Information Technology, Knowledge Management and Human Resource Management: Investigating Mutual Interactions towards Better Organizational Performance

Abstract

Purpose – Drawing on dynamic capability view, this study offers a conceptual framework to clarify the nature of the effects of firm's information technology capability, knowledge management capability and human resource management capability on organizational business performance. Information technology is the driver that changes all aspects of doing business in the digital era, while both knowledge and human resources are being increasingly regarded as key levers of competitive advantage in today's global, dynamic and complex business environment.

Design/methodology/approach – The survey methodology was used to collect data. In order to clarify the relationships between information technology capability, knowledge management capability and organizational business performance, the qualitative literature review has been conducted. This review has revealed the three structural models presenting possible interactions between observed constructs. Confirmatory Factor Analysis has been used for the evaluation of proposed measurement models while Structural Equation Modeling has been employed for structural models assessments as well as hypotheses testing.

Findings – IT capability enhances HRM capability which enhances KM capability. As a result, KM capability together with IT capability enhance organizational business performance. In addition, there is an interaction effect of KM capability and HRM capability on business performance.

Research limitations/implications – First, the sample is based on the emerging economy firms. Second, the use of a self-rating performance measure may be a limitation of the study. Third, the data is not completely normally distributed. Fourth, specificities of different industries were not the subject of analysis in this paper. This should be taken into account in the interpretation and understanding of the results.

Practical implications – From managerial, the paper indicates what managers can do to master their dynamic capabilities, especially those relevant to the business in the digital era. Firms are urged to develop and improve their capabilities in order to face dynamic environment and intense competition, as well as business globalization. However, to improve certain capability, firms should develop others as well because of their interconnectedness.

Academic implications – The main academic contribution of this study is reflected through the development of the integrative model which is aimed at identifying the interrelationships among IT, KM, HRM and business performance. The results indicate the importance of observing interconnections between the firms' various capabilities to verify the premise of the dynamic capability view.

Originality/value – This paper identified relationships between most prominent firm's resources for the Digital era: knowledge, human resources, and information technology. The results show causes and effects relationships between capabilities related to these resources.

Keywords: Information technology, human resource management, knowledge management, dynamic capability view, knowledge-based economy/digital era, SEM

Paper type: Research paper

1 Introduction

A rapidly changing business environment characterized by the globalization and ever-increasing customers' demands and competition pursue firms to improve their performance continually. In such environment, improvements are possible by innovating products and processes and improving quality, productivity, and speed to market (Becker and Gerhart 1996). Furthermore, it is recognized that tangible assets are not as important for a firm like it was before considering business performance and competitiveness. Nowadays, information technology and people together with their knowledge are most valuable firm's assets.

Information technology (IT) is the key driver that reshapes all aspects of doing business in the digital era (Brynjolfsson and Kahin 2000), while both knowledge and human resources are being increasingly considered as key enablers of competitive advantage in today's global, dynamic and complex business environment (Brachos, Kostopoulos, Soderquist, and Prastacos, 2007; Oltra, 2005). Human resources management (HRM) and knowledge management (KM) are considered critical segments of firm's management for achieving competitiveness and superior business performances. It is clear that modern information technology and globalization has been changing business rules in the 21 century. Knowledge has become the most strategically significant resource of a firm because of its heterogeneity and immobility (Chen and Fong, 2013). This raises very important questions such as whether human resource management or knowledge management plays a central role in a firm regarding learning and knowledge creation and whether HRM or KM contribute more to business performance? Besides, the mutual causal relationship between these two capabilities represents an important phenomenon for managers and scholars.

Some scholars are concerned with human capital as holders of the knowledge, while others deal with the knowledge itself without involving HR. The third group addressed both HRM and KM; they argued that a) knowledge is dependent on people and b) HRM practices are fundamental for KM in firms (Oltra, 2005). Some of them have tried to explain the role of HRM in KM (Soliman and Spooner, 2000; Yahya and Goh, 2002), which led to the even greater interweaving of KM and HRM practices. As a consequence of this reasoning, a significant research gap is observed concerning the empirical confirmation of KM and HRM delimitation and precise definition of their roles in knowledge creation and their mutual relationship, especially regarding the widespread use of information technology. Most of all, it is necessary to elucidate whether KM or HRM contribute more to business performance.

Thus, the objectives of this study are as follows: to investigate the possibility of drawing a line between HRM and KM; to assess which of these two management segments contribute more to business performance; and to analyze the relationship between them together with IT, i.e., to determine where HRM meets KM. In other words, this paper aims to suggest a conceptual framework that links HRM, KM, IT and business performance.

2 Theoretical background and literature review

2.1 Dynamic capability view

"Why are some companies more successful than others?" is the question of interest of many scholars for decades. One of the dominant theories in this field is the "Resource Based View" - RBV (Lockett, Thompson, and Morgenstern, 2009; Barney and Clark, 2007; Lavie, 2006). According to this theory, the superior firm's performance depends on the resources that firm owns and uses in its operations. However, due to changes in business environment resulted from several types of development trends such as those in information technology and the globalization of business, recent studies highlighted the difference between tangible assets, i.e., physical capital, and intangible assets such as organizational routines and capabilities. Thus, Teece, Pisano, and Shuen (1997) noted that only those firms that have abilities to effectively coordinate and redeploy internal and external competencies and resources to timely respond to changes in the business environment could be the winners in the global marketplace. They started from the resource-based perspective under a dynamic context and proposed

the "Dynamic Capability View" - DCV, according to which firm's success depends on its ability to renew competencies to achieve congruence with the changing business environment (Teece, Pisano and Shuen, 1997). Dynamic capabilities are defined as the firm's abilities to integrate, build, and reconfigure internal and external competences and resources to address a rapidly changing environment (Wang, Klein and Jiang, 2007).

Information technology is the driver that reshape all aspects of doing business in the digital era (Brynjolfsson and Kahin 2000), while both knowledge and human resources have been increasingly regarded as key levers of competitive advantage in today's global, dynamic and complex business environment (Oltra, 2005). Thus, when it comes to the digital era, information technology (Brynjolfsson and Kahin 2000), knowledge (Zhao, Lu, and Wang, 2013; Titi Amayah, 2013; Beijerse, 1999) and human resources (Kianto, Andreeva and Pavlov, 2013) are recognized as the most valuable resources for firms. The dynamic nature of particular resources is identified in many studies (Chase, 1997; Tallon, 2008; Lim, Stratopoulos, and Wirjanto, 2011; Zhao *et al*., 2013; Villar, Alegre, and Pla-Barber, 2014; Chang and Lin, 2015).

