

# INNOVATION MANAGEMENT MODELS IN TEACHING HOSPITALS CASE-STUDY – TEACHING HOSPITAL OF FERNANDO PESSOA UNIVERSITY

**Bruno Soares, Fernando Pessoa University**

**António Cardoso, Fernando Pessoa University**

**Inês Dias, Fernando Pessoa University**

**Susana Gregório, Teaching-Hospital of Fernando Pessoa University**

**João Camarinha, Teaching-Hospital of Fernando Pessoa University**

**João Moreira Pinto, Teaching-Hospital of Fernando Pessoa University**

## ABSTRACT

*Facing the permanent competitive challenges characterized by turbulence and unpredictability, organizations are called to innovate, looking for an optimization balance between human capital and its technological, material and financial resources, premises which enable surviving or developing. The innovation management model appears as a crucial element to the development and evolution of the organization, thus assuming a predominant role in competitiveness and innovation. This study has as research objective the “Innovation Management Model in teaching hospitals. Teaching Hospital of Fernando Pessoa University (TH – FPU)” and has as objective the analysis of the importance of innovation management model in TH-FPU. The research problem was expressed through the following questions: What factors are in the basis of the management model implemented in the organization?; Is it possible to develop innovation in TH considering the actual organizational environment? Which course of action may be developed to improve the management model suitable to differentiation and innovation? In order to answer the research problem and the research objectives a quantitative study with descriptive design was developed with the goal of assessing the innovation management model of TH and its impact in the following categories: (1) Creation of value; (2) Value Proposition; (3) Value Collection. The scale designed by Clauss was adopted when designing the questionnaire. It was applied using Google Forms tool within the universe of workers of the TH-FPU (515 workers), collecting and validating 291 answers. The quantitative data obtained through the questionnaire were analysed in SSPS and AMOS (univariate, bivariate and multivariate analysis). It was concluded that ( $H_1$ ) innovation management has a positive and significant impact in the value proposition ( $\beta=0.920$ ,  $p<0.001$ ) and ( $H_2$ ) in the creation of value ( $\beta=0.94$ ;  $p<0.001$ ), therefore confirming the mentioned hypotheses. Regarding the value collection dimension ( $H_3$ ) the regression coefficients aren't significant ( $p>0.005$ ), not confirming the third hypotheses.*

**Keywords:** Management Models, Innovation, Teaching Hospitals, Hospitals, Value Creation, Value Proposition, Value Collection.

## INTRODUCTION

The management model appears as a crucial element for an organization to develop, assuming a determinant and competitive role in innovation, development, entrepreneurial sustainability and, subsequently, in the market.

This research has as theme “*Corporate Culture, Innovation Management Models in teaching hospitals. Case-study - Teaching Hospital of Fernando Pessoa University (TH – FPU)*” and its objective is the analysis of the importance of the management model for innovation in the Teaching Hospital.

The research problem was expressed through the following questions: What factors are in the basis of the management model implemented in the organization?; Is it possible to develop innovation in TE considering the actual organizational environment? Which course of action may be developed to improve the management model suitable to differentiation and innovation?

In order to answer the research problem and the research objectives a quantitative study with descriptive design was developed through a survey applied to a representative sample of TH- FPU employees.

The structure of the article consists of literature review, which enables the research’s theoretic and conceptual framing having as basis corporate culture constructs and the management and innovation models characteristic of the teaching hospitals.

A discussion of results is made at the end and the main research conclusions and practical recommendations for hospital management are presented.

## LITERATURE REVIEW

In an ecosystem characterized by globalization, the ability to generate and apply knowledge is determinant in the management, productivity and competitiveness. The several social actors have a crucial role in creating the circulation of knowledge and information in hospitals. A corporation’s innovative ability, as well as the one of a country, doesn’t solely depend on economic factors, investment on new technologies or its managers to trigger adequate measures, but also on social, cultural and political structure in the optimization and productive application of the resources available.

