynamic and flexible, adaptable to the changing context, co-creative and relationship-based (Lycett et al., 2004; Näsholm and Blomquist, 2015). This requires program managers having "a subtle blend of interpersonal skills and personal credibility, a deep understanding of the political dynamics of the formal and informal networks that form the organizational context, and a great knowledge of the broader strategic context" (Partington et al., 2005, p. 87–88). This requirement implies that the role of program managers has gone beyond "managers", who are responsible for day to day management work, towards "leaders", who are responsible for managing business and leading program teams (Milosevic et al., 2007).

The development in program management research shows similarities with research in project management. Discussions on project success over the last fifty years revealed that on top of the traditional "hard" factors, like clear mission, right methodologies, right tools/techniques, reasonable plans/schedules, effective controls/monitors etc., the "soft" factors, such as leadership of project managers, increasingly draw the attention of researchers as a means to predict project success (Jugdev and Müller, 2005; Pinto and Slevin, 1998; Cooke-Davies, 2002; Shenhar et al., 2001; Turner and Müller, 2005). Besides, acknowledging that "one size does not fit all", project contextual factors are explored to understand the match between project characteristics and appropriate project implementations (Shenhar, 2001; Müller and Turner, 2007; Müller et al., 2012). The study engages with this trend by addressing the following research question:

> How does program context moderate the relationship between program managers' leadership competences and program success?

The unit of analysis is the relationship between program managers' leadership competences and program success. The study adopted Turner and Müller's (2006) methodology. They investigated the relationship between project managers' leadership competences and project success in different types of projects. Accordingly, the present study measured program managers' leadership competences as intellectual, managerial and emotional competences (i.e. IQ, MQ and EQ), as developed by Dulewicz and Higgs (2005) for their studies on leadership competences. Constructs for measuring program context and program success were taken from Shao, Müller and Turner (Shao and Müller, 2011; Shao et al., 2012).

The contribution of the study lies in a better understanding of leadership in programs, and its contingency on program

context. The results will help program managers develop the desired leadership competences consciously according to their program contextual factors, including the culture, strategies, policies, resources and power structures of the parent organizations, in order to seek for the best "fit" between programs and their parent organizations.

The next section of this paper reviews the previous research on program managers' leadership competences, program context and program success, with contingency theory as the theoretical lens. Based on the literature review, the research hypotheses are proposed. Then the research methodology and data analysis results are described. This is followed by a discussion of the results and the related practical and theoretical implications. Finally, the paper concludes with a brief summary of the study and suggestions for the further research.

3. Literature review

In this section, the contingency theory will be identified as the theoretical perspective. Then literature on program success, program context and leadership is reviewed before the research hypotheses are developed.

3.1. Contingency theory as theoretical perspective

Since Luthans (1973) predicted that contingency theory will lead management out of the theory jungle, this perspective started dominating in the studies of organizational design and performance (Drazin and Van de Ven, 1985). The central theme of contingency theory is that the organizational structure and/or process must fit its context, including characteristics of the organization's culture, environment, technology, size of task etc., in order to improve organizational performance (Lawrence and Lorsch, 1969; Schoonhoven, 1981). The underlying assumptions of contingency theory are: firstly, there is no one best solution to organize; secondly, any solution to organize is not equally effective under all conditions (Galbraith, 1973). Although contingency theory seems to link well management theory and practices by stressing the "fit" of organizational settings with their situations, Schoonhoven (1981) questioned the clarity of the concept of "fit". He asked what does "fit" mean and what does "consistent with" mean? To reduce this ambiguity, Drazin and Van de Ven (1985) specified three different conceptual approaches to "fit" in the development of contingency theory. These are selection, interaction and systems approaches to contingency theory. Assuming there are three concepts of structure, context and performance in the organization studies using contingency theory, structure refers to the arrangement or configuration of interrelated elements in an organization, such as centralization, formalization, complexity etc.; context means the conditions around or within the structure, e.g. environment, technology, size etc.; and performance represents the output or results of an organization. In Drazin and Van de Ven's (1985) paper, selection approach simply hypothesizes that context should be related to structure, without checking whether this context-structure relationship will affect performance. The interaction approach emphasizes

the interaction effect of the context and structure on performance. The focus in interaction approach is not on understanding the congruence between context and structure, but on explaining how performance varies according to the various interactions of structure and context (Drazin and Van de Ven, 1985). For systems approach, the central theme is context-structure-performance relationships can only be understood by addressing simultaneously the many contextual factors, structural alternatives and performance criteria in a holistic way. The aim of systems approach is to find patterns of consistency among multiple dimensions of context, structure and performance (Drazin and Van de Ven, 1985).

Contingency theory derived from general management; however, it also applies to project management. For example, Shenhar's study of "one size does not fit all projects" (Shenhar, 2001), and Crawford et al.'s study on the project categorization system (Crawford et al., 2005) conformed to the selection approach of contingency theory, which hypothesized that organizational structure should be related to its context. Turner and Müller (2006) on project managers' leadership and project success in different project types, and Tabassi et al.'s study on linking team condition with team performance through application of transformational leadership (Tabassi et al., 2017) followed the interaction approach of contingency theory, which explained how performance varies according to the various interactions of structure and context. Näsänen and Vanharanta (2016) and Turkulainen et al. (2015) adopted systems approach of contingency theory, which viewed program context as a product of social construction.