2.2 Information Technology

The World economy has undergone a fundamental structural change driven by globalization of business and by the revolution in the information and communication technology (Pohjola, 2002). The new economy is a superior economic structure that is the result of these two trends. This economy has set new rules and new ways of doing business, and its fundamental feature is omnipresence of information technology. Information technology automates business operations, reduces costs, and enables the internationalization of business (Li *et al.*, 2006), i.e., it enables exploiting the opportunities of globalization. Firms must adapt to the development of technology as electronic connections within and between companies are changing the way that companies acquire and purchase inputs or factors of inputs, turn them into products and services and distribute outcomes to its customers (Melville, Kraemer and Gurbaxani, 2004). In other words, information technology has become an integral part of all business functions.

Crawford *et al*. (2011) stated that the key challenge for companies considering information technology is to define and determine IT accurately and that the usual way of conceptualizing information technology within firms is through IT capability (Tippins and Sohi, 2003; Chakravarty, Grewal, and Sambamurthy, 2013). IT capability refers to the way firms use information technology to successfully manage information resources (Tippins and Sohi 2003). The term *IT capabilit*y includes possession of information technology and its appropriate use for satisfying the information needs of companies (Mithas, Ramasubbu and Sambamurthy, 2011).

IT capability can be seen as a construct of three dimensions: IT knowledge, IT operations and IT infrastructure, each of which helps the utilization of IT investments (Crawford, Leonard and Jones, 2011).

- *IT knowledge* refers to the extent to which firm understands the abilities of existing and new technologies and the level of employees' skills to use computer-based technology.
- *IT operations* are related to IT-based methods, processes, and techniques that are required to make technology creating the value. In other words, those are business activities whose implementation is supported by information technology.
- *IT infrastructure* relates to the technology itself, i.e., tools and resources that contribute to the acquisition, processing, storage, dissemination and use of information. In other words, IT infrastructure includes elements such as hardware, software and support staff (Pérez-López and Alegre 2012) as well as the level of firm's investment in the IT (Crawford, Leonard and Jones, 2011).

2.3 Knowledge management

As one of the results of the rapid growth of information and communication technology and the new economy, competitive advantage is increasingly based on the successful application of knowledge (Glot, 2006).

Gray (2001) denoted that common denominator of knowledge management literature is that knowledge management deals with the organizations as aggregations of knowledge stocks and knowledge flows. Most scholars agree that KM involves processes and strategies for the identification, acquisition, and exploitation of knowledge. In other words, knowledge management involves processes for knowledge acquisition, knowledge conversion and knowledge application (Ju, Li, and Lee, 2006; Liao and Wu, 2009; Cui, Griffith, and Cavusgil, 2005). Therefore, KM capability can be seen as a company's dynamic capability for creating and modifying its knowledge resources over time or it is the ability of a company to acquire, converse and apply knowledge (Ju, Li and Lee, 2006).

- *Knowledge acquisition* is the process that company uses for obtaining new information and knowledge (Jimenez-Jimenez and Sanz-Valle 2013). Liao and Wu (2009) defined knowledge acquisition as the process to seek and acquire new knowledge which involves the creation of new knowledge out of existing knowledge through collaboration between individuals and business partners.
- *Knowledge conversion* is defined as company's ability to make knowledge useful (Liao and Wu, 2009; Gao, 2006). Some of the processes that potentiate knowledge conversion are knowledge integration, organization, structuring, combination, distribution and coordination (Gao, 2006).
- *Knowledge application* refers to the application of existing knowledge for the production of goods and services (Grant, 1996) or for the processes that enable the realization of the knowledge practical values (Lee, Kim, and Kim, 2012).

2.4 Human resource management

Many scholars have agreed that knowledge management depends upon people, but Hislop (2003) pointed out the noticeable paradox that many studies neglected human factor while analyzing KM. However, obtaining valuable and unique knowledge is not possible without HRM and knowledge-based practices that enable the internal development of human resources (Lopez-Cabrales, Perez-Luno and Cabrera, 2009). Thus, Lopez-Cabrales *et al*. (2009) highlighted the "human capital advantage" importance which is the result of valuable and unique characteristics of employees which allow firms to obtain valuable and unique knowledge. Therefore, companies have to apply appropriate human resource management practices for managing people to exploit its possibilities and to achieve the human capital advantage. One of the most important features of HRM is to manage employees in order to achieve better performance (Demo *et al.*, 2012).

HRM practices refer to specific selection, training, development, appraisal, and compensation practices (Mohanapriya and Sasikala 2015). Thus, HRM can be defined as an integrated approach and planned development process for efficient utilization of human resources for the achievement of company's objectives (Lee *et al*., 2010). Following this, HRM capability is conceptualized as the company's ability to implement HR strategies, plans, and policies, and to develop human resources. HR practices are the primary means by which firm can influence and shape the skills and behavior of individuals to steer them to work in a way that contributes achieving the company's goals (Prieto and Pérez-Santana 2014).

- *Selection and recruitment* refer to the selection criteria in the recruitment processes. Specifically, it is necessary for companies to develop adequate selection criteria for new employees considering the ability of individuals to create and share knowledge. The aim of the selection process is hiring the best persons in terms of their potential to learn and develop.
- *Training* present the level of formal education and training that company provides to its employees. Training focus can be on development either technical or *soft* skills such as teamwork, leadership or presentation skills.
- *Participation of employees in decision-making* refers to the HR practices that encourage employees to participate in the decision making processes. These HR practices enable better-informed employees of all business processes in the enterprise and create a sense of belonging

among the staff.

- *Compensations and rewarding* refer to the system of compensation for promoting equality among employees, and it includes incentive programs whose primary goal is the promotion of company's goals. In defining these measures, it is necessary to take into account that they promote flexibility, teamwork and the creation of new knowledge among employees.

3 Research models

In order to clarify the relationships between observed constructs, we divided literature review into 2 steps. First, drawing on DCV and its premise that dynamic capabilities influence organizational business performance positively, we have checked for studies that analyzed direct impact of ITC, KMC, and HRC on business performance. Second, we reviewed studies that have offered other conceptual models and causal relations between observed constructs.

The literature review revealed the need to analyze three structural models:

- Model 1: the analysis of direct impacts of ITC, KMC, and HRC on BP.
- Model 2: addresses moderating role of HRM capability.
- Model 3: considers interconnections between observed capabilities adopted from other empirical studies.

3.1 Model 1: dynamic capabilities and business performance

Based on the dynamic capability view, this paper addresses the impact of dynamic capabilities (IT capability, KM capability, and HRM capability) on company's business performance. According to this theory, dynamic capabilities positively influence organizational business performances. Thus, IT capability, KM capability and HRM capability should impact firm's business performance positively:

H1. ITC positively influences organizational business performance;

H2. KMC positively influences organizational business performance; and

H3. HRM positively influences organizational business performance.

