IT PROJECT MANAGER COMPETENCIES AND TEAM COMMITMENT: A NEW SCALE PROPOSAL

ABSTRACT

Project managers are required to develop competencies that will help them to lead their teams in stressful, challenging and dynamic environments such as in many Information Technology (IT) project settings. Project managers should also develop team commitment in order to improve team performance. Therefore, this study addresses the question: Which IT project manager competencies influence team commitment? The main objective is to develop and validate a new instrument to measure project manager competencies and team commitment in IT projects. To accomplish this objective, we, firstly, did an exploratory and qualitative research. Then, we did a quantitative research in which we collected 484 responses. Besides providing a new scale, this research also presents pertinent implications to the practice of project management in IT settings. For instance, organizations can use the measuring instrument to evaluate project managers, to evaluate the work environment as well as to structure training programs for their employees.

Keywords: Team Commitment. Organizational Commitment. Project Manager Competencies. Scale Development. Structural Equation Modeling.

AS COMPETÊNCIAS DO GERENTE DE PROJETOS DE TI E COMPROMETIMENTO DE EQUIPE: PROPOSTA DE UMA NOVA ESCALA

RESUMO

Gerentes de projetos precisam desenvolver competências necessárias para gerenciar equipes em ambientes estressantes, desafiadores e dinâmicos como costumam ser os ambientes de TI. Gerentes de projetos também precisam desenvolver o comprometimento da equipe a fim de melhorar a performance de suas equipes. Porém, construir o comprometimento de equipe não é uma tarefa fácil. Por isso, este estudo endereça a seguinte questão: quais competências do gerente de projetos de Tecnologia da Informação (TI) influenciam o comprometimento da equipe? O principal objetivo é o de desenvolver e validar um novo instrumento para medir as competências do gerente de projetos e o comprometimento da equipe em ambientes de TI. Para cumprir este objetivo, nós, primeiramente, conduzimos uma pesquisa qualitativa e exploratória. Na sequência, nós conduzimos uma pesquisa quantitativa em que coletamos 484 respostas. Além de contribuir com uma nova escala, esta pesquisa apresenta implicações pertinentes para a prática da gestão de projetos de TI. Inclusive, as empresas podem utilizar este novo instrumento para avaliar gerentes de projetos, para mensurar o ambiente de trabalho de suas equipes, como também para estruturar treinamentos corporativos.

Palavras-chave: Comprometimento de Equipe. Comprometimento Organizacional. Competências do Gerente de Projetos. Desenvolvimento de Escala. Modelagem de Equações Estruturais.

Cintia Cristina Silva de Araújo[1]
Cristiane Drebes Pedron[2]
Filipe Quevedo Pires de Oliveira e Silva [3]

[1] PhD in Business Administration from Universidade Nove de Julho - UNINOVE. Brazil. E-mail: **cintyaraujo@gmail.com**
[2] PhD in Management from the Technical University of Lisbon - Higher Institute of Economics and Management, Portugal. Professor at the Universidade Nove de Julho - UNINOVE. Brazil. E-mail: **cdpedron@uni9.pro.br**
[3] PhD in Business Administration from Universidade Nove de Julho - UNINOVE. Professor at the Universidade Federal de Mato Grosso do Sul - UFMS. Brazil. E-mail: **quevedo.silva@ufms.br**

1 INTRODUCTION

Human aspects such as lack of end user involvement, miscommunication, weak leadership and unskillful resources are appointed as causes of Information Technology (IT) project failure (The Standish Group, 2013, 2014; Sumner, Bock, & Giamartino, 2006). IT projects with managers who have the "right competencies" and who know how to lead teams towards the project goals is crucial to ensure that the organization's projects will achieve the expected performance (Jha & Iyer, 2007; Thamhain, 2013; Wateridge, 1997).

Unfortunately, project managers are usually promoted to this position due to their technical skills rather than their managerial skills (Kerzner, 2009; Wateridge, 1997). For this reason, many projects fail since project managers lack important skills such as communication and leadership (Kerzner, 2009; Müller & Turner, 2010; Sumner, Bock, & Giamartino, 2006; Turner & Müller, 2005; Wateridge, 1997).

Altogether, IT project managers are required to develop competencies that will help them to lead their teams in stressful, challenging and dynamic environments such as in many IT project settings (Sumner et al., 2006). In fact, effective IT project managers do not lean on "technical expertise alone" to be effective (Kerzner, 2009, p. 149). IT project managers need to know how to maximize team performance and how to get the team committed with the project goals (Thamhain, 2011; 2013).

Commitment is another important component in IT project management (Jha & Iyer, 2007). Scholars have demonstrated that team commitment positively affects team performance (Bishop, Scott, & Burroughs, 2000) and IT project success (Xu, Zhang, & Barkhi, 2010). However, it is known that building commitment is a very difficult task to accomplish (Thamhain, 2013). Team commitment is defined as an individual's identification and involvement with a specific team (Porter, Crampon, & Smith, 1972). Organizational commitment can be characterized by three factors: (1) a strong belief in and acceptance of the team's goals and values, (2) a willingness to exert considerable effort on behalf of the team and (3) a strong desire to remain in the team (Bishop & Scott, 2000; Bishop, Scott, & Burroughs, 2000).

Surely, managerial competencies solely are not sufficient to build team commitment in organizational settings (Jha & Iyer, 2007; Thamhain, 2013). However, as the PMI (2013, p. 17) affirms, "the project manager is the link between the strategy and the team". Therefore, IT project managers can use specific competencies to get their team members committed (Leung, Chen, & Yu, 2008; Thamhain, 2013). In spite of all these evidences regarding the influence of project managers on team commitment, there have been few studies on the relationship between project manager's competencies and team commitment (Jha & Iyer, 2007; Korzaan, 2009). In fact, Brazilian studies have contributed little in exploratory researches on organizational commitment (Moraes, Godoi, & Batista, 2004).