This study applies contingency theory through taking Turner and Müller's (2006) study onto the next higher organizational level, i.e. program management, similar to research by Miterev et al. (2016). The interaction approach of contingency theory is seen as an appropriate theoretical perspective to conduct the investigation. This leads to the emergence of moderator models, identified through related analysis techniques, i.e. hierarchical regression analyses.

3.2. Program success

Project professional organizations often refer program success to benefits realization (PMI, 2006; OGC, 2007), and researchers suggest to measure program success from the lens of strategy achievement. For example, Thiry (2004) clarified the difference of the underpinning paradigms of program management and project management. He indicated that project management is subjected to a performance paradigm, based on short-term tactical deliverables, whereas, program management allows to deliver strategic change. This is in line with Partington (2000) and Maylor et al. (2006) who link program success with organizational strategy achievement. Along this line, Pellegrinelli (1997), Lycett et al. (2004) and Reiss et al. (2006) associated program success with bringing about organizational change. Artto et al. (2009) did a bibliometric study of more than 1600 publications on the topic of program and/or project management articles in leading scientific business journals of the last 21 years. They found that - compared with project management - strategic

thinking is a distinguishing factor for program management. Similarly, Müller (2009) showed that companies who govern their multi-project business as programs are more successful than those governing it as individual projects.

Although these earlier studies provided insights into program success, they basically remain at the organizational level, and little indication on specific program success constructs is found (Shao et al., 2009). Therefore, researchers attempted to develop measurement constructs for program success. Among these attempts, Shao et al. (2012) identified four dimensions to measure program success, namely, delivery capability, organizational capability, marketing capability and innovative capability, based on their web-based survey with 172 program managers. In this study, we will use their program success constructs as the starting point to further explore the relationship between program success and other variables.

3.3. Leadership competence

Leadership competence of project managers has been extensively studied for a decade (Turner and Müller, 2006; Geoghegan and Dulewicz, 2008), and the question arises whether the leadership profiles of project managers are similar to those of program managers? The answer is "not exactly", because project managers and program managers have different mindsets and focus (Partington et al., 2005; Pellegrinelli, 2008; Blomquist and Müller, 2006). This is exemplified by research which showed that some IQ competences like "vision" of project manager correlate negatively with project success (Müller and Turner, 2010a); whereas other IQ competences like "strategic thinking" are seen as a crucial element for program managers and their success (Artto et al., 2009; Shao and Müller, 2011). To investigate program managers' leadership requirements, we now briefly review the concept of leadership.

Leadership is different from management. Bennis and Nanus (1985) defined leaders as people who do the right things, while managers are people who do things right. In academia, leadership has been a central subject since formal management studies began. Researchers have classified leadership theories into six schools of thought (Turner and Müller, 2005; Partington, 2003), namely, the trait school, behavior school, contingency school, charismatic or visionary school, emotional intelligence school and competence school. The most often cited and appealing school therein is the emotional intelligence (EI) school. This school (Goleman, 1996; Mayer and Salovey, 1997) looks at leadership beyond the observable behaviors, but the unobservable psychological motives, e.g. understanding of self and others' emotions to achieve better understanding of oneself or better manage the relationships between self and others. This school (EI) comprises of two major streams, represented by Mayer et al. and Goleman respectively. Mayer et al. views EI as an ability, that is, the ability of perceiving and understanding emotions to assist thought, and then reflectively regulating emotions to promote emotional growth (Mayer et al., 2008; Mayer and Salovey, 1997). In this stream, EI is used to explain the performance of one's own emotional related

subject, such as one's leadership. Furthermore, as EI is defined as an ability, which is something that can be learned and improved, it is implied that one can improve his/her leadership performance by enhancing their EI ability. Contrarily, in the other stream, Goleman et al. (2002) proposed EI as a trait, which are emotion-related dispositions and self-perceptions of a person's personality (Joseph and Newman, 2010). In this stream, EI is perceived as an intrinsic characteristic of a person, the focus is not on self-development, but on explaining how typical EI influences the performance of organizations (Druskat and Druskat, 2006; Hassan et al., 2017). In between the two streams are a variety of EI models. These models are applied to predict both people's own EI performance and organizational performance (Bar-on, 1997; Dulewicz and Higgs, 2000), including project performance (Preston et al., 2015; Müller et al., 2016). Among these models, Dulewicz and Higgs' (2000) model is widely adopted. It proposes three dimensions to measure leadership, i.e. intellectual (IQ), management (MQ) and emotional (EQ) competence. Together these dimensions predict 71% of the variance in leaders' performance. Dulewicz and Higgs developed the leadership competence school, which is a further development of the EI school. The validity of the measurement constructs of this school (i.e. IQ, MQ and EQ) was frequently tested using a variety of different settings, for example, in the Royal Navy (Young and Dulewicz, 2005, 2006) and Royal Air Force (Wren and Dulewicz, 2005) in the UK; and in industrial project management (Geoghegan and Dulewicz, 2008; Turner et al., 2009; Müller et al., 2012; Turner and Müller, 2006). These investigations provide the basis for the present study, which, as the first study of this kind uses the leadership competence school and its associated leadership dimensions to measure program managers' leadership competences.