3.2 Model 2: moderation effect of HRM capability

Model 2 has H1 and H2 same as Model 1 with the change of H3. Specifically, the literature review revealed some studies suggesting the moderating effect of HRM on the relationship between KM and BP. Because of the growing importance of knowledge in the dynamic business environment of the digital era, the relationship between knowledge management and organizational business performance is increasingly a subject of interest to scholars and managers (Liao, 2011). Most of the early KM studies were focused on technological issues of KM. However, some recent studies recognized the importance of human factor in knowledge management. Thus, Liao (2011) proposed that HRM control systems contribute the relationship between KM and organizational performance, i.e., HRM positively moderates the KMC-BP relationship. In other words, the interaction of KMC and HRC is related to better firm performance. In light of this proposition, and in addition to the two hypotheses from the Model 1, the third hypothesis is suggested as follows:

H1. HRM capability moderates the relationship between KM capability and business performance.

3.3 Model 3: interconnections between observed capabilities

In order to provide a broader insight into the prerequisites of superior organizational performance, it is necessary to analyze the possible interactions, moderators, and interconnections between observed constructs. This more comprehensive analysis is important because it gives a general overview of the interactions between

firm's capabilities and enables understanding of antecedents of the successful business. Thus, relationships are defined following the analysis of previously published studies and the results of empirical analysis taking into account the possible interconnection and mediations of the observed capabilities in relation to business performance. Systematic literature review determined the following theoretical causal relationships between observed constructs:

H1. IT capability positively influences KM capability.

H2. IT capability positively influences HRM capability.

H3. HRM capability positively influences KM capability.

H4. IT capability positively influences business performance.

H5. KM capability positively influences business performance.

IT capability and KM capability

The relationship between information technology and knowledge management is based on the premise that IT enhances KM in a way that it facilitates sharing of information and knowledge. IT supports KM using various technologies such as intranets, databases, document management systems, search engines, groupware, decision support systems and data warehouses (Wang, Klein and Jiang, 2007). Technology represents key facilitator that enable explicit knowledge to be formalized and articulated as well as codified (Chen and Huang, 2012). IT support for KM allows an organization to create, store, share, and use knowledge more effectively and efficiently (Wang, Klein and Jiang, 2007). Wang *et al*. (2007) discussed that IT influences KM in a way that it enhances firm's capability of handling their knowledge to cope with the changing business environment and, in turn, influences firm performance. Tsui (2005) highlighted the importance of relevant technologies for KM considering that it is becoming more and more process-centric. Thus, following hypothesis is proposed: IT capability positively influence KM capability.

IT capability and HRM capability

Information technology has had a profound impact on almost all business functions within firms. It is widely recognized that HRM function is influenced by the development and use of IT (Stone, Deadrick, Lukaszewski, and Johnson, 2015; Parry and Tyson, 2011). This irrefutable premise is based on the use of information technology in HR processes and the fact that IT has transformed the way firms collect, store, disseminate and use information about employees. Information technology increases both the amount and quality of information within firms. In light of this, there is some empirical evidence on the positive impact of IT usage on HR practices. Thus, Black and Wiliam (2008) gave empirical support for the relationship between IT and HRM. Based on these premises and stark empirical support, the following hypothesis is proposed: IT capability positively influences HRM capability.

HRM capability and KM capability

Knowledge management is about developing, sharing and applying knowledge within a firm to gain and sustain a competitive advantage (Edvardsson, 2008). These processes depend on people and HR practices, such as recruitment and selection, education and development, employees' participation as well as compensation and reward (Oltra, 2005; Carter and Scarbrough, 2001). Oltra (2005) has considered people-oriented KM highlighting that people and knowledge are two concepts inextricably joined. Several scholars proposed the relationship between HRM and KM based on the literature (Jimenez-Jimenez and Sanz-Valle, 2013; Glot, 2006; Hislop, 2003). However, stronger empirical confirmation is required. Therefore, based on the proposition of several authors, the relationship between HRM and KM is proposed: HRM capability positively influences KM capability.

4 Research methodology

Following the deductive approach, this study has begun with the analysis of literature relevant to the topic and context of the research and identifying the gaps in the literature, research topics, hypotheses, objectives, and methodology framework. When it comes to data collection process, empirical analysis is based on primary data collected through a survey conducted among small, medium and large firms from all industries. Confirmatory factor analysis (CFA) was used to verify the reliability and validity of the measurement models, while the structural equation modeling (SEM) was used to test and analyze the structural models and hypotheses (Hair *et al.*, 2010).

4.1 Measures

The survey measures for the analysis were adopted from previously published studies. The psychometric properties of the measurement models were estimated following accepted practices: content, nomological, discriminant and convergent constructs validities (Anderson and Gerbing 1988). Testing content and nomological validity were conducted during and after the operationalization of the measurement models. All indicators are carefully checked in terms of text, specificity and length to ensure the relevance for the research context.

One of the objectives of this paper is to present the roles of KM and HRM in acquiring knowledge separating its processes. Considering the fact that the education is regarded as part of HR practice, and that the education are the primary forms of knowledge acquisition, the question regarding HRM and KM role in the knowledge acquisition rises. Therefore, the literature review is conducted in order to mark off the HR and KM practices related to knowledge. The main conclusion is that it is not easy to draw a line between HR practices related to the training and education and KM practices related to the knowledge acquisition. The only difference between these practices is reflected in the accentuation of the certain practice's objectives. Development of employees and their learning is the primary goal of HR practices related to education. On the other hand, the accentuation of KM practices related to the knowledge acquisition is the collection of knowledge into the organizational knowledge base, i.e., organizational learning. However, this is not the rule.

All indicators of measurement constructs are measured by the Likert scale ranging from 1 - "completely disagree" to 7 - "completely agree". Measuring models used in study are:

- *IT capability* is a second-order reflective model consisting of three first-order constructs: IT knowledge, IT operations and IT infrastructure. Items are adopted from Tippins and Sohi (2003) consulting Pérez-López and Alegre (2012) and Kmieciak, Michna, and Meczynska (2012) and taking care about the conceptual definition of each construct.
- *KM capability* is a second-order reflective construct consisting of three first-order constructs: knowledge acquisition, knowledge conversion, and knowledge application. Indicators are adopted from the study by Liao and Wu (2009).
- *HRM capability* is a second-order reflective measurement model consisting of four first order constructs: hiring, strategic training and education, the participation of the employees in the decision making, and compensation and rewarding. Items are adopted from the Perez Lopez *et al*. (2005).
- Organizational *business performance* is a first-order reflective measurement model consisting of five indicators adopted from Chen, Tsou, and Huang (2009).