Based on these arguments, this research project aimed to answer the following question: Which IT project manager competencies influence team commitment? To answer this question, the main objective of this study was to develop and validate an instrument to measure IT project manager competencies and team commitment.

The research was divided into two phases. In the first phase, we did an exploratory qualitative research in which sixteen semi-structured in-depth interviews were conducted with IT project managers. The second phase aimed to design a new scale on IT project manager competencies. To validate the scale, we collected 484 responses from Brazilian IT professionals.

This paper is structured as follows: introduction, theoretical background, research methodology, qualitative data analysis, quantitative data analysis, and final considerations.

2 LITERATURE REVIEW

In this session, we briefly present the theoretical foundations of this research.

2.1 IT Project Manager Competencies

The definition of competence has been the object of constant debates and remains of diffuse matter in the organizational literature (Crawford, 2005). For the purpose of this research, competence is defined as a combined set of an individual's knowledge, abilities and personal characteristics used to perform an specific task or activity (Crawford, 2005; Müller & Turner, 2010).

Many studies have been done to determine which individual/managerial competencies are essential for efficient project management (Araújo & Pedron, 2015; Keil, Lee, & Deng, 2013; Skulmoski & Hartman, 2009; Takey & Carvalho, 2015). Unfortunately, in many firms, "personnel are generally promoted to management on the basis of

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their professional or technical competence rather than their managerial ability" (Kerzner, 2009, p. 172). This practice has many negative consequences later on, as it tends to staff projects with managers insufficiently capable to perform their role.

Technical skills are not sufficient to guarantee project success (Kerzner, 2009). For instance, in order to spur team commitment soft skills such a leadership and communication are fundamental (Thamhain, 2004). To be effective, project managers should use a synergy of different competencies since they are supposed to deal with "(1) the people to be managed, (2) the task to be done, (3) the tools available, (4) the organizational structure, and (5) the organization environment" (Kerzner, 2009, p. 148).

Regarding essential competencies for IT project managers, there is a variety of studies covering this theme (Keil et al., 2013; Skulmoski & Hartman, 2009; Stevenson & Starkweather, 2010). Studies indicate that IT professionals lack important skills such as communication and leadership, which jeopardizes their performance (Sumner et al., 2006). These attitudinal and interpersonal competences are known as soft skills.

Keil et al. (2013) and Skulmoski and Hartman (2009) did a thorough research on IT project managers' competencies. They collected information among IT professionals to identify which competencies project managers should develop to be more effective in IT settings. Based on their study and on other researches (PMI, 2013; Stevenson & Starkweather, 2010), we designed a list of eighty-five project manager competencies. Then, we grouped these competencies into ten categories.

2.2 Team Commitment

Team commitment is similar to organizational commitment since teams build goals and principles that members can accept or not (Bishop & Scott, 2000; Bishop et al., 2000). Based on the concept of organizational commitment (Mowday, Steers, & Porter, 1979), Bishop and Scott (2000) define team commitment as (a) an individual's strong belief in, and acceptance of, team's goals and values; (b) willingness to put in considerable effort on behalf of the team and (c) intense desire to remain as a member of the team.

Bishop et al. (2005) declare that it is important to separate an individual's commitment to the organization from the commitment he/she has towards his/her teammates. An employee may be extremely committed to the team and to the organization or he/she can be committed to the team and not to the organization and even to none of them (Bishop et al., 2005).

Literature confirms that project leaders can influence team commitment (Allen & Meyer, 1990; Shenhar & Dvir, 2007). Effective project leaders serve as "social architects" who spur team commitment in order to increase team performance and to ensure project success (Thamhain, 2004).

In a study on multinational projects, Thamhain (2013) concluded that to drive team commitment it is necessary to have an experienced project leader who is able to gain the team's trust, respect and credibility. Some tactics to spur team commitment are scheduling regular meetings to review project objectives and to discuss problems encountered during project execution (Sabherwal & Elam, 1995; Thamhain, 2013).

3 METHODOLOGY

In order to better define the constructs scope and to analyze the relationship between them, we adopted mixed methods, as recommended by Creswell and Plano-Clark (2011). The first phase of this study was exploratory and had a qualitative approach. After the literature review, we conducted 16 (sixteen) 40-50 minute in-depth interviews with Brazilian IT project managers. Table 1 presents the professional profile of the 16 interviewees.

This first stage of the research helped us (1) to define the sample of participants for the online survey to be conducted on the quantitative stage; (2) to determine which competencies would be included or excluded from the new measuring instrument; (3) to define the boundaries of the research constructs; and (4) to obtain a better understanding of IT project management on Brazilian organizations.

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Table 1 - Interviewees' profile

Interviewee	Occupation	Firm's Business Sector	Yrs of Experience	Size of projects h/s has managed
1	IT manager	Big multinational fashion retail clothing store	20	All sizes
2	IT project manager	Small technology consultancy	10	Small to medium
3	IT project manager	Small technology consultancy	5	Small to medium
4	IT project manager	Big multinational IT consultancy	20	All sizes
5	IT project manager	Big multinational technology company	18	All sizes
6	IT project manager	Big multinational technology company	15	All sizes
7	IT project manager	Multinational in the telecommunication sector	16	All sizes
8	IT project manager	Multinational in the telecommunication sector	8	Small to medium
9	IT Business Analyst	Multinational in the telecommunication sector	5	Small to medium
10	IT Senior Business Analyst	Multinational in the telecommunication sector	7	All sizes
11	Senior System Analyst	Public data processing company	10	Small to medium
12	Team Coordinator	Multinational e-commerce company	16	All sizes
13	IT Project Management	Multinational security and protection company	5	All sizes
14	IT Project Management	Multinational security and protection company	6	All sizes
15	IT Project Management	Multinational security and protection company	7	All sizes
16	IT Senior Business Analyst	Multinational security and protection company	10	Small to medium

Source: Authors

After transcribing the interviews, we analyzed the collected data using the software NVIVO 10. We used codification to classify the collected data. The codes or categories were generated based on literature review as recommended by Gibbs (2008). The code categories are: IT Project Manager's Competencies and Organizational Commitment.