The innovation management model is highlighted as the key element for an organization to grow and be able to both impose itself in the health “*market*”, which is more and more competitive, and overcome the competitiveness challenges (Medina et al., 2012; Maria et al., 2009). The new labour market paradigms, caused by changes in the organizational ecosystem at the economic, social, political and technological level (Lambin & Alejandro Molla descals, 1987, Teixeira, 2013), led companies to an abrupt change of its structures and organizational models (Cunha et al., 2007). At the moment, reference organizations known as “*learning organizations*” (Collison & Parcell, 2001; Dymock & McCarthy, 2006; Siengthai, 2021), consider their employees as a strategic asset, so the investment in the individual (human capital) must be developed in the long term (McElroy et al., 2001). The several studies identified in the literature (Porter, 2008; Begin, 1991; Butler et al., 1991; Jackson & Shuler, 1995; Wright & MacMahan, 1992, Toner, 2011) are unanimous in stating that when properly applied, human resource practices will have a direct economic impact in the organizational performance and in the management model.

The only way to obtain a source of competitive advantage on the organizational environment involves having committed employees, who identify with its vision, its values and its rules.

In this regard, academic and professional training is important as it translates the organizations' bet in people as a strategic resource (Vidal-Salazar et al., 2012; França, 2013). Therefore these organizations are now called "*learning organizations*" (Franco & Ferreira, 2007; Harrison, 2005, Pereira, 2014).

The organizational development interconnected to the management model is a continuous and systematic process to implement change, allowing for the organization to improve and adapt to the demands of the external environment, the new markets, regulations and technologies. As a consequence, the organization develops its internal ability and allocates resources in order to more efficiently and effectively provide labour conditions and strategies leading to a sustainable and long-lasting development (Damanpour, 1991, Sageer et al., 2012).

The innovation management model doesn't limit itself to technology or product innovation, as it shall be extended to the entire process involved, the organizational strategy and architecture (Drucker, 1974; Damanpour, 1991; Froehle et al., 2000). The concept of "*innovative performance*" emerges related to the mediation of innovation results (COTEC Portugal, 2010). Innovation success, even if hard to attain due to its continuous, dynamic and incremental character, is assessed through four main factors (Martínez, 2011): (1) innovation inputs (innovation objectives, barriers to innovation), (2) innovation activities (research and development, training), (3) innovation outputs (patents, processes and business models), technologies and/or (4) innovation impacts (invoicing, competitiveness, productivity).

Several authors, highlighting the pioneer Schumpeter, describe innovation as something new which will effectively change the market, reinforcing the difference between innovation and invention. To Schumpeter (1988, 2017) invention is the creation of a new idea that has potential for commercial exploration. Innovation relates to the same idea when commercially explored in any way. Porter (1982) also recognizes differences between the two concepts when defining that innovation relates to a new way of doing things, as long as it is commercialized.

The works from Clauss (2017) and Clauss et al. (2019) consider that there are three interrelated dimensions in the innovation management models, namely: innovation in value creation, innovation in value proposition and innovation in value collection.

Bashir & Verma (2016) disaggregate these dimensions in eight categories: value proposition, channels, comparison to competitors, human capital, net cooperation value, partnerships, assets and abilities and income sources. Regardless of this dispersion it is possible to integrate them in the classifications previously proposed by Clauss, being clearly absorbed in the three dimensions proposed by the author, the perspective we will adopt in this study.

The Teaching Hospitals, also identified in literature as "*Hospital Schools*" develop teaching and research activities and provide high complexity health services (Ayanian & Weissman, 2002; Nogueira et al., 2015; Safarani et al., 2018) thus requiring quality and wholeness in its activities that must be based in the principles and guidelines of the National Health Service (NHS), covered by the hospital management legal regime (Decreto Lei n.º 206/2004), as exposed in "*Parecer sobre Regime jurídico dos centros académicos clínicos*" (Parecer n.º 13/2018; Diário da República n.º 103/2018; Decreto Lei 61/2018). This way the diploma from the Minister of Science, Technology and Higher Education (MSTHE) establishes the legal regime applicable to academic centres, creating conditions to the development, in and

integrated way, of assistance, teaching, clinical and translational research activities as well as the regime of university hospitals' pilot-projects.

In spite of the interest and the relevance of the above mentioned studies there are some insufficiencies as the majority of research is centred in technology-based innovation and in big organizations (denominated of excellence). The largest part of the research target products and or services didn't centre in the hospital or health sector neither reflect the Portuguese teaching, cultural and corporate reality, especially at the hospital management and university teaching level.