4.2 Sampling

The formal survey was conducted in the emerging economy context of South Eastern Europe. In order to achieve the objectives of the research, companies of all industry sectors are selected as a population for the analysis. Since observed constructs are companies' dynamic capabilities related to the human resources, knowledge and information technologies, the topic is relevant and important for all industrial sectors. In light of that, it is accepted to include all industries and business sectors to the analysis. Based on the available online data

of active firms, 2,966 contacts were collected randomly. Invitations for participation in the study are sent by email with the link to the questionnaire and a cover letter. LimeSurvey software is used for data collection. Respondents were managers of the highest level who are familiar with the organizational capabilities and performance. After exclusion of observations that had more than 20% missing data (Hair *et al.*, 2010) and companies that reported to have less than ten employees (micro firms), 395 observations were used for the analysis, which is 13.32% of the total invitations. Chi-square test showed that non-response bias is not a problem for this study ($\chi 2 = 3.324$, $p = 0.344$). Firms that responded after the first call and those responded after the second reminder were compared based on firms' size and test revealed insignificant result.

Determining sample size is usually done based on the number of variables. Hair, Black, Babin, and Anderson (2010) stated that this relationship should not be less than 5:1, i.e., at least 5 observations per 1 variable. Some scholars determined the minimum number of observations as a prerequisite of sample size adequacy depending on the technique to be used for the analysis. For structural equation modeling, most of the scholars consider 200 observations as a minimum sample size (Comrey, 1988). The sample in our research consisted of 395 observations, which meets the rule on the minimum number of observations. Also, the ratio of the number of manifest variables in the model to the number of observations is 9.9 observations per one manifest variable, which can be considered as the adequate ratio, i.e., proper sample size.

Table 1. Sample demographics

Indicator	***Contents***	***Sample***	***%***
Firm size	Small	161	40.76
	Medium	158	40.00
	Large	63	15.95
	N/A	13	3.29

5 Results and Discussion

Assessment of the proposed models has been done through the two-step approach (Anderson and Gerbing 1988). Since the proposed conceptual model consists of five measurement models, their reliability and validity have been tested using a confirmative factor analysis (CFA). Then, the structural models have been tested using structural equation modeling (SEM) technique. SEM represents the multivariate method of combining factor analysis and multiple regression allowing the simultaneous analysis of interconnections between the measured variables and latent constructs, but also between multiple latent constructs (Hair *et al.*, 2010).

For the purpose of identifying outliers, univariate (Z-value is calculated) (Tsai, Chou and Kuo, 2008) and multivariate (Mahalanobis D^2 method is used) analyses were performed (Grottke *et al.*, 2008). It was found that there are no significant outliers and all observations are retained for the analysis.

Data were tested for normality assumption by using skewness and kurtosis measures. The results show that the data are not completely normally distributed. For this reason, maximum likelihood (ML) estimation technique has been used. Diamantopoulos and Siguaw (2000) stated that the ML technique is relatively robust to moderate deviations from the normal distribution with the sample of 100 or more observations. Homoscedasticity was tested using Breusch-Pagan test, whose null hypothesis is related to the existence of homoscedasticity. Results suggested data homoscedasticity ($B=1/2*0.031017=0.0155085$; $p=0.901$).

5.1 Reliability and validity

Evaluation of reliability and validity of the measurement models has been done by using SPSS 22. Reliability was tested by using Cronbach alpha coefficient (a value of 0.7 or more), and composite reliability (CR) coefficient which assesses whether the given indicators are sufficient to represent a suitable construct (should be higher than 0.7 as well). Discriminant and convergent validities of constructs are analyzed with composite reliability (CR) and average variance extracted (AVE) coefficient. CR should be greater than 0.7, and

AVE should be greater than 0.5 (Fornell and Larcker, 1981; Hair *et al*., 2010). Convergent validity confirms that each measuring construct correlates with other constructs of the same measurement model while discriminant validity ensures that the measurement construct is nevertheless sufficiently different from the other constructs to stand by itself.

Therefore, with the aim of testing dimensionality and fit of measurement models, confirmative factor analysis (CFA) was applied. Results of CFA showed that the models have an acceptable good fit regarding the absolute and incremental indices. Results are presented in Table 2.

Table 2. The fit indices analyses of measurement models

Fit index	***ITC***	***KMC***	***HRC***	***BP***	***Reference threshold***
χ^2	72.488	131.630	131.504	7.749	
χ^2/df	2.27 (df=32)	2.58 (df=51)	2.74 (df=48)	1.55 (df=5)	*<3 (<5)*
RMSEA	0.0567	*0.0633*	*0.0664*	*0.0374*	*<0.08*
SRMR	0.0293	*0.0289*	*0.0355*	*0.0112*	*<0.08*
NFI	0.985	*0.984*	*0.973*	*0.995*	*>0.95*
NNFI	0.988	*0.987*	*0.976*	*0.996*	*>0.95*
CFI	0.991	*0.990*	*0.982*	*0.998*	*>0.90*

Table 5 presents Cronbach's alpha values for the scales as a confirmation of reliability (>0.7). In addition, all factor loadings are greater than 0.5 (Hair *et al.*, 2010) suggesting convergent validity. Discriminant validity is tested by comparing the values of the square root of AVE values with constructs correlations (table 6). In conclusion, the reliability and validity, as well as overall fit have been demonstrated by CFA results.

5.2 Structural models and hypotheses tests

The structural models are evaluated using LISREL 8.8. In order to accept proposed model, it has to fit the data. Goodness-Of-Fit (GoF) indices that are used to check the models are: the chi-square normalized by the degree of freedom (χ2/df), the root mean square error of approximation (RMSEA<0.08), the standardized root mean square error of approximation (SRMR<0.08), normed fit index (NFI>0.95), Bentler–Bonnet non-normed fit index (NNFI>0.95), and comparative fit index (CFI>0.90). Threshold values indicated in brackets are adopted from Hair, Black, Babin, and Anderson (2010) and Chang and Lin (2015).

5.2.1 Model 1 analysis

Model 1 is proposed in accordance with the main premise of dynamic capability view, i.e., that dynamic capabilities enable companies to achieve superior business performance. Following that, observed capabilities are treated as exogenous variables while business performance is considered as the endogenous variable.

The results of this analysis, i.e., absolute and incremental fit indices are in the threshold intervals indicating that proposed structural model fit the data well (χ2/df=2.11; RMSEA=0.053; SRMR=0.049; NFI=0.967; NNFI=0.981; CFI=0.983). After confirming that the model fit is acceptable, an analysis of the hypotheses has been conducted. We conclude that the results support the causal relationship between IT capability and business performance (β=0.197, t=2.443, p<0.01). However, relationships between KM capability and business performance (β=0.252, t=1.340) and between HRM capability and business performance (β=0.088, t=0.455) are not supported. A possible reason for this can be found in the interconnectedness of these two capabilities, which weakens their influence on the dependent variable (Baron and Kenny 1986). Because of this, it is of great importance to analyze the model 2, i.e., interaction effect of KMC and HRM on BP.