Based on the qualitative analysis, we defined the research constructs - IT project manager competencies and team commitment – as well as the boundaries of these constructs. We opted for studying the direct relationship between IT project manager competencies and team commitment without considering different levels of impact for each competence category, as literature shows that the project manager should combine different competences and abilities to foster team commitment and guarantee project success (Thamhain, 2004). Figure 1 illustrates the conceptual model of research.
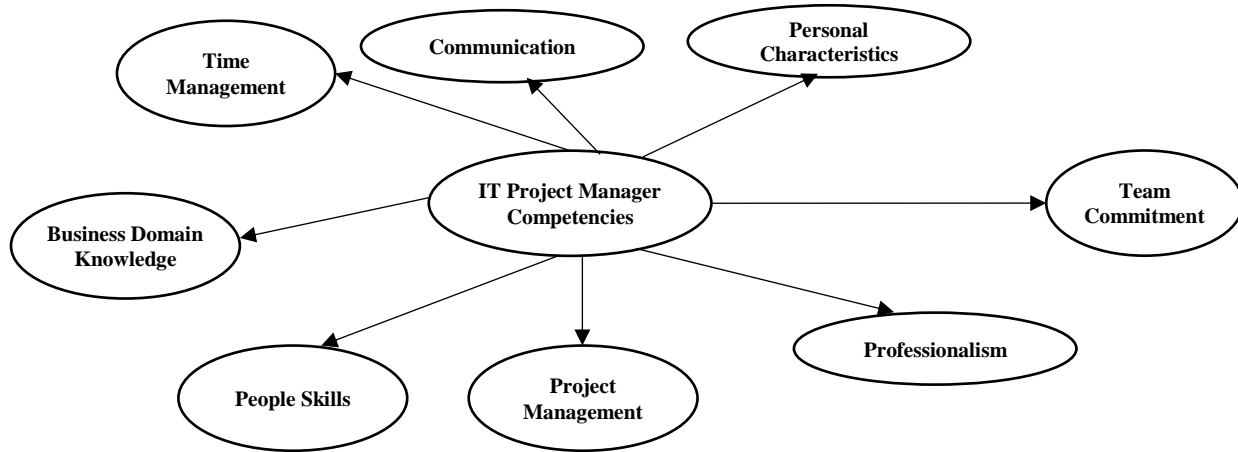

Figure 1 - Conceptual Model of the Research Constructs
Source: Authors

In the second phase of the research, we conducted a quantitative research that gave us the necessary data to design an instrument to measure the IT project manager competencies that influence team commitment. The items of the new scaled were extracted from 85-competence list. To avoid excess of scale items, we kept only the most relevant competencies according to the qualitative analysis.

To design the new scale, we adopted Slavec's and Drnovesek's (2012) procedure of scale development. Founded on the classical Churchill's (1979) paper, Slavec and Drnovesek (2012) propose a ten-step procedure. These ten steps were grouped in three stages: "(1) theoretical importance and existence of the construct, (2) representativeness and appropriateness of data collection, and (3) statistical analysis and statistical evidence of the construct" (Slavec & Drnovesek, 2012, p. 53).

In the first stage of the scale development, we focused on content domain specification, item pool generation and content validity evaluation. We defined the content domain of the new scale based on the results of the qualitative phase of the research. Then, we had six experts reviewing the scale items. Later,

the questionnaire was written and revised, translation and back-translation of the questionnaire were performed, and a pilot study with nineteen people was performed as recommended by Slavec and Drnovesek (2012). Afterwards, we added eight items related to team commitment, extracted from the study of Bishop and Scott (2000). That was necessary to verify which competencies were more related to team commitment both in the exploratory and confirmatory factor analysis (Henseler, Ringle, & Sinkovics, 2009). After performing these steps, the number of items in the scale was fifty. Appendix 1 and 2 show the scale items in Portuguese and English, respectively.

The next stage of the scale design consisted of sampling and collecting data. To apply the online survey, we used Google Forms. In the online survey, we I used a 5-point Likert-scale format that ranged from 5 (strongly agree) to 1 (strongly disagree). Before the items regarding team commitment, we added the statement "Based on what you have observed, how do team member behave in IT projects?" In turn, before the items related to IT project manager competencies, we added the statement "Based on what you have

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observed, what are the attitude and characteristics of IT project managers?"

Our target population was Brazilian IT professionals who work in project settings. Regarding the sample size, DeVellis (2003) suggests that the sample of respondents should be high and in direct proportion to the number of items. It means that, as the number of items increases, the numbers of respondents should increase as well (Hinkin, 1998). Based on that, we decided to determine the number of responses based on researches that affirm that 200 responses are necessary for confirmatory factor analysis (CFA) and other 200 responses for exploratory factor analysis (EFA) (Guadagnoli & Velicer, 1988; Hinkin, 1998). The period of data collection was from September to October, 2014. During this period, 484 valid responses were collected.

The last stage of scale development refers to the statistical analysis and statistical evidence of the construct. It involved three steps: dimensionality assessment, reliability assessment and construct validity assessment. We used the Exploratory Factor Analysis (EFA) to Confirmatory Factor Analysis (CFA) to perform dimensionality assessment as instructed by Slavec and Drnovesek (2012). We randomly split the sample in half: the first half was used to perform EFA and the remaining 242 responses were used in the CFA. To perform EFA, we used the software SPSS and to perform the CFA, SmartPLS.

