

# Supporting innovation in the healthcare sector: the role of ambidexterity

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## Abstract

The role of exploration and exploitation, alone or combined with each other (ambidexterity), in the healthcare setting is relevant today, since hospitals are experimenting new organisational designs aimed at improving their capability to manage the tension between high-quality delivery of care and cost-containment. In this view, the present paper focuses on the determinants of exploration, exploitation and ambidexterity, being something that literature has not investigated yet within the healthcare sector. Data were collected from 80 head clinicians by means of an “ad hoc” questionnaire, one developed in accordance with existing scales validated in literature. Results show that opening leadership, organisational creativity and environmental dynamism are determinants of exploration, while exploitation is well explained by closing leadership and organisational creativity. In addition, both opening and closing leadership as well as organisational creativity are required in order to achieve ambidextrous behaviour within the healthcare setting, thus being the result of social and organisational mechanisms. In conclusion, the results offer solutions to hospital wards, thus paving the way for the determination of an efficient leadership style, together with a creative and open mind, useful in order to foster innovation and present ambidexterity.

# 1. Introduction

Hospitals worldwide are experimenting with new organisational designs, aimed at improving their capability to manage the tension between high-quality and safe delivery of care and cost containment. The complexity of attaining this lies in the contradiction between the efforts underlining the two objectives; while improving quality and safety would require “*exploration*” efforts, cost containment would require “*exploitation*” efforts (Gastaldi and Corso, 2012).

These efforts compete for the same resources in an environment whose attitude is preserving the status quo. This peculiar context emphasises the tensions between exploratory and exploitative behaviours (Lavie *et al.*, 2010). The combined effect of these forces tends to open up the gap between exploratory and exploitative activities, acting as two opposing attractors between which an effective balance arises only if persistent and on-going efforts are put in place (Martini *et al.*, 2013). Continuous innovation researchers focus on how it is possible to unceasingly maintain this unstable and paradoxical balance over time, leading to what have been called ambidextrous organisations (Turner *et al.*, 2013).

## 2. Research questions and framework

The role of exploration and exploitation in healthcare is relevant, with significant managerial implications (Gastaldi and Corso, 2012), albeit: (i) no evidence have reported the specific quantitative measures and indicators useful for this field; and (ii) the ambidextrous behaviours and related constructs in clinical and managerial practice have been little investigated.

Analysing the healthcare sector, hospital wards represent the best unit of analysis for at least four reasons: (i) complex internal dynamics; (ii) attitude to research and innovation activities; (iii) autonomy in the decision-making and resources allocation processes, and (iv) need of a high level of co-ordination among different professionals to be efficient.

In this view, the present paper aims to define the main determinants of exploration, exploitation and ambidexterity, in doing so answering to the following research questions:

- What should a ward improve to acquire new knowledge (exploration)?
- What should a ward improve to be more efficient (exploitation)?
- Which drivers should a ward have to achieve ambidextrous behaviours?

In accordance with a deep literature review, with regard to the role of exploration and exploitation within the industrial setting, four factors acquired a significant role: (i) opening and closing leadership, (ii) perceived organisational support (POS), (iii) organisational creativity, and (iv) environmental dynamism.

Based on these arguments, the following hypotheses were accordingly developed.

## 2.1. Opening and Closing Leadership

Leadership is “a process of social influence in which a person can enlist the aid and support of others in the accomplishment of a common task” (Chemers, 1997), and may be described as an important predictor of innovation (Manz *et al.*, 1989). Leaders should find the right trade-off between exploratory and exploitative dimensions, balancing the interdependencies between the two behaviours. Regarding this issue, an ambidextrous leader is “able to foster both exploration and exploitation in followers, by increasing or reducing variance in their behaviours and flexibly switching between those behaviours” (Rosing *et al.*, 2011).

The role of leadership may be distinguished by two factors (Rosing *et al.*, 2011):

- *Opening leader behaviour*: which includes doing things differently and experimenting, giving room for independent thinking and acting, and supporting attempts to challenge established approaches.
- *Closing leader behaviour*: which includes taking corrective action, setting specific guidelines, and monitoring goal achievement.

In the healthcare sector, there are two specific problems in developing clinical leadership: *i*) the clinicians are used to reinforcing work autonomy, not easily accepting the role