5.2.2 Model 2 analysis

As the results indicate the insignificant impact of KMC and HRC on business performance, the possible explanation can be found in the existence of interaction effect of these two variables on business performance. Some earlier studies suggest moderating role of HRM capability between KM capability and business performance (Liao, 2011). Thus, to analyze a possible moderating role of HRC between KMC and business performance, another model is introduced and tested following residual centering unconstrained approach (Steinmetz, Davidov and Schmidt, 2011). To reduce the number of variables in the model, i.e., to shift second-order measurement models into first-order models, it was decided to create composite variables. Therefore, the first-order constructs' indicators of HRC and KMC are aggregated into one item by calculating their mean value (Bandalos, 2002). After this, two step residual centering approach is conducted:

1. Indicators of HRC and KMC are multiplied using the SPSS 22. 12 new variables have been created and then regressed on all HRC and KMC indicators. The unstandardized residuals of these regressions were saved in the data file.
2. Model with interaction effect is tested, and saved residuals were used as indicators of a latent interaction variable. For each latent variable, one factor loading was fixed to unity to provide a scale for the respective latent variable. Furthermore, the error of the residual product indicators resulting from the multiplication of the same first-order effect were allowed to correlate (Steinmetz, Davidov and Schmidt, 2011).

Results of model fit analysis, i.e. the absolute and incremental fit indices determined good fit (χ^2=800.05, df=486, RMSEA=0.040, SRMR=0.039, CFI=0.987). An analysis of the hypotheses is conducted, and results are presented in Table 4.

Table 3. Structural parameter estimates for Model 2

Structural relationship	***Unstandardized parameter estimate***	***Standardized parameter estimate***	***t-value***
ITC → BP	0.212	0.174	2.101***
KMC → BP	0.310	0.302	1.749*
HRC → BP	0.0699	0.052	0.288
MOD → BP	0.0953	0.136	2.668***

***p<0.01; **p<0.05; *p<0.1

The main conclusion of the Model 2 analysis is that HRC strengthens the positive relationship between KMC and BP. Table 4 shows the parameter estimates that confirm significant interaction effect of KMC and HRC on BP. This means that HRC moderates the relationship between KMC and BP. In addition, Figure 1 shows the effect of HRC on the relation between KMC and BP. We can conclude that HRC has not relevant positive effect on organizational business performance when the level of KMC is low. However, as the level of KMC increases, HRC has a greater impact on business performance. That is, as the firm's knowledge management capability grows, HR practices become increasingly relevant.

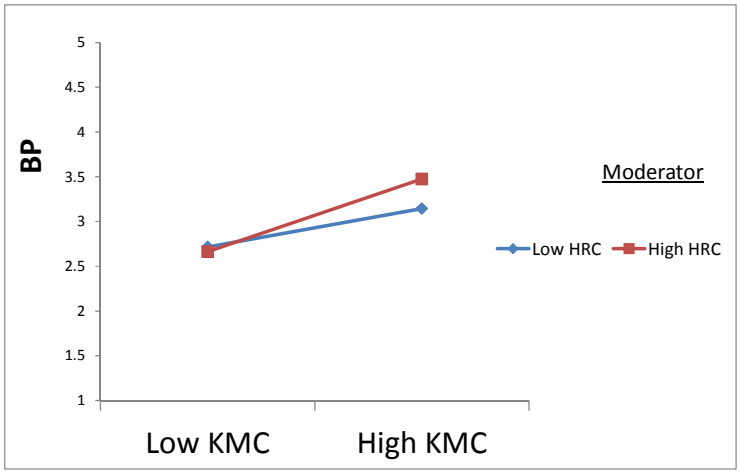

Figure 1. Interaction effect of KMC and HRC on BP

5.2.3 Model 3 analysis

Instead of three hypotheses between observed capabilities, we included two additional relationships: the relationship between IT capability and business performance (significant in both Model 1 and Model 2) and the relationship between KM capability and business performance (significant in Model 2). Evaluation of GoF indices for Model 3 has been done and all parameters indicate that model fits the data well (χ^2=1,446.254; df=687; RMSEA=0.0530; SRMR=0.0495; CFI=0.983).

In addition, structural parameters are estimated indicating acceptance of four out of five hypotheses. That is, IT capability positively predicted HRM capability and so H2 is accepted (p<0.01). The link between HRC and ITC was conceptually supported in the literature, although not well supported with empirical evidence. Therefore, this research confirmed earlier conceptualizations that HRM function is positively influenced by the development and use of IT (Stone *et al.*, 2015). Furthermore, a widely held view that KM processes depend upon people and HR practices (Jimenez-Jimenez and Sanz-Valle 2013) is confirmed with this study highlighting the importance of human-based KM (Oltra, 2005). At the other side, KMC and ITC have direct positive impact on organizational BP. Thus, this study confirms that a firm with greater ITC, KMC and HRC is more successful. The results reported in this paper are important because they show that, in order to achieve greater business performance, developing dynamic capabilities related to IT, HR and KM are of great importance for a firm in the digital era. There is no support for the hypothesis that IT capability impacts KM capability. That is, firms with greater ITC do not necessarily have greater KMC. A possible reason for this result is the existence of a mediation construct between ITC and KMC.

Table 4. Structural parameter estimates for Model 3

Structural relationship	***Unstandardized parameter estimate***	***Standardized parameter estimate***	***t-value***
H1. ITC → KMC	0.104	0.096	1.549
H2. ITC → HRC	0.615	0.699	8.806***
H3. HRC → KMC	1.032	0.840	8.676***
H4. ITC → BP	0.251	0.206	2.625***
KMC → BP	0.372	0.331	4.171***

***p<0.01; **p<0.05; *p<0.1

Firms' size (number of employees) and age (number of years since firm's establishment) were included as control variables in all of three models (Goktan and Miles 2011). Level or organizational capabilities may differ between firms depending on size, because larger firms may be more likely to use sophisticated practices.

The age was included to control for any advantages associated with increased time for the evolution and accumulation of observed capabilities. However, they were not significantly related to the dependent variable (business performance). Therefore, greater representation depending on the firm's size or age should not affect results in this study, i.e., the firm's size and age do not explain the differences in business performances among firms (Yang, 2010). Consequently, control variables were not retained in the analysis.

6 Conclusion, Implications and Limitations

Guided by DCV and empirical results, as well as propositions of previous studies, the three structural models are proposed and empirically tested. We can conclude that observed capabilities are prerequisites of superior business performance for firms doing business in the digital era.