3.4. Program context

Pellegrinelli et al. (2007, p. 41) defined program context as "a dynamic cultural, political and business environment in which the program operates". It is the program managers' responsibility to shape a flexible and adaptable program context to embed and align programs with the evolving organizational strategies, and shelter the program's component projects from external turbulence and uncertainty (Lycett et al., 2004; Pellegrinelli, 2002). Pellegrinelli (2011) suggested taking a social constructionist perspective towards program management, becasue program managers always need to compromise and adjust their program strategies to the changing requirements stemming from changing program context. Moreover, Lycett et al. (2004) advocated the need to understand the dynamic interactions between program context and program management, in order to better understand the role of program context.

To the best of our knowledge, very few studies examined program context. Only recently Shao et al. (2009, 2012) did a series of studies, both qualitatively and quantitatively, to develop a measurement construct for program context. They proposed four program context dimensions, namely, organizational fit, program flexibility, organizational stability, and resource

availability. Beside this, they identified that program context does not directly relate to program success, but that there is a more complex relationship between the three variables of program managers' leadership competences, program success, and program context. From the review of these previous studies, a knowledge gap emerges about the relationship between program managers' leadership competences, program success and program context. This is the basis for the present study.

As we take contingency theory as the theoretical perspective, we need to test the fit between program managers' leadership competences and program context in predicting program success by building a moderator model following the suggestion of methodologists (Drazin and Van de Ven, 1985; Saunders, 1956; Sharma et al., 1981) and other researchers (Carson et al., 2003). Accordingly we propose the following research hypotheses:

H1. There is a correlation between program managers' IQ and program success, moderated by program context.

H2. There is a correlation between program managers' MQ and program success, moderated by program context.

H3. There is a correlation between program managers' EQ and program success, moderated by program context.

4. Methodology

A post-positivistic epistemological perspective with a deductive approach was used in this study. We used two established measurement constructs as our questionnaires to collect quantitative data from program managers. The first construct measures program success (Shao et al., 2012) and program context (Shao and Müller, 2011). The second one (the Leadership Dimensions Questionnaire - LDQ) measures the psychological profiles of program managers in terms of their leadership competences (Dulewicz and Higgs, 2005). Validity and reliability of both questionnaires were tested individually through different studies (Müller and Turner, 2007; Shao et al., 2012; Dulewicz and Higgs, 2005). This study combines these two questionnaires to test the relationship between the three variables as described in the research hypotheses. We obtained 81 responses to both questionnaires, of which 79 were usable. After testing the data for missing values, validity, reliability and meeting of the underlying assumptions of the multi-variate analysis techniques, we analyzed them by using moderated hierarchical regression analyses (MHRA) as suggested by Sharma et al. (1981).

4.1. Sample

The LDQ questionnaire on leadership competences was applied to programs and their managers. Respondents were members of the Project Management Institute (PMI), International Project Management Association (IPMA) and other project management professional organizations. Targeting this group of engaged professionals with the leadership questionnaire reduced the sampling error to a large extent (Teddlie and

Yu, 2007). Eighty-one answered the LDQ, with a response rate of 47.1%. Seventy-nine of the 81 responses could be used for analyses. Compared with studies done with project managers (Turner and Müller, 2006) and general managers (Dulewicz and Higgs, 2005), the sample size of program managers is relatively small because of the smaller sample frame. Of the 81 respondents, the majorities are from Europe (51%) and North America (21%), and have worked in program management for less than 10 years (91%). Eighty percent worked in the private sector. Fifty-eight percent hold an academic degree, see Table 1. The data in the sample does not show significant differences against the demography in Table 1.

4.2. Variable explanation

The variables (leadership competences, program success, and program context) were operationalized and tested in two earlier questionnaire-based studies. Below we will explain the operationalization and constructs of these variables.

1. *Leadership competences* were measured by a standardized tool of the competency school of leadership, i.e. the LDQ, developed by Dulewicz and Higgs (2005). The LDQ is developed on the basis of incorporating and integrating established research tools in the field of leadership (Dulewicz and Higgs, 2003). Validity and reliability were assured through (a) addressing the questionnaire to over 400 line managers; (b) triangulating the leadership dimensions model with the results from other leadership assessment

Table 1
Sample demographics.