4 RESULTS

Most of respondents were men, as they represented 76%; only 24% of participants were women. Regarding respondents' job position, the range of participants contained all sort of IT related occupations: systems analysts, IT company owners, executives, consultants, programmers. To comply with a primary condition of the research, all respondents worked in IT project settings. In regard to IT experience of the participants of the survey, 89% had at least five years of experience.

As already mentioned, the sample was split in two so we would perform the factorial analyses with distinct samples. Following, we present the results of statistical analysis (EFA and CFA) used to assess the dimensionality of the new scale (Slavec & Drnovesek, 2012).

4.1 Exploratory Factor Analysis (EFA)

The EFA is used to assess to which dimension the scale items (or indicators) should belong to (Zambaldi, Costa, & Ponchio, 2014). In the EFA, we excluded eleven items due to their low factorial loading (less than 0.5). We also excluded item 2 was because its communality rate was below 0.5 (0.462). In total, 12 indicators were excluded in the EFA. Table 2 lists the scale items that were excluded and the criteria according to which these items were excluded.

Table 2 - List of the scale items that were excluded in the EFA

Indicator	Item description	Reason for exclusion
TC2	Accept doing almost any task to remain in the team they are working with.	Low communality loading
PCH5	Are organized people.	Factorial loading < 0.5
PCH2	Know how to satisfy the motivations of the business and technical personnel.	
PCH3	Take decisions based on real facts instead of feelings or personal beliefs.	
TM8	Delegate power and responsibilities to team members (empowerment).	
TM2	Engage themselves to accomplish tasks spontaneously.	
TM6	Share credit for project success with their team.	
BDK7	Understand the cultural differences within the organization and know how to deal with the "unwritten guidelines".	
COMM5	Listen closely to his/her team members.	
BDK6	See the big picture and make tactical/strategic decisions that benefit the project.	
COMM2	Know how to persuade people to follow one direction rather than the other.	
PS2	Know how to satisfy the motivations of the business and technical personnel.	

Source: Authors

We checked the Barlett's Test of Sphericity and the Kaiser-Meyer-Olkin Test of Sampling Adequacy (KMO) to assess the strength of the relationship between the variables (Beavers et al., 2013) and how suitable the data is for factor analysis (Williams, Onsman, & Brown, , 2010). The Barlett's Test of Sphericity (p<0.001) and a KMO index of

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0,962 indicate that the collected data was suitable for factor analysis.

According to Hair et al. (1995 apud Williams, Onsman, & Brown, 2010) in the humanities, the total explained variance should be at 50-60%. The cumulative percentage of variance in the statistical analysis was 66.294%. To assess the relationship between the factors we used the orthogonal VARIMAX rotation method (Beavers et al., 2013). Table 3 presents the rotation matrix that derived from the statistical analysis. It is important to note that the indicators of IT project manager competencies were grouped differently from the original version of scale: indicators related to communication and people skills were grouped in the same factor, such as indicators related to professionalism and personal characteristics.

Table 3 - VARIMAX rotation matrix

Indicators	Loadings within the six factors					
	1	**2**	**3**	**4**	**5**	**6**
PROF3	0.696					
PROF2	0.688					
PROF4	0.676					
PROF5	0.634					
PROF1	0.607					
PCH1	0.595					
PCH4	0.562					
PCH6	0.550					
PM6	0.544					
TC6		0.784				
TC8		0.755				
TC7		0.755				
TC5		0.705				
TC4		0.689				
TC3		0.658				
TC1		0.648				
TM4			0.659			
TM1			0.639			
TM7			0.583			
TM5			0.567			
TM3			0.524			
PM2				0.731		
PM4				0.687		
PM3				0.672		
BDK5				0.617		
PM5				0.591		
PM1				0.576		
PS4					0.688	
PS3					0.639	
PS1					0.579	
PS5					0.562	
COMM1					0.553	
COMM4					0.536	
COMM3					0.503	
BDK3						0.732
BDK2						0.646
BDK4						0.518
BDK1						0.502

Source: Authors

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4.2 Confirmatory Factor Analysis (CFA)

As instructed by Slavec and Drnovesek (2012), the CFA was performed to assess the results of the EFA. As shown in the figure 2, the construct of IT project manager competencies was set as a construct of second order, linking the other competence categories with the construct of team commitment. Besides that, after the EFA, the model was simplified: instead of seven competence categories, the final version of the model presents five categories.
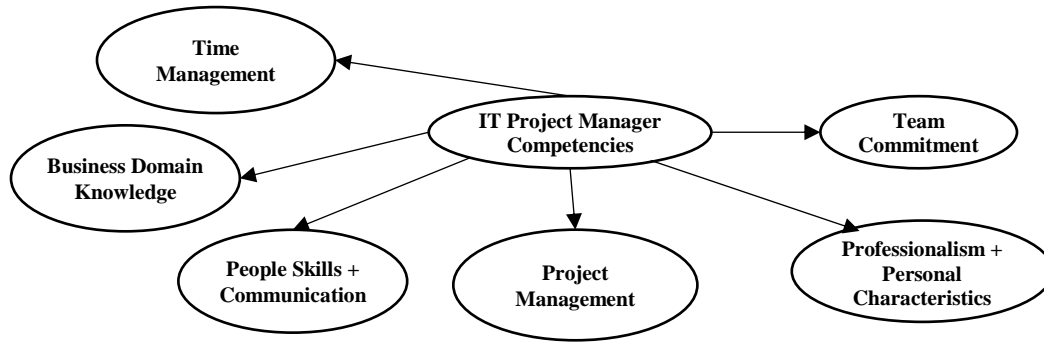

Figure 2 - The conceptual model that was tested in CFA
Source: Authors

The model is reflective as the construct of IT project manager competencies causes the measurement (covariation) of the indicators (note the arrows pointing from the variable to its indicators) (Henseler et al., 2009).