The relation between HRM and KM is quite interesting among researchers. However, there is a lack of empirical confirmation of this relationship and their simultaneous impact on organizational performance. Especially, if IT is taken into account together with HRM and KM. Furthermore, many scholars have tried to explain the role of HRM in KM (Soliman and Spooner, 2000; Yahya and Goh, 2002), which led to the even greater entanglement of KM and HRM practices. It is quite hard to say where HRM meets KM, or where HRM stops and KM starts when it comes to some organizational practices. Thus, this study tries to provide empirical evidence on those issues contributing to the dynamic capability theory, IT, KM and HRM literature. Based on the premises of DCV and propositions of earlier studies, three structural models are developed and empirically tested. In terms of information technology, the key contribution is the identification of the relationship with business performances and HRM. In other words, this paper answered the important question: "Whether to invest in IT?" and gave empirical confirmation that investment in IT together with its application in business operations, as well as the development of IT, related knowledge would positively influence business performance. The results indicate the importance of observing interconnections between the firms' various capabilities to verify the premise of the dynamic capability view.

This research indicates what managers can do to master their dynamic capabilities, especially those relevant for businesses in the digital era. Companies are urged to develop and improve their capabilities in order to cope with the dynamic environment and intense competition as well as business globalization. This emphasizes the human-related KM aspect because, with appropriate HR practices, employees will contribute to the KM processes with their knowledge. Finally, IT together with HRM and KM will enhance business performance, i.e., firm's success.

However, the results should be interpreted in light of the study's limitations and provide some future directions for research. First, the sample is based on the emerging economy firms. Although it is possible that the model can be replicated in a developed country, it should still be confirmed by additional research. Second, the use of a self-rating measures may be a limitation of the study, especially measuring business performance with imprecise items regarding the period. Third, the data is not completely normally distributed. However, to mitigate the consequences of this violation, ML estimation technique is used, for which is in many earlier studies confirmed to be robust to moderate deviations from the normal distribution if the sample contained 100 or more observations (Anderson and Gerbing, 1988; Browne, 1984). Finally, the proposed conceptual models deserve further research, which should take into account the specificities of different industries.

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Appendices

Table 5. Survey Measurement Scales

*Table 6. Discriminant Validity Test**

	ITK	ITO	ITI	KMA	KMC	KMP	HRE	HRT	HRD	HRR	BP
ITK	**0.821**										
ITO	0.774	**0.796**									
ITI	0.719	0.778	**0.759**								
KMA	0.525	0.567	0.527	**0.792**							
KMC	0.470	0.508	0.472	0.739	**0.889**						
KMP	0.486	0.525	0.488	0.764	0.684	**0.837**					
HRE	0.453	0.489	0.455	0.631	0.565	0.584	**0.816**				
HRT	0.525	0.567	0.527	0.731	0.655	0.677	0.681	**0.831**			
HRD	0.492	0.531	0.494	0.685	0.613	0.634	0.638	0.739	**0.767**		
HRR	0.302	0.327	0.304	0.421	0.377	0.390	0.392	0.455	0.426	**0.797**	
BP	0.365	0.395	0.367	0.424	0.380	0.393	0.348	0.404	0.379	0.233	**0.799**