Dimension	Attribute	Frequency	Accumulation
Work experience	Less than 5 years (including 5 years)	59.5%	59.5%
	6–10 years	31.6%	91.1%
	11–15 years	3.8%	94.9%
	16–20 years	3.8%	98.7%
	More than 20 years	1.3%	100%
	Missing value	0	100%
Sex	Male	82.5%	82.5%
	Female	16.3%	98.8%
	Missing value	1.2%	100%
Sector	Private	80%	80%
	Public	17.5%	97.5%
	Not-for-profit	1.3%	98.8%
	Missing value	1.2%	100%
Education	None	1.3%	1.3%
	GCSE	1.3%	2.6%
	A level/HNC	1.3%	3.9%
	1st Degree	3.8%	7.7%
	Higher Degree	57.5%	65.2%
	Professional Qualification	33.8%	99.0%
	Missing value	1.0%	100%
Nationality	Europe	51.3%	51.3%
	Africa/Caribbean	2.5%	53.8%
	Asia	10%	63.8%
	North America	21.3%	85.1%
	Australia/New Zealand	5.0%	90.1%
	Other	8.8%	98.9%
	Missing value	1.1%	100%

tools; (c) further testing validity and reliability in different organizational context (e.g. Müller et al., 2012; Turner and Müller, 2006; Dulewicz and Higgs, 2000; Young and Dulewicz, 2005, 2006; Wren and Dulewicz, 2005; Geoghegan and Dulewicz, 2008). The LDQ contains 187 questions to measure fifteen leadership dimensions mainly using five point Likert scales. The fifteen leadership dimensions are further grouped into three competence areas: Intellectual (IQ, including three dimensions: Critical Analysis and Judgment, Vision and Imagination, and Strategic Perspective), Managerial (MQ, including five dimensions: Resource Management, Engaging Communication, Empowering, Developing and Achieving), and Emotional (EQ, including seven dimensions: Self-awareness, Emotional Resilience, Intuitiveness, Interpersonal Sensitivity, Influence, Motivation, and Conscientiousness). Questions in the LDQ are in random order so that respondents cannot infer the intention of a particular question, and it reduces the common method bias (Podsakoff and Organ, 1986; Conway and Lance, 2010). Leadership competences were calculated as the mean value of IQ, MQ and EQ. In our study reliability levels for IQ, MQ and EQ are satisfactory with Cronbach Alpha values of 0.817, 0.882 and 0.741 respectively, which is higher than the minimum threshold of 0.60 (Churchill, 1979).

2. *Program success* was measured following Shao et al. (2012). Four dimensions were used to measure program success: Delivery Capability, Organizational Capability, Marketing Capability and Innovative Capability. Delivery Capability assesses the extent the program delivers what it is supposed to deliver, and the degree the delivery satisfies the stakeholders. Organizational Capability assesses the extent the program enhances the assets of its parent organization, such as the process efficiency, organizational culture etc. Marketing Capability measures the program's contribution to the organizational marketing strategies. Innovative Capability assesses how well the program contributes to the future development in terms of technology. The mean value of the four program success dimensions was used to measure overall program success. Validity and reliability were achieved through (a) closely linking questionnaire items with existing theories; (b) pilot testing the questionnaire to assure its understandability; (c) collecting data from program managers through professional project management organizations; (d) checking Cronbach' Alpha values against the threshold. In this study, Cronbach's Alpha values of 0.858, 0.840, 0.763, and 0.645 respectively, show that all program success dimensions meet the requirement for reliability.

3. *Program context*: in addition to the measurement dimensions of program success, Shao et al. (2012) also developed constructs to measure program context, including Organizational Fit, Program Flexibility, Organizational Stability, and Resource Availability. Organizational Fit reflects the fit between program and its organizational strategies, cultures, and internal power structures etc. Program Flexibility represents the adaptability of program structures, program procedures etc. Organizational Stability measures the stability of the parent organization. Resource Availability defines to what extent the resources in the parent organization are available for programs. The Cronbach's Alpha of these four program context dimensions are 0.711, 0.748, 0.608, and 0.600 respectively, indicating acceptable reliability.

4. *Control variable*: following the practices of earlier studies (Zhu and Sarkis, 2004; Li and Tang, 2010), we used a control variable to rule out "noise" in the hierarchical regression analyses. We chose work experience as the control variable, because we are interested in explaining program success from the perspective of leadership, spurious effects in terms of program managers' work experiences could be expected and were therefore controlled for. This is derived from Müller and Turner's (2010a) earlier study on leadership and project success. They found that older project managers tend to be more successful in managing projects than younger project managers, and possible explanation is more work experiences of the older project managers. Fig. 1 shows the related research model.

4.3. Data analysis method

Moderated hierarchical regression analysis (MHRA) was used to analyze the data. A moderator variable(s) impacts either the nature and/or the strength of the relationship between an independent variable and a dependent variable (Saunders, 1956). Guided by the interaction approach of contingency theory, the moderating effect is represented by the interaction term of the independent variable(s) and moderator variable(s) (Sharma et al., 1981), which is further shown by the cross-products of the independent variable(s) and moderator variable(s) (Zedeck, 1971). We followed Dunlap and Kemery's (1987) method of standardizing variables to alleviate possible multicollinearity problems associated with the interaction terms. Steps of MHRA are:

1) The control variable of work experience is entered into the regression in the first step, and kept for all following steps.
2) The first leadership competence, i.e. IQ, is entered into the regression.
3) The moderator variables of Program context dimensions are entered as a block.
4) Finally, the interaction terms of IQ and program context dimensions are entered as a block. If the interaction accounts for a significant amount of incremental variance on the dependent variable, as measured by significance tests for the incremental F-statistic (Boyer et al., 1997; Tatikonda and Montoya-Weiss, 2001), then there is evidence to support the hypothesis that there is a significant moderating effect of program context on the given leadership competence dimension.
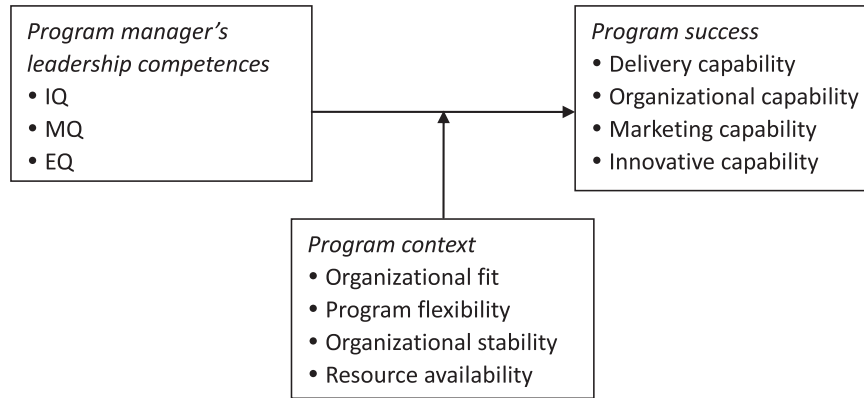5) Step 1 to 4 is repeated for the two other leadership competences (i.e. MQ and EQ).

Fig. 1. Research model.

5. Results

5.1. Pre-examinations for regression analyses

Before performing MHRA, two pre-requisites were checked: adequacy of sample size and normality of variables. Hair et al. (1998) suggest that sample sizes for multiple regressions should be at minimum five observations per independent variable, and 15 to 20 observations per independent variable are desired for results to be generalizable. In this study, at any one round of MHRA, there was one independent variable (i.e. IQ, MQ or EQ) together with four moderator variables (i.e. four program context dimensions) and one dependent variable (i.e. one of the program success dimensions). Therefore, each round of MHRA constituted of five independent and moderator variables. With a ratio of a bit higher than 15 observations per variable, it meets the minimum threshold for generalization (Hair et al., 1998).

Descriptive statistical analyses were performed to check the normal distribution of the variables before conducting MHRA. We compared means, standard deviations, skewness and kurtosis of all variables with their respective thresholds (e.g. ±1.96 for skewness, and ±3.29 for kurtosis (Field, 2005)). Except for the kurtosis of "Marketing capability" all variables met the requirements of normal distribution, see Table 2. We further detected a possible outlier causing the unsatisfactory kurtosis for "Marketing capability". However by doing a t-test between the all answers of the outlier and all answers of the other respondents we could not find significant differences between the outlier and all the other respondents. So there was no strong theoretical support to take away any cases from the sample and we had to compromise the statistical purification and admit the variables to the following MHRA.

5.2. Moderating effect of program context on the relationship between leadership and success

Correlation analyses were performed before MHRA to detect preliminarily the relationships between variables, see Table 3. High correlations between independent variables may indicate multicollinearity issues, which requires checking in later regression analyses. However, all these coefficients were still within the threshold of 0.90 (Hair et al., 1998). From the correlation matrix, we found positive correlations between IQ, MQ and EQ and success (main effects), which is a pre-requisite for further testing the moderating effects.

Tables 4 to 6 show the results of the MHRA with program *overall success* as the dependent variable. Multicollinearity issues were assessed by using Variance Inflation Factor (VIF). Maximum acceptable level of VIF is 10 (Field, 2005). The greatest value of VIF in our MHRAs was 1.359, so we had no multicollinearity issue.

Tables 4 to 6 show that the control variable has no significant effect on program success. IQ, MQ and EQ have significant main effects on program success (step 2), which provides the basis for further checking the moderating effects. IQ has the highest predictive power on program success (R^2 of 12.6%), followed by MQ (R^2 of 9.1%), then EQ (R^2 of 6.8%). The results are in concert with Shao and Müller's (2011) prior

Table 2
Descriptive statistics.

Variable (Zscore)	N	Mini.	Maxi.	Mean	SD	Skewness	Kurtosis
IQ	79	−2.677	2.691	0.000	1.000	−0.033	0.077
MQ	79	−2.744	2.166	0.000	1.000	−0.132	0.150
EQ	79	−3.113	1.998	0.000	1.000	−0.599	0.720
Organizational fit	79	−2.316	1.672	−0.002	0.881	−0.340	−0.066
Program flexibility	79	−3.511	1.954	−0.002	1.000	−0.825	1.807
Organizational stability	79	−2.466	1.732	−0.029	0.885	−0.238	−0.134
Resource availability	79	−2.316	1.792	0.015	0.941	−0.407	−0.194
Delivery capability	79	−2.666	1.447	0.097	0.849	−0.795	0.991
Organizational capability	79	−3.517	1.402	0.022	1.008	−1.597	3.105
Marketing capability	79	−4.730	1.994	0.028	1.088	−1.216	3.626
Innovative capability	79	−2.737	2.069	0.045	0.926	−0.480	0.787