## METHODOLOGY

The current study is framed in a research paradigm that associates the organizational innovation process to people management, assuming that both phenomena are interconnected and in constant evolution.

The management model and the corporate environment have great influence in the innovation process. Decision makers are required to have management competences, technical knowledge and skills.

Within knowledge we may consider problem-solving skills and the ability to obtain resources, being it also necessary to count on creativity and innovation to generate opportunities and funding sources.

In truth it isn't easy to find organizations that innovate when employees experience a bad working environment and with an improper or inexistent corporate culture.

According to Bedani (2012) the management model and organizational culture influence creativity manifestations, are characterized for encouraging the implementation of innovation and resort to new ways of solving problems.

Fernando Pessoa Foundation (FPF), a family-owned organization with around 1500 employees, has higher education as its main activity, owning Fernando Pessoa University and the Teaching Hospital. FPF and – TH-FPU's top management noticed that some of the organization co-workers started showing evidence of lack of motivation and institutional involvement in what regards innovation.

In view of this observation the following questions related to the research issue were raised:

1. The TH's innovation management model is able to provide the conditions for the creation of value, value proposal and value delivery?
2. TH-PFU employees consider themselves a part of the TH-PFU innovation management model?

In this sense, taking this consideration into account, it was tried to assess whether the management model in force in TH-PFU creates an environment conducive to innovation, as well as to analyse the level of development and maturity of the organizational innovation.

As a consequence, and taking into account the works identified in the literature (Acar & Acar, 2012; Bashir & Verma, 2016; Clauss, 2017; Clauss et al., 2019) three hypotheses were defined:

*H<sub>1</sub> The TH innovation management model has a positive and significative effect in "Value Creation";*

*H<sub>2</sub> The TH innovation management model has a positive and significative effect in "Value Proposal";*

*H<sub>3</sub> TH innovation management model has a positive and significative affect in “Value Collection”*

The scale proposed by Clauss (2017), later readjusted by Clauss et al. (2019) was applied to assess the hospital management model. The latter considers the existence of three interconnected dimensions: innovation in value creation, innovation in the proposition of value and innovation in the collection of value (Table 1).

<b>Construct</b>	<b>Dimensions</b>	<b>Items</b>	<b>Items</b>
Innovation Management Model	Innovation in value creation	New resources	3
		New technologies and/or equipment	3
		New partnerships	3
		New Processes	3
	Innovation in the proposition of value	New offers	3
		New patients	3
		New channels	3
		New patient relationships	3
	Innovation in the collection of value	New models	3
		New cost structures	3

Concerning the propositions presented to respondents, a 5 point scale of semantic differential of the Likert type, in which “1” meant “*Totally Disagree*” and “4” meant “*Completely Agree*” (Table 2) was used.

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Totally Disagree	Disagree Partially	Neither Agree nor Disagree	Agree Partially	Completely Agree

Having as basis the reality of the Teaching-Hospital, and framed in the Portuguese context, there was the need to adapt research instruments, namely the ad equation of the questions/propositions used in the survey, with the objective of collecting information about employees’ perception of the TH-FPU, therefore being it a case study (Yin, 2012).

A pre-test was held with twelve employees in order to validate the research tool Churchill & Iacobucci 2006; Hill & Hill, 2002; Coutinho, 2005). There wasn’t any register of evidence that hindered the administration of the survey.

Considering the research goals, the analysis model, the characteristics of the field of analysis and the respondents it was opted to administrate the survey directly in the Teaching – Hospital (Hill & Hill, 2002; Quivy et al., 2008).

In this sense a permit from the Administration of the Teaching-Hospital and the Ethics Committee was obtained to administer and collect the data in the organization.

The administration and collection of data was made through Google Forms and was disseminated and made available internally to the whole Teaching-Hospital community by email. It was held between January and March 2021. The response rate was much higher than what it had been previously expected obtaining 55.64% of participation, having collected 291 surveys. It was a random probability sample (Hill & Hill, 2002) and the representativeness of the population was considered.