***Square root of AVE value is presented on the diagonal, while constructs" correlations are below it.**

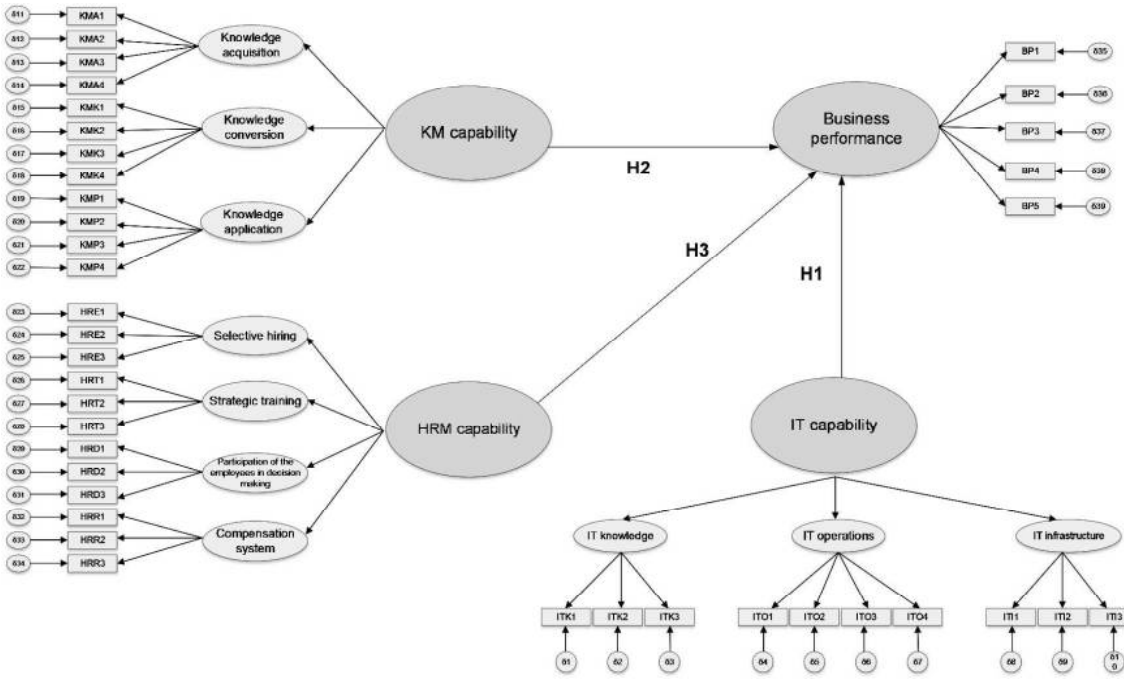


Figure 2. Structural model 1

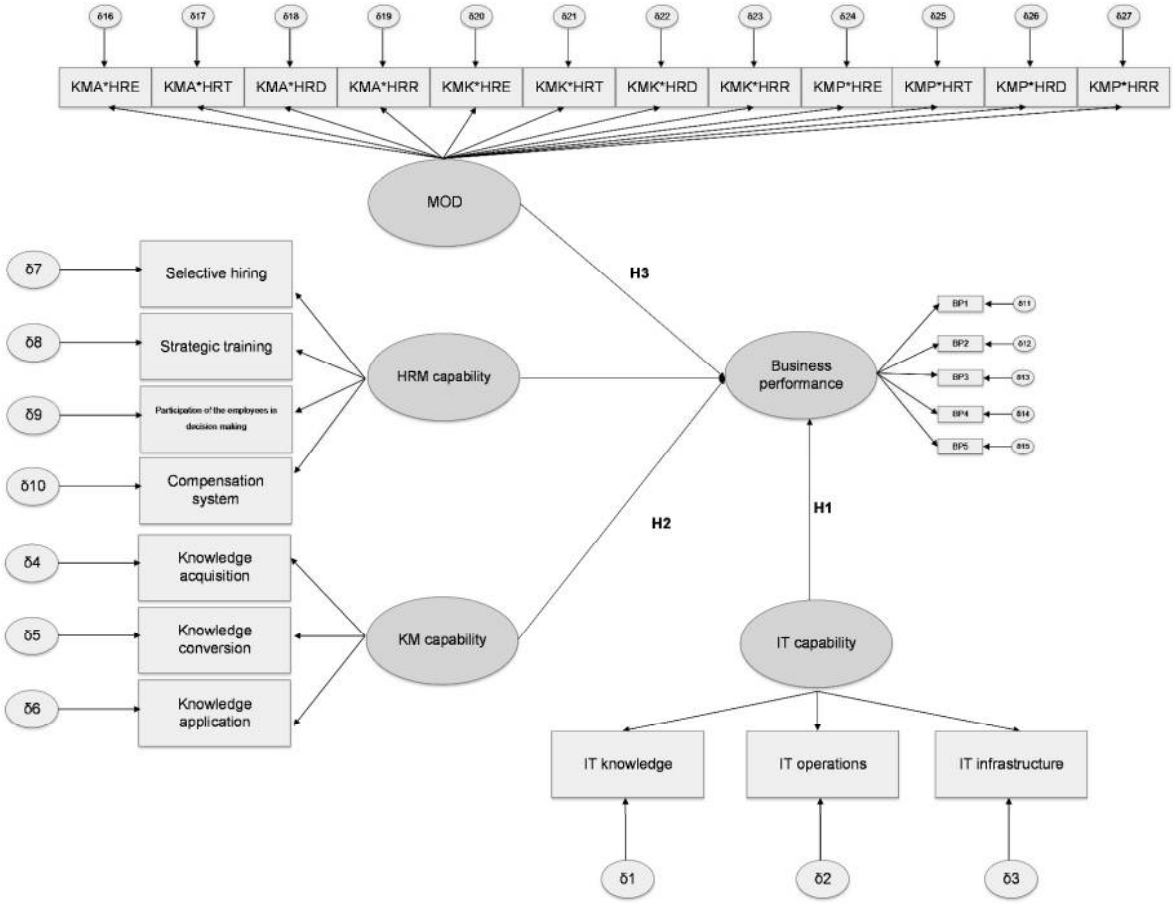


Figure 3. Structural model 2

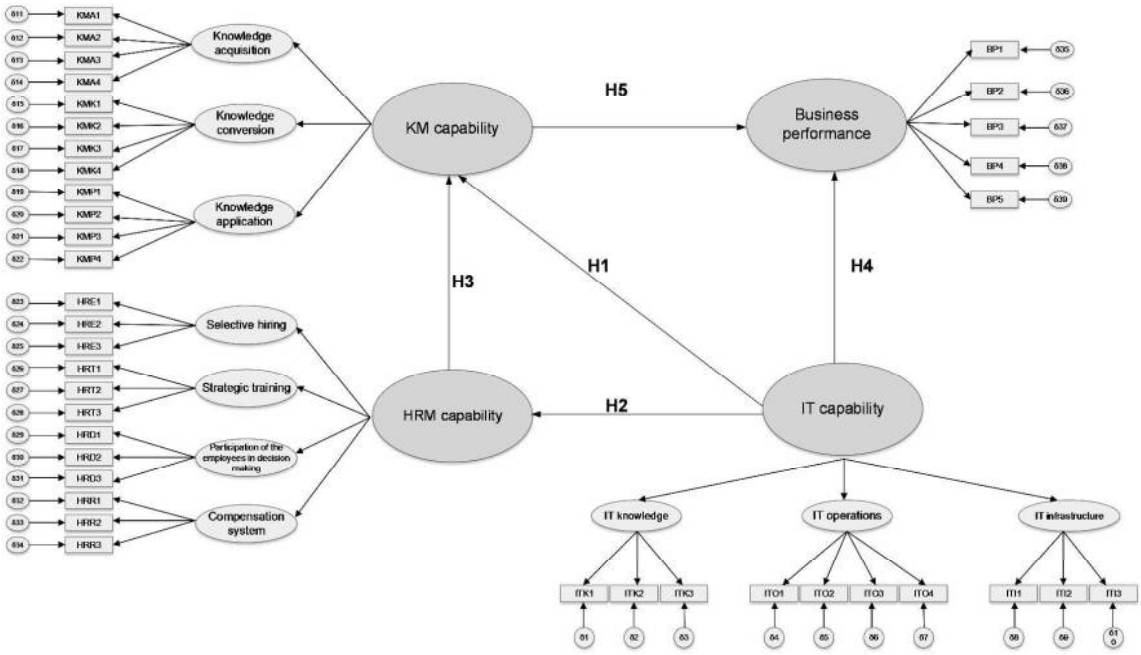
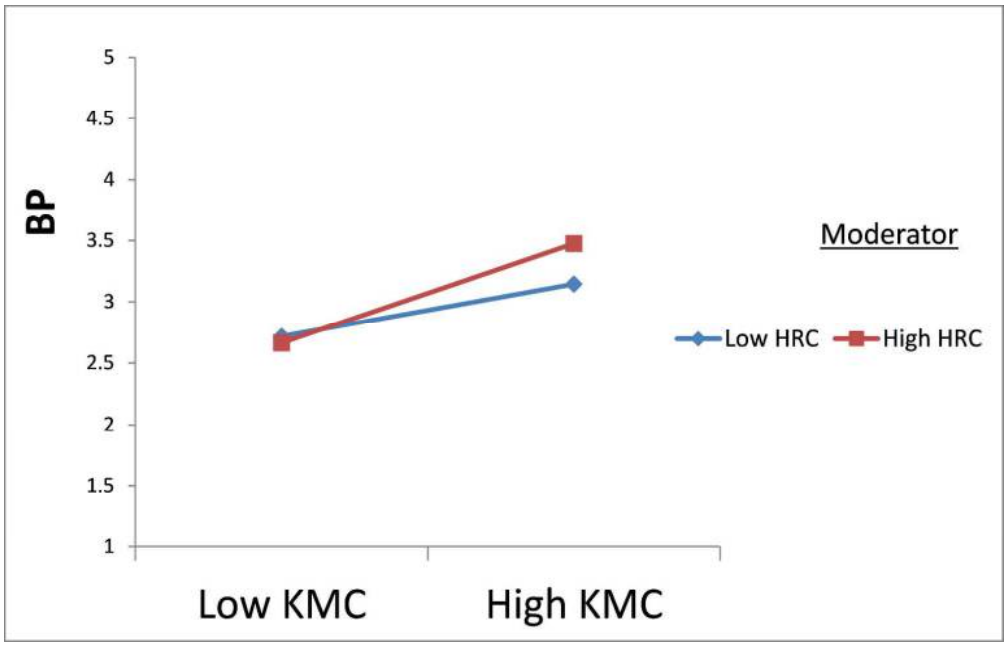
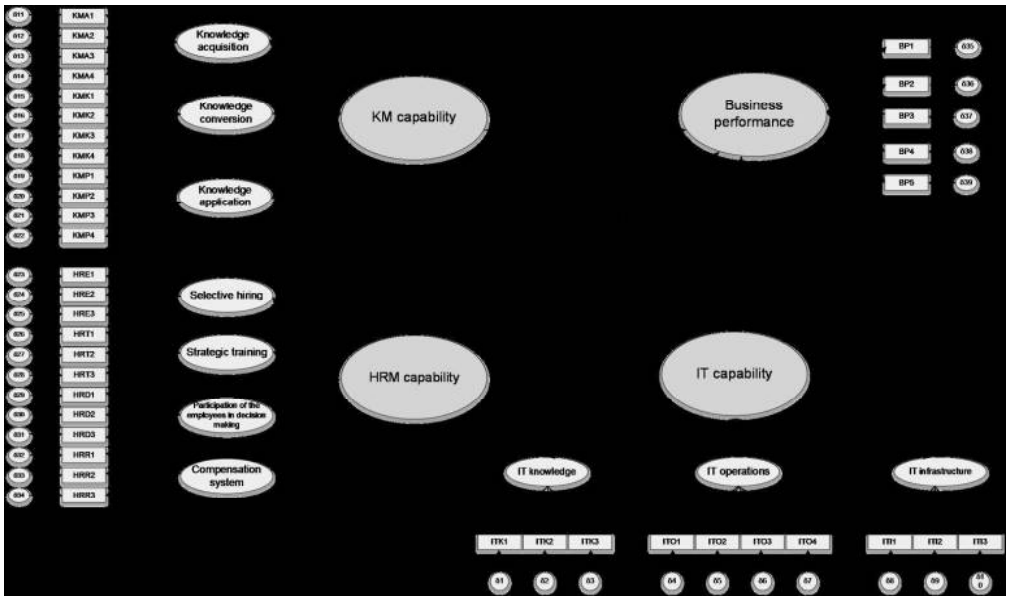