Table 3
Correlations between variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13
IV: leadership competences													
1. IQ	1.0												
2. MQ	0.829 **	1.0											
3. EQ	0.772 **	0.821 **	1.0										
Moderators: program context													
4. Organizational fit	0.072	0.091	0.055	1.0									
5. Program flexibility	0.277 *	0.187	0.223 *	−0.032	1.0								
6. Organizational stability	0.106	0.052	0.070	−0.061	−0.100	1.0							
7. Resource availability	0.093	0.050	0.067	−0.040	0.080	−0.010	1.0						
DV: program Success													
8. Delivery capability	0.311 **	0.291 **	0.273 *	0.291 **	0.214	0.230 *	0.017	1.0					
9. Organizational capability	0.179	0.086	0.071	0.093	0.432 **	−0.112	0.140	0.013	1.0				
10. Marketing capability	0.297 **	0.241 *	0.196	0.142	0.191	−0.042	0.135	0.037	0.188	1.0			
11. Innovative capability	−0.029	0.029	0.030	0.089	−0.133	−0.142	0.121	0.072	0.061	−0.013	1.0		
12. Overall success	0.350 **	0.294 **	0.257 *	0.273 *	0.331 **	−0.045	0.196	0.457 **	0.605 **	0.613 **	0.489 **	1.0	
CV: work experience													
13. Year in the position	0.175	0.214	0.172	−0.148	0.101	0.164	0.014	0.059	−0.040	0.095	−0.120	0.001	1.0

  * Correlation is significant at the 0.05 level.
** Correlation is significant at the 0.01 level.

qualitative study. Through their interviews with program managers from various industries, they found that program managers rated highest on IQ, than MQ and EQ.

Adding the program context dimensions (i.e. step 3 in Tables 4 to 6) leads to a significant improvement of the explanatory power in all models (significant incremental F). Adding the cross-products of program context and leadership competence in step 4 shows the moderating effect of program context on both the relationship between IQ and program success, and the relationship between MQ and program

success. More specifically, two dimensions of program context, i.e. organizational fit and program flexibility moderate the relationship between IQ and program success positively (see step 3 in Table 4, the coefficients of these two moderator variables are positive). One dimension of program context, that is, organizational fit moderates the relationship between MQ and program success positively (see Table 5). The introduction of program context to the main effects of IQ and MQ on program success increases the R^2 to 38% and 36% respectively.

In the case of EQ (step 4 in Table 4), the presence of the moderating effect lowered the significance of the relationship

Table 4
Hierarchical regression between IQ and overall success with IQ/program context interactions.
Dependent variable: overall success (n = 79); Main table contains standardized coefficients.

Variables entered	Step 1	Step 2	Step 3	Step 4
Control variables				
Work experiences	0.001	−0.062	−0.028	0.009
Main effect				
IQ		0.361 ****	0.252 **	0.249 **
Moderators				
Organizational fit			0.264 **	0.312 ***
Program flexibility			0.257 **	0.242 **
Organizational stability			−0.024	−0.015
Resource availability			0.163	0.197 *
Interaction terms				
IQ × Organizational fit				−0.211 **
IQ × Program flexibility				−0.187 *
IQ × Organizational stability				−0.098
IQ × Resource availability				−0.056
F for the step	0.000	10.972 ****	3.788 ***	2.641 **
F for the regression	0.000	5.486 ***	4.622 ****	4.083 ****
R^2	0.000	0.126	0.278	0.375

   * p < =0.10.
  ** p < =0.05.
 *** p < =0.01.
**** p < =0.001.

Table 5
Hierarchical regression between MQ and overall success with MQ/program context interactions.
Dependent variable: overall success (n = 79); Main table contains standardized coefficients.

Variables entered	Step 1	Step 2	Step 3	Step 4
Control variables				
Work experiences	0.001	−0.065	−0.037	−0.001
Main effect				
MQ		0.308 ***	0.216 **	0.196 *
Moderators				
Organizational fit			0.264 **	0.266 ***
Program flexibility			0.289 ***	0.316 ***
Organizational stability			−0.004	0.003
Resource availability			0.173 *	0.139
Interaction terms				
MQ × Organizational fit				−0.186 *
MQ × Program flexibility				−0.070
MQ × Organizational stability				−0.148
MQ × Resource availability				−0.146
F for the step	0.000	7.572 ***	4.274 ***	2.633 **
F for the regression	0.000	3.786 **	4.329 ****	3.886 ****
R^2	0.000	0.091	0.265	0.364

   * p < =0.10.
  ** p < =0.05.
 *** p < =0.01.
**** p < =0.001.

Table 6
Hierarchical regression between EQ and overall success with EQ/program context interactions.
Dependent variable: overall success (n = 79); Main table contains standardized coefficients.

Variables entered	Step 1	Step 2	Step 3	Step 4
Control variables				
Years in the position	0.001	−0.044	−0.017	0.003
Main effect				
EQ		0.264**	0.169	0.126
Moderators				
Organizational fit			0.277***	0.305***
Program flexibility			0.290***	0.301***
Organizational stability			−0.006	0.001
Resource availability			0.173*	0.148
Interaction terms				
EQ × Organizational fit				−0.196*
EQ × Program flexibility				−0.007
EQ × Organizational stability				−0.150
EQ × Resource availability				−0.124
F for the step	0.000	5.523**	4.337***	1.645
F for the regression	0.000	2.762*	3.973***	3.128***
R^2	0.000	0.068	0.249	0.315

   * $p < =0.10$.
  ** $p < =0.05$.
*** $p < =0.01$.