The platform Raosoft was used for the sample calculation. After the insertion of the different parameters of evaluation (population: 515 employees; Trust Interval 99%, margin of error 5%) the collection of data from 291 employees through the formula presented in figure 1 was needed.

$$x = Z\left(\frac{c}{100}\right)^2 r(100-r)$$

$$n = \frac{N x}{((N-1)E^2 + x)}$$

$$E = \text{Sqrt}\left[\frac{(N-n)x}{n(N-1)}\right]$$

**FIGURE 1**  
**RAOSOFT PLATFORM SAMPLE CALCULATION FORMULA**

### **ANALYSIS AND DISCUSSION OF RESULTS**

According to the research objectives, the research questions and the nature of the formulated hypotheses a sample of the Teaching Hospital was chosen and studied, stratified by gender, age, length of service, qualifications and training area (Table 3).

The data collected through the surveys were target of a validation process and subsequent upload in the statistical analysis software (SPSS version 24 - Statistical Package for Social Science), which allowed the treatment of the information collected.

We started by characterising the sample.

A total of 291 respondents cooperated in the research. The majority was female (80.1%), in the age segment 30-39 (36.7%), holders of a degree (42.6%), with length of service between three to six years (31.6%) and carried out functions as Medical Auxiliaries (27.1%).

#### **Value Creation**

The analysis of the poli-factorial structure in the scale of value creation was made through a confirmatory factorial analysis (CFA). The values obtained,  $\chi^2/df=3.863$ ; CFI=0.936; GFI=0.899; RMSEA=0.099 indicate an adequate quality of adjustment (Table 4 and Figure 2).

Additionally, the scale of creation of value presents some problems regarding divergent validities as the AVE square root of all variables is inferior to the correlation with the other latent variables.

However, the AVE values are higher than 5.0 and the composite accuracy values are higher than a 0.70. The internal consistency values, measured through the Cronbach Alfa, are all higher than a 0.70.

#### **Proposition of Value**

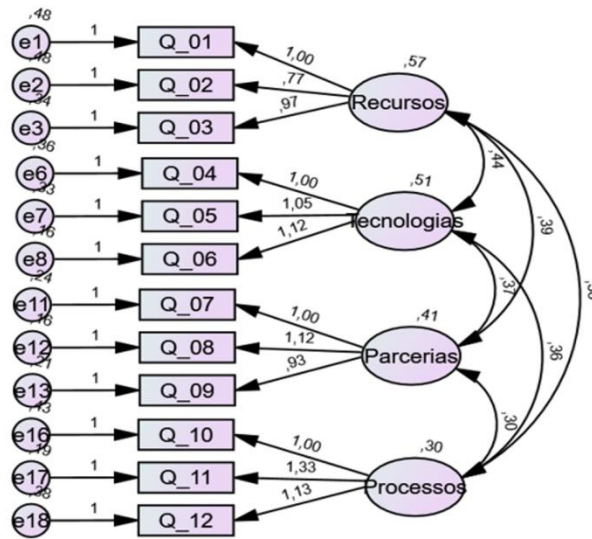
The analysis of the poli-factorial structure of the value proposition scale was done through a confirmatory factorial analysis (CFA). The values obtained,  $\chi^2/df=1.788$ ; CFI=0.984; GFI=0.953; RMSEA=0.052, indicate a good adjustment of the data to the sample (Table 5 and Figure 3). The scale presents some divergent validity problems as the square root of AVE in all

the variables is inferior to the correlation between the other latent variables. However, AVE values are higher than 0.50 and the composite reliability values are higher than 0.70. The values of internal consistency are all higher than 0.80 (good).

	N	%
<b>Gender</b>		
Female	233	80.1
Male	57	19.6
Other	1	.3
<b>Age</b>		
20-29 years old	96	33.0
30-39 years old	107	36.7
40-49 years old	56	19.2
50-59 years old	24	8.2
60-69 years old	8	2.7
<b>Qualifications</b>		
Up to the 9 <sup>th</sup> Grade	25	8.6
Up to the 12 <sup>o</sup> Grade	81	27.8
Bachelor	1	.3
PhD	7	2.4
Degree	124	42.6
Master's	53	18.2
<b>Functional Level</b>		
Administrative Assistant	37	12.7
Medical Auxiliary	79	27.1
Middle Management	11	3.8
Direction	5	1.7
Nurse	75	25.8
Doctor	44	15.1
Support Services	13	4.5
Diagnose and Therapist Technician	27	9.3
<b>Length of Service</b>		
<1 year	76	26.1
1-3 years	57	19.6
3-6 years	92	31.6
> 6 years	63	21.6
Other	3	1.0