Figure 4. Structural model 3



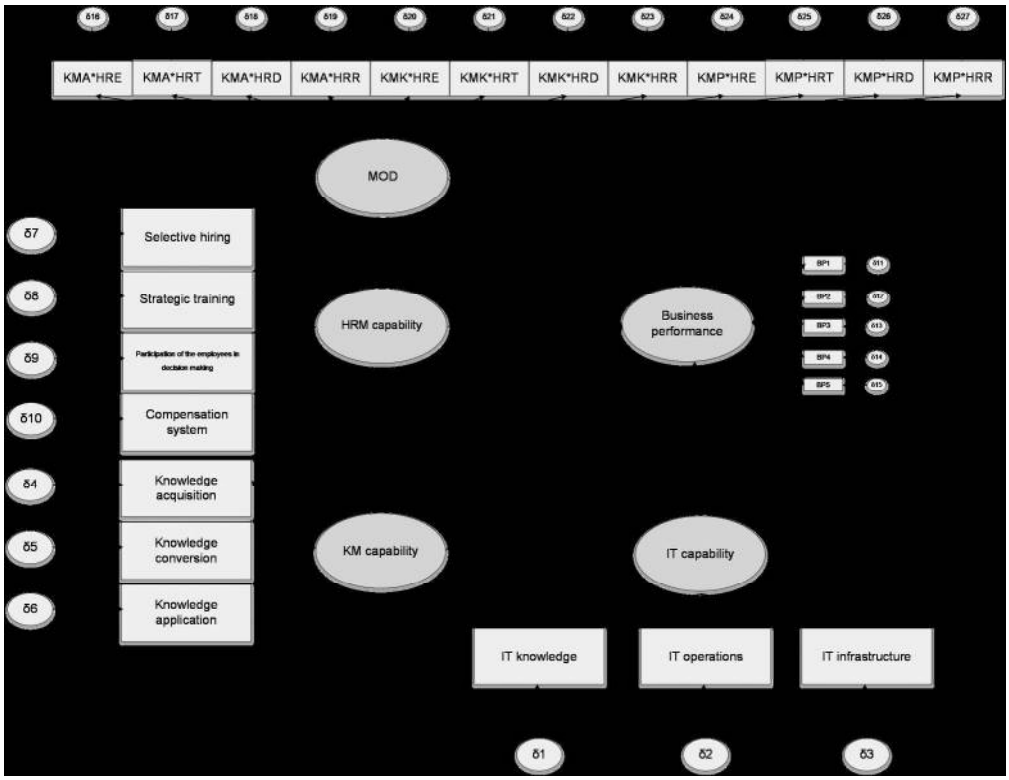
Interaction effect of KMC and HRC on BP

658x419mm (144 x 144 DPI)



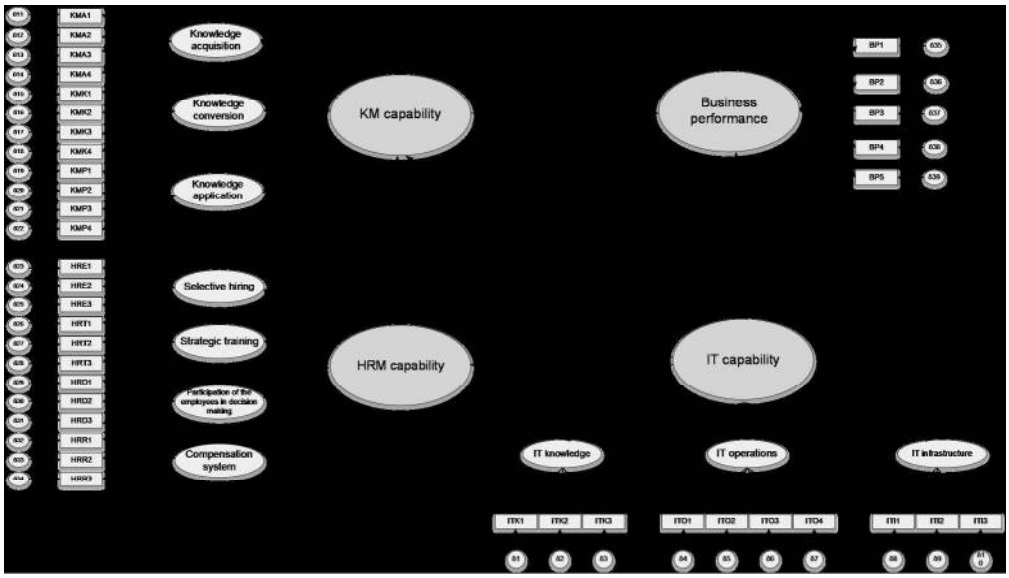
Structural model 1

395x233mm (144 x 144 DPI)



Structural model 2

443x341mm (144 x 144 DPI)



Structural model 3

409x232mm (144 x 144 DPI)