Table 7
Results summary.

Independent variable	Dependent variable	Main effect	Moderating effect
IQ	Program success	+	Organizational fit (+); Program flexibility (+)
	Delivery capability	+	Program flexibility (+)
	Organizational capability	0	0
	Marketing capability	+	0
	Innovative capability	0	0
MQ	Program success	+	Organizational fit (+)
	Delivery capability	+	Program flexibility (+)
	Organizational capability	0	0
	Marketing capability	+	0
	Innovative capability	0	0
EQ	Program success	+	0
	Delivery capability	+	0
	Organizational capability	0	0
	Marketing capability	0	0
	Innovative capability	0	0

+. Positive relationship; 0. No relationship.

between EQ and program success to insignificance, which makes the moderating effect missing its basis. Therefore, Program context is not a moderator on the main effect between EQ and program success, but possibly an antecedent, intervening, suppressor, or predictor to program success - according to Sharma et al. (1981).

Other MHRA with each program success dimensions as dependent variables were also done using similar processes as described above (i.e. with program *overall success* as the dependent variable). All the MHRA results are summarized in Table 7. We found that program managers' leadership competences, in terms of their IQ, MQ and EQ, are all positively related to program success. Both relationships between IQ/MQ and program success are positively moderated by program context. However, the relationship between EQ and program success becomes insignificant in the presence of program context. Therefore, two research hypotheses H1 and H2 are supported, while H3 is not supported.

6. Discussion

Previous studies indicate the need for understanding the role of context in program management. The results of the present study answers the research question by showing that program context positively moderates the relationships between program managers' IQ, MQ and program success, but not the relationship between EQ and program success.

Positive moderating effects imply that the fit between programs and their context is beneficial for program managers to better exert their intellectual (IQ) and managerial (MQ) competences to lead programs to success. This is in line with the kernel of contingency theory, i.e. the concept of "fit". In the realm of project management Thomas and Mullaly (2008) also

addressed the concept of "fit" in their study on the value of project management by investigating the extent project management approaches fitted to the particular context of their case organizations. They found that the combination of project management implementations with its context can influence the value of project management perceived by the project's parent organizations. It will conversely influence the support the projects can gain from their parent organizations. Compared with the results of other studies on program context, the fit between programs and their context can be materialized by influencing the internal power of the parent organizations (Van Donk and Molloy, 2008); aligning with the organizational strategies (Ives, 2005); integrating projects objectives to achieve organizational strategies (Rijke et al., 2014); and managing relationships with program stakeholders (Blomquist and Müller, 2006).

We also noticed that program context plays an insignificant moderating role on the relationship between EQ and program success based on our sample. The result implies that EQ contributes to program success in the form of an antecedent. In other words, EQ is a pre-requisite for program success. Müller and Turner (2010b) clarified IQ as the rational capability of a leader, MQ represents the management skills to lead teams towards pre-defined goals, and EQ is about self-management and relationship management skills of a leader. Accordingly, we infer that IQ and MQ are more closely linked to immediate, direct and tangible success, while EQ contributes to success through influencing people, and the influence may take time and actions in an indirect way. Therefore, the interactions between IQ/MQ and program context manifest themselves in a more apparent manner. That does not mean EQ is less important than IQ and MQ for a program manager, but EQ plays a more fundamental and long-term role in achieving program success. Other studies with different types of managers found similar patterns. For example, Turner et al. (2009) compared the leadership between project managers and functional managers; they found that for both types of managers, EQ contributes the most in predicting

performance (Table 8). Clarke (2010a, 2010b) explained how emotional intelligence influences project managers' decision making and behaviors. These studies together indicate the necessity of training and educating program managers for their leadership competences. In addition, it also alerts top managers to evaluate candidates on their leadership competences before appointing them to be program managers or bringing them into the pool of program managers.

Clarke (2012) observed that even though a number of studies on leadership were done in the project arena, an overall theory has not yet emerged, especially involving moderator or mediator variables. Müller and Turner (2010b) made their first attempt to develop a *leadership competence based theory of project performance* based on their series of studies on leadership of project managers. Analogously, we tried to build a *leadership competence based theory of program success* based on the studies in program management, including the present one. The theory is developed following the process outlined by Whetten (2002), which requires identifying a core construct first, then adding the complementary constructs, and finally adding the enablers and disablers or constraints of the theory. Fig. 2 shows the model to illustrate the theory.

The theoretical model in Fig. 2 covers the main information of the research results, such as the direct link between leadership and program success, the fit between leadership and program context and the fit between program and its parent organization; furthermore, the model also abstracts the discrete and concrete information from a single piece of research to a higher level with supports and validation from other related studies, such as Müller and Turner (2010b), Thomas and Mullaly (2008).