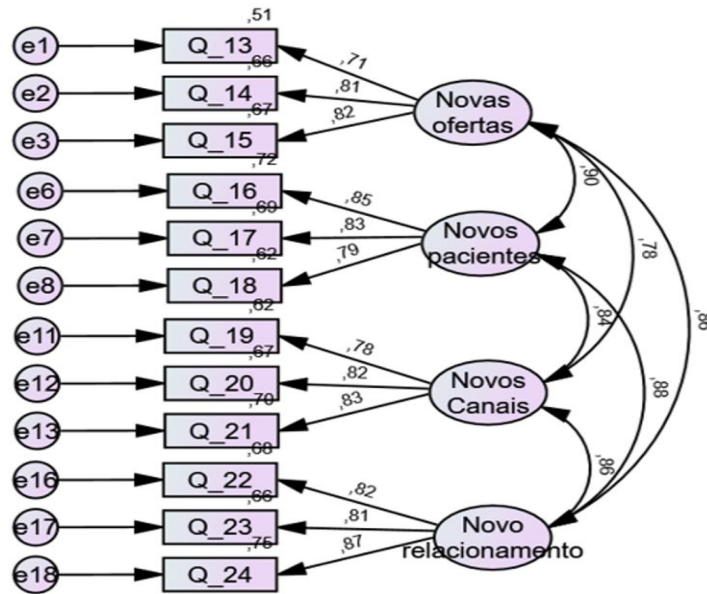
	M	SD	Alfa	CR	AVE	MSV	MaxR(H)	Rec	Tecn	Parc	Proc
Resources	3.08	0.963	0.764	0.766	0.524	0.825	0.777	0.724			
Technologies	3.36	0.967	0.856	0.860	0.672	0.825	0.878	0.821***	0.820		
Partnerships	3.50	0.740	0.853	0.858	0.669	0.754	0.866	0.801***	0.803***	0.818	
Processes	3.34	0.850	0.784	0.783	0.550	0.825	0.817	0.908***	0.908***	0.868***	0.741

X2(48)=185,447; p=,000; x2df=3,863  
 CFI=,936; TLI=,912; GFI=,899;  
 RMSEA=,099; P(rmsea<=0.05)=,000



**FIGURE 2**  
**CFA OF VALUE CREATION**

X2(48)=85,838; p=,001; x2df=1,788  
 CFI=,984; TLI=,978; GFI=,971  
 ;RMSEA=,052; P(rmsea<=0.05)=,401



**FIGURE 3**  
**CFA OF VALUE PROPOSITION**



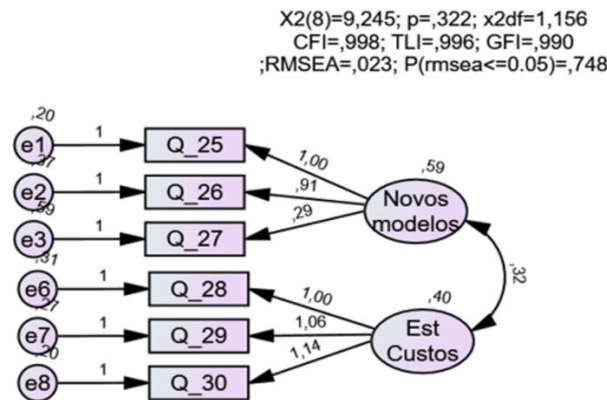
**Table 5**  
**CONVERGENT AND DISCRIMINANT VALIDITY (PROPOSITION OF VALUE)**

	M	SD	Alfa	CR	AVE	MSV	MaxR (H)	Nfert	Npac	Ncan	Nrela
New Offers	3.26	0.944	0.822	0.826	0.614	0.816	0.835	0.784			
New Patients	3.44	0.866	0.861	0.863	0.678	0.816	0.866	0.903***	0.823		
New Channels	3.45	0.910	0.853	0.853	0.659	0.746	0.855	0.780***	0.837***	0.812	
New relationships	3.40	0.913	0.872	0.873	0.696	0.777	0.876	0.860***	0.881***	0.864***	0.834

**Innovation in the Collection of Value**

The analysis of the bi-factorial structure of the Innovation scale in the collection of value was made through a confirmatory factorial analysis (CFA). The values obtained  $\chi^2/df=1.156$ ; CFI=0.998; GFI=0.990; RMSEA=0.023, indicate a good adjustment of the data to the sample. The scale presents some divergent validity problems as the square root of AVE in all the variables is inferior to the correlation between the other latent variables.