To perform the CFA, we followed the instructions of Ringle, Silva, and Bido (2014). Therefore, firstly, we assessed the convergent validity (by checking the AVE of the variables), the discriminant validity and the composite reliability. To assess the discriminant validity used verified the cross loadings the Fornell-Larcker criteria. In this step, the indicator PS1 "Manage conflicts constructively to obtain alignment within those involved in the project" was excluded.

Table 4 displays the AVE (Average Variance Extracted), the composite reliability, the coefficient of determination (R^2) and the Cronbach's alpha. As the instructed by Ringle et al. (2014), the AVE is greater than 0.50, the Cronbach's Alpha is greater than 0.70, the composite reliability is greater than 0.70. The Pearson's determination (R²) indicates that IT project manager competencies have a high effect on team commitment (44.61%).

Table 4 - Results of the CFA

Construct	AVE	Composite Reliability	R²	Cronbach's Alpha
BUSS KNOW	0.649388	0.880776	0.674762	0.819762
PROF+PCH	0.638562	0.940577	0.859282	0.928379
PROJ MANAG	0.63674	0.912997	0.745421	0.885426
PSKILLS+COMM	0.665977	0.922707	0.792392	0.899243
TEAM COMMIT	0.605509	0.914532	0.446089	0.890326
TEAM MANAG	0.596921	0.880571	0.739728	0.829887

Source: Authors

According to Fornell and Larcker (1981), the AVE of each latent variable should be higher than the square of their correlations with the other latent variables. The result of the Fornell-Larcker criterion is described in Table 5.

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Table 5 - Results of the Fornell-Larcker criterion

	BUSS KNOW	PROF+PCH	PROJ MANAG	PSKILLS+ COMM	TEAM COMMIT	TEAM MANAG
BUSS KNOW	0.80585					
PROF+PCH	0.705795	0.7991				
PROJ MANAG	0.69267	0.761576	0.79796			
PSKILLS+COMM	0.734422	0.786084	0.706382	0.81607		
TEAM COMMIT	0.415323	0.546634	0.482959	0.48668	0.77814	
TEAM MANAG	0.701584	0.743569	0.696448	0.751097	0.50713	0.77261

Source: Authors

Note: TC is the abbreviation for Team Commitment, TM for Team Management, BDK for Business Domain Knowledge, CPK for Communication + People Skills, PM Project Management, PPC for Professionalism + Personal Characteristics

The path coefficients were assessed to evaluate the causal relations of between the constructs (Ringle et al., 2014). Figure 3 presents the final model, after the adjustment and verification performed during the CFA.
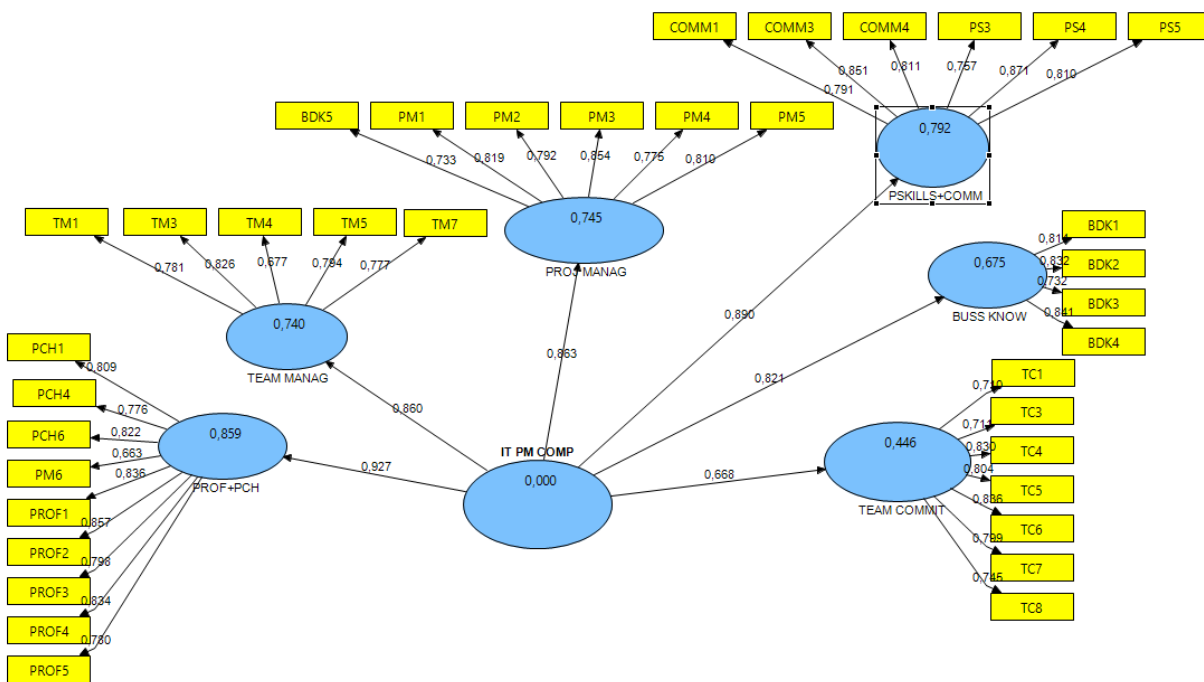

Figure 3 - Final model
Note: The numbers on the arrows represent the path coefficients (HENSELER et al., 2009)

Finally, table 6 presents the final version of the instrument, with the loadings of the indicators and the AVE of each variable. The final version of the instrument has 37 items.

Table 6 - Final version of the instrument with indicators' loadings and constructs' AVE

Construct & AVE	Indicators	Competence	Scale Item	Loadings
Team Commitment AVE= 0.605509	TC1	Not applicable	Think it is great working with team mates	0.710191
	TC3		Believe that their personal values are aligned with the values of the team they are working with.	0.710922
	TC4		Feel proud to be part of the team they are in.	0.830243
	TC5		Feel motivated to give their best for the welfare of the team.	0.804284
	TC6		Feel happy to be part of the team they are currently in.	0.836315
	TC7		Indeed care about what happens to their team.	0.798621
	TC8		Believe that the team they are in is the best place to work.	0.745244
Team Management AVE = 0.596921	TM1	Ability to motivate team members	Lead the team without being authoritarian, so that the team accomplishes the project goals with enthusiasm.	0.781006
	TM3	Ability to bridge diverse teams	Have a good understanding of each team's responsibilities and where they overlap.	0.826035
	TM4	Virtual team skills	Know how to deal with cross-cultural factors such as different time zones, international customs, holidays, traditions and distinct work ethics.	0.676567
	TM5	Share information	Share information about the project with all people involved.	0.794293
	TM7	Provide feedback	Give team members timely positive or negative feedback.	0.776954
Business Domain Knowledge AVE = 0.649388	BDK1	Ability to understand the business domain	Understand the business requirements as well as the factors that can affect the project's health instead of only focusing on the technical solution.	0.813911
	BDK2	Ability to identify stakeholders	Identify the individuals (stakeholders) that will be impacted by the project.	0.832143
	BDK3	Ability to involve end-users	Sell the project to end-users and make them accept the system.	0.732221
	BDK4	Knowledge of the end product	Understand what the end product is. How it works and what it must accomplish.	0.840529
	BDK5	Ability to document process	Document organizational processes effectively.	0.733295
Project Management AVE = 0.63674	PM1	Scope management	Manage the project scope well.	0.819065
	PM2	Project planning	With business requirements as a starting point. Create activities and precise deadlines. Avoiding penalties for not meeting these deadlines.	0.791766
	PM3	Time management	Make a good time management to prevent bottlenecks. by using appropriate techniques such as critical path analysis.	0.853888
	PM4	Cost management	Have good control of project budget and its actual costs.	0.774844
	PM5	Risk management	Identify potential risks and develop a plan to reduce or eliminate these risks.	0.809596

Construct & AVE	Indicators	Competence	Scale Item	Loadings
People Skills + Communication AVE = 0.665977	PS3	Political awareness/agility/tact	Discern and deal with political issues.	0.757305
	PS4	Good people skills	Work with and interact with all types of people in all types of situations.	0.870936
	PS5	Negotiation	Build relationships and are able to negotiate with the different people involved at distinct hierarchical levels (technical and business area).	0.809635
	COMM1	Communication	Have both verbal and written skills to communicate well with all those involved in the project.	0.791243
	COMM3	Open communication	Communicate openly in order to build trust and improve communication in all project phases.	0.850938
	COMM4	Ability to communicate at multiple levels	Are able to communicate not only with his/her team members but also with stakeholders and people from different hierarchical levels.	0.811266
Professionalism + Personal Characteristcs AVE = 0.638562	PCH1	Cooperation	Help others for the common benefit.	0.809312
	PCH4	Initiative-proactive	Have initiative and pro-activity.	0.776077
	PCH6	Transparency-honesty	Are transparent and honest.	0.82196
	PM6	Identify/expand opportunities	Identify and expand opportunities for improvement and growth.	0.662758
	PROF1	Credibility	Keep their promises and demonstrate a high level of ethics.	0.836432
	PROF2	Participate and contribute fully	Participate and contribute fully.	0.856981
	PROF3	Ownership of tasks	Are accountable for their tasks.	0.797666
	PROF4	Commitment	Are committed to the project.	0.834097
	PROF5	Experience	Know how to learn from past experiences and interaction with others professionals.	0.780312

Source: Authors

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5 DISCUSSION

Differently from the article Keil et al. (2013), the competence categories of communication and people skills were grouped into a single one and the same occurred with the professionalism and personal characteristics. Since individuals tend to take into the organization environment their cultural identity (Hilal, 2003; Hofstede, Hofstede, & Minkov, 2010), we can look at some aspects of Brazilian culture in order to understand this result. Brazilian culture is strongly relational (Hilal, 2003) and Brazilians have a high tendency to take things personally (Damatta, 1997). Therefore, it is understandable why our respondents did not separate communication abilities from people oriented abilities. Neither did they separate professionalism from personal characteristics.

According to the statistical analysis, communicating well with superiors and peers (items COMM1, COMM4), creating trust within project team members and stakeholders (COMM3), building relationships (PS4, PS5) and dealing with conflicts and political issues (PS3) are strongly correlated. These results indicate that how important is communication for IT project managers efficiency (Brière, Proulx, Flores, & Laporte, et al., 2015).

In the same reasoning, ethics, credibility, accountability and commitment (PROF1, PROF2, PROF3, PROF4, PROF5), cooperation, empathy, initiative, transparency and honesty (PCH1, PCH4, PCH6) are interrelated as well as related to the ability to identify opportunities (PM6). We can also infer the influence of our relational society (Damatta, 1997) on this result. We can also infer that leaders can use specific competencies to develop a healthy work environment that can improve team's productivity and creativity, fact that has been already depicted in other studies (Araújo, Modolo, Carneiro, & Vils, 2017;

It should be mentioned that 35.5% of respondents think that IT project managers have little or any empathy. This result may reflect a cultural characteristic of Brazilian leaders: for Hofstede et al. (2010), Brazilian business leaders tend to focus more on their own interests than on the expectations of others (i.e. stakeholders and community).

Most of the items regarding project management competencies were kept together (PM1, PM2, PM3, PM4, PM5) alongside an indicator that was originally linked to business domain knowledge (BDK5 "Document organizational processes effectively"). This result is in tune with previous studies such us Brière et al. (2015) that emphasize how fundamental are project management competencies for professionals to achieve success.

Regarding business domain knowledge it is worth mentioning that research findings are in accordance with other studies that highlight the role of project managers on aspects related to business area. Nowadays, project managers are expected to be well informed about business criteria as well as to manage the expectations from the business area (Kerzner, 2009; Rigo, Pedron, Caldeira, & Araújo, 2016). In fact, IT project managers need to develop not only their technical competencies but also their soft skills – communication, interpersonal abilities (Araújo & Pedron, 2016).

6 FINAL CONSIDERATIONS

Project manager competencies and team commitment are topics that usually are presented at the literature (Stevenson & Starkweather, 2010; Thamhain, 2013). However, we could not find a scale that would identify and measure the project manager competences that impact team commitment. Therefore, we aimed to answer the following research question: which IT project manager competencies influence team commitment? The main objective of this study was to develop and validate an instrument to measure project manager competencies and team commitment.

At the conclusion of the research, we presented a scale with five categories and thirty-seven items. The results of the statistical analysis show that the scale is very consistent and has a strong correlation with the research constructs. According to the research results, the five competence categories that impact team commitment on IT projects are business domain knowledge, communication combined with people skills, team management, project management and professionalism combined with person characteristics.

Research results are of great use for the academia and project management practice. The statistical analysis demonstrates that almost 45% of team commitment can be explained by IT project manager competencies. The implications of this finding are very relevant for the practice of project management. IT project managers should develop competencies and create ways make their teams committed to the project objectives. Otherwise, team performance can be jeopardized and potential risks can be overlooked, causing serious problems during project execution. Besides, the statistical analysis shows that the scale is very consistent and has a strong correlation with the constructs. Finally, a parsimonious model was delivered, as needless complexity was cut away and the model was reduced

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as much possible (Vandekerckhove, Matzke, & Wagenmakers, 2015).

This study also provides foundation for further studies. It offers consistent material for scholars to develop researches regarding the influence of team commitment and project manager competencies on IT project success. A limitation of this study is not measuring the relevance of project manager competencies according to project phase or culture demands of the setting project managers are inserted in (Ahadzie, Proverbs, & Sarkodie-Poku, 2014). An interesting idea for future studies is to assess the model derived from the statistical analysis empirically.

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Appendix 1 – Items used in the online survey (in Portuguese)

Indicators	Survey Items in Portuguese (regarding Team Commitment)
TC1	Acham ótimo trabalhar com seus companheiros de equipe.
TC2	Aceitam executar praticamente qualquer tarefa a fim de permanecer na equipe em que trabalham.
TC3	Acreditam que os seus valores pessoais estão alinhados com os valores da equipe em que trabalham.
TC4	Sentem orgulho de fazerem parte da equipe em que trabalham.
TC5	Se sentem motivados a dar o seu melhor pelo bem da equipe.
TC6	Se sentem felizes por integrarem a equipe em que trabalham atualmente.
TC7	Se importam verdadeiramente com o que acontece com a equipe em que trabalham.
TC8	Acreditam que a equipe em que trabalham é a melhor para se trabalhar.
TM1	Lideram a equipe, sem serem autoritários(as), para que esta cumpra os objetivos do projeto com entusiasmo.
TM2	Se engajam de forma espontânea para cumprir tarefas.
TM3	Entendem as funções de cada equipe e onde estas funções se intercalam.
TM4	Sabem lidar com fatores interculturais como diferença de fusos horários, costumes internacionais, feriados, tradições e éticas de trabalho distintas.
TM5	Compartilham informações sobre o projeto com todos os envolvidos.
TM6	Compartilham os créditos pelo sucesso do projeto com sua equipe.
TM7	Dão feedback positivo ou negativo aos membros da equipe em tempo oportuno.
TM8	Delegam poderes e responsabilidades aos membros da equipe (empowerment).
BDK1	Entendem os requisitos de negócio bem como os fatores que podem afetar a saúde do projeto, em vez de apenas focar na solução técnica.
BDK2	Identificam quais indivíduos (stakeholders) serão impactados pelo projeto.
BDK3	Vendem o projeto para os usuários finais, fazendo com eles aceitem o sistema.
BDK4	Entendem o que é o produto final, como o produto final funciona e que objetivo este produto deve cumprir.
BDK5	Documentam os processos organizacionais com efetividade.
BDK6	Veem o panorama geral e tomam decisões táticas/estratégicas que beneficiam o projeto.
BDK7	Entendem as diferenças culturais na organização e sabem como lidar com as "regras não escritas".
COMM1	Comunicam-se bem tanto de forma verbal como escrita com todos os envolvidos no projeto.
COMM2	Sabem como convencer as pessoas a seguir uma direção em vez de outra.
COMM3	Comunicam-se abertamente no intuito de aumentar a confiança e melhorar a comunicação em todas as fases do projeto.
COMM4	Comunicam-se não somente com os membros do seu time, mas também com stakeholders e com pessoas de diferentes níveis de hierarquia.
COMM5	Escutam atenciosamente os membros do seu time.
PM1	Gerenciam bem o escopo do projeto.
PM2	A partir dos requisitos de negócio, criam atividades e prazos precisos, prevendo penalidades pelo não cumprimento destes.
PM3	Gerenciam bem o tempo a fim de evitar gargalos, utilizando técnicas adequadas como por exemplo análise de caminho crítico.
PM4	Controlam bem o orçamento do projeto e seus custos reais.
PM5	Identificam potenciais riscos e desenvolvem planos para reduzir ou eliminar estes riscos.
PM6	Identificam e expandem oportunidades de melhoria e de crescimento.
PS1	Gerenciam conflitos construtivamente de modo a obter alinhamento entre os envolvidos no projeto.
PS2	Sabem satisfazer as motivações do pessoal de negócios e da área técnica.
PS3	Sabem discernir e lidar com questões políticas.
PS4	Sabem trabalhar e interagir com todos os tipos de pessoas em todos os tipos de situações.
PS5	Constroem relacionamentos e sabem negociar com os diferentes envolvidos dos distintos níveis hierárquicos (área técnica e área de negócio).
PROF1	Cumprem suas promessas e demostram alto nível de ética.
PROF2	Participam e contribuem plenamente.
PROF3	Executar suas tarefas com responsabilidade.
PROF4	São comprometidos com o projeto.
PROF5	Sabem como aprender a partir de experiências anteriores e de interações com outros profissionais.

PCH1	Ajudam outras pessoas, a fim de alcançar um objetivo em comum.
PCH2	Sabem se colocar no lugar do outro para saber como o outro se sente (empatia).
PCH3	Tomam decisões baseadas em fatos reais em vez de sentimentos ou crenças pessoais.
PCH4	Têm iniciativa e pró-atividade.
PCH5	São pessoas organizadas.
PCH6	São transparentes e honestos.

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Appendix 2 – Scale used in the online survey (in English).

Construct/ Competence	Indicators	Competence element	Scale Item
Team Commitment	TC1	Not applicable	Think it is great working with team mates
	TC2		Accept doing almost any task to remain in the team they are working with.
	TC3		Believe that their personal values are aligned with the values of the team they are working with.
	TC4		Feel proud to be part of the team they are in.
	TC5		Feel motivated to give their best for the welfare of the team.
	TC6		Feel happy to be part of the team they are currently in.
	TC7		Indeed care about what happens to their team.
	TC8		Believe that the team they are in is the best place to work.
Team management	TM1	Ability to motivate team members	Lead the team, without being authoritarian, so that the team accomplishes the project goals with enthusiasm.
	TM2	Collaboration	Engage themselves to accomplish tasks spontaneously.
	TM3	Ability to bridge diverse teams	Have a good understanding of each team's responsibilities and where they overlap.
	TM4	Virtual team skills	Know how to deal with cross-cultural factors such as different time zones, international customs, holidays, traditions and distinct work ethics.
	TM5	Share information	Share information about the project with all people involved.
	TM6	Share credit	Share credit for project success with their team.
	TM7	Provide feedback	Give team members timely positive or negative feedback.
	TM8	Give autonomy to team members	Delegate power and responsibilities to team members (empowerment).
Business domain knowledge	BDK1	Ability to understand the business domain	Understand the business requirements as well as the factors that can affect the project's health, instead of only focusing on the technical solution.
	BDK2	Ability to identify stakeholders	Identify the individuals (stakeholders) that will be impacted by the project.
	BDK3	Ability to involve end-users	Sell the project to end-users and make them accept the system.
	BDK4	Knowledge of the end product	Understand what the end product is, how it works and what it must accomplish.
	BDK5	Ability to document process	Document organizational processes effectively.
	BDK6	Strategic thinking	See the big picture and make tactical/strategic decisions that benefit the project.
	BDK7	Cultural fit	Understand the cultural differences within the organization and know how to deal with the "unwritten guidelines".
Communication	COMM1	Communication	Have both verbal and written skills to communicate well with all those involved in the project.
	COMM2	Ability to construct persuasive arguments	Know how to persuade people to follow one direction rather than the other
	COMM3	Open communication	Communicate openly in order to build trust and improve communication in all project phases.

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Construct/ Competence	Indicators	Competence element	Scale Item
	COMM4	Ability to communicate at multiple levels	Are able to communicate not only with his/her team members but also with stakeholders and people from different hierarchical levels.
	COMM5	Listening	Listen closely to his/her team members.
Project management	PM1	Scope management	Manage the project scope well.
	PM2	Project planning	With business requirements as a starting point, create activities and precise deadlines, avoiding penalties for not meeting these deadlines.
	PM3	Time management	Make a good time management to prevent bottlenecks, by using appropriate techniques such as critical path analysis.
	PM4	Cost management	Have good control of project budget and its actual costs.
	PM5	Risk management	Identify potential risks and develop a plan to reduce or eliminate these risks.
	PM6	Identify/expand opportunities	Identify and expand opportunities for improvement and growth.
People skills	PS1	Conflict management	Manage conflicts constructively to obtain alignment within those involved in the project.
	PS2	Understanding the psychology of people	Know how to satisfy the motivations of the business and technical personnel.
	PS3	Political awareness/agility/ tact	Discern and deal with political issues.
	PS4	Good people skills	Work with and interact with all types of people in all types of situations.
	PS5	Negotiation	Build relationships and are able to negotiate with the different people involved at distinct hierarchical levels (technical and business area).
Professionalism	PROF1	Credibility	Keep their promises and demonstrate a high level of ethics.
	PROF2	Participate and contribute fully	Participate and contribute fully.
	PROF3	Ownership of tasks	Are accountable for their tasks.
	PROF4	Commitment	Are committed to the project.
	PROF5	Experience	Know how to learn from past experiences and interaction with others professionals.
Personal characteristics	PCH1	Cooperation	Help others for the common benefit.
	PCH2	Empathy	Know how to put themselves in the place of another to feel what another feels (empathy).
	PCH3	Decisiveness	Take decisions based on real facts instead of feelings or personal beliefs.
	PCH4	Initiative-proactive	Have initiative and pro-activity.
	PCH5	Self-organization/self-directed	Are organized people.
	PCH6	Transparency-honesty	Are transparent and honest.

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