The core construct in the theoretical model in Fig. 2 is interaction *of leadership competence with program context*. Reading the model from left to right, it shows that the construct of *Leadership competences* is the input component. Program managers must possess certain leadership competences when taking on their role. Through leadership training programs or work experiences program managers can develop their leadership competences. The *development of leadership competences* enables program managers to better interact with the program's context. However, the *situational requirements*, e.g. program governance, organizational culture, strategies etc. may constrain or at least impact the interactions with program context.

The appropriate interactions between leadership competences and program context lead to program success. *Program success* is the output component in the model. Flexible program governance tends to be better adaptive to organizational context, and it will further enable program success. In contrast, if program governance does not fit with organizational context, it will constrain or hinder program success.

Table 8
Contribution of IQ, MQ and EQ (Turner et al., 2009).

	Functional managers	Project managers
EQ	30%	21%
EQ + IQ	52%	26%
EQ + IQ + MQ	71%	31%

7. Conclusion

We investigated the effect of program context on the relationship between program managers' leadership competences and program success. Contingency theory was taken as the theoretical perspective. A worldwide web-based questionnaire yielded 79 usable responses from program managers. The moderating effect of program context was tested using Moderated Hierarchical Regression Analyses (MHRA).

We can now answer the research question. In line with our research hypotheses, program context positively moderates the relationships between program managers' IQ/MQ and program success, but not the relationship between EQ and program success. Thus research hypotheses H1 and H2 are supported, and H3 is not supported.

The growing importance of understanding the role of context was earlier shown for projects, for example, by Müller et al. (2012), Turner and Müller (2006) on the moderating effect of different project complexities and types. These studies provided both the theoretical and methodological basis for the present study, which then took the thinking onto the next higher level, i.e. the program level. Contingency theory, which originally derived from general management, has thereby proven its appropriateness in the program management context by clarifying how program contextual factors moderate the relationship between leadership and program success. This led to the development of a *leadership competence based theory of program success*. These are the study's main contributions to knowledge.

Theoretical implications of the study are drawn more from the different role of EQ for program managers and project managers. At the program level, EQ plays a more indirect and fundamental role, while the role of IQ and MQ is more apparent; whereas, at the project level, EQ is more direct and important than IQ/MQ for project managers (Turner and Müller, 2006). This has further implications for theory development in terms of a) the types of success factors, which differ by project and program, b) the leadership theory for projects and programs, where in projects the direct interpersonal interaction plays a more crucial role for success, whereas at the program level the more rational and traditional managerial competences come to bear, c) the first version of the leadership theory in program context outlined in the paper, which must be enhanced through further variables and studies to become validated and stable over time.

Managerial implications include that program managers should be inspired to be more open and adaptive to program context, actively interacting with program context through better exerting their intellectual and managerial competences (i.e. IQ and MQ), and consciously developing their power of influencing (i.e. EQ). This implies the necessity of integrating leadership into program manager training and development curricula. Moreover, senior managers are encouraged to choose appropriate program managers according to the climate of the parent organizations and characteristics of the programs, and make efforts to shape the context for programs in a favorable manner for program managers.
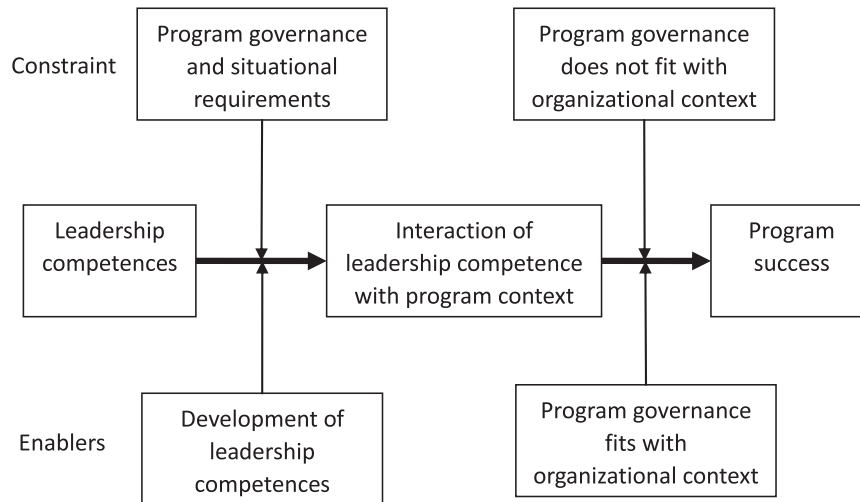
Fig. 2. Model for the leadership competence based theory of program success.

The strength of the study lies in the use of established concepts and measurement constructs to achieve credible results. The results are in concert with other related studies, which also provide theoretical supports for the present study. Limitations could be found with the relatively small sample size. The sample size is just beyond the minimum threshold for generalizability, which may cause result instability (Field, 2005).

Future studies are suggested to test the moderating effects of program context from different perspectives, e.g. program types, industrial areas, and cultures etc. A recent paper has already made an attempt to explore whether various program types need different program management competences (Miterev et al., 2016). Coupled with the current study, which took the perspective from program contextual characteristics, these studies will together provide a holistic picture of program context, and it will eventually help program managers to better resonate with program context, in order to achieve better results.

Conflict of interest

The author declared that there is no commercial or associative interest that represents a conflict of interest in connection with the work submitted.

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