The composite reliability values are very close to or superior to 0.70. The convergent validity (AVE) of the new models variable is inferior do 0.50. The internal consistency of the New Models dimension is 0.631 (weak but acceptable).



**FIGURE 4**  
**CFA OF INNOVATION IN THE CREATION OF VALUE**

**Table 6**  
**CONVERGENT AND DISCRIMINANT VALIDITY (INNOVATION IN THE CREATION OF VALUE)**

	M	SD	Alfa	CR	AVE	MSV	MaxR(H)	Nov Model	N estr
New Models	3.11	0.821	0.631	0.690	0.464	0.426	0.813	0.681	
New cost structures	3.39	0.837	0.84	0.839	0.635	0.426	0.846	0.653***	0.797

**Table 7**  
**STANDARDIZED AND NON-STANDARDIZED ESTIMATES OF THE COEFFICIENTS**

			Estimate	S.E.	C.R.	P
Innov. Collection	<---	Ginov	1.000		0.793	
Innov. Proposition	<---	Ginov	1.326	0.071	0.920	***
Innov. Value Creation	<---	Ginov	1.304	0.068	0.944	***

The proposition of value has a positive and significative impact with the innovation management model ( $\beta=0.920$ ,  $p<0.001$ ) and the creation of value with the innovation

management model ( $\beta=0.944$ ;  $p<0.001$ ), thus confirming both hypotheses (Table 6 and Table 7 and Figure 4).

Regarding the Value Collection dimension, the regression coefficients aren't significant ( $<0.005$ ), so, hypothesis 3 is not confirmed.

From the analysis of the questionnaires applied to all the employees of the TH-PFU it was verified that, on average ( $M=3.69$ ;  $SD=0.886$ ) the employees consider there is innovation in the creation of value as well as in the proposition of value ( $M=3.73$ ;  $SD=0.886$ ). They consider that the TH regularly uses new communication channels for the products and services ( $M=3.91$ ;  $SD=0.857$ ) and that regularly seeks to meet their clients' needs ( $M=4.05$ ;  $SD=0.874$ ).

In the evaluation of innovation of products and services of the TH in relation to their opponents the values presented were lower ( $M=3.47$ ;  $SD=0.959$ ).

The inquired people acknowledge that there is innovation in value collection in TH-FPU ( $M=3.66$ ;  $SD=0.859$ ), considering that the TH makes integrated services more and more available, targeting long term financial return.

## CONCLUSION

With the current study it was possible to identify the existence of a positive and significant relation between the Innovation Management Model and the Creation and Proposition of Value as it was preconized by several authors.

However, only two of the hypotheses were confirmed: the TH innovation management model has a positive and significant impact in the creation of value ( $H_1$ ) and proposition of value ( $H_3$ ).

Regarding the value collection dimension, the regression coefficients aren't significant ( $p>.005$ ), thus not confirming hypothesis 3 ( $H_3$ ).

The employees feel that the organization supports them, they become more committed and confident, dedicating more time and energy to their functions, a higher sense of innovation and creation of value.

These conditions are clearly stated in FPF's motto, founding body of TH-PFU, "*Nova et Nove*", meaning "*making different to make better*" and in its main values: humanization, innovation and quality.

As it is a case-study circumscribed to TH-PFU and knowing that in this research area the organisational reality and context are volatile and evolving it is not possible to extrapolate these conclusions to all teaching hospitals. Therefore, we recommend involving other teaching hospitals in Portugal (and even abroad), accompanying the evolution of innovation management models in force (longitudinal study) and considering other factors (such as: organisational culture, organisational commitment, talent retention, the organisation's dynamic skills towards public crisis situations) which were not considered in this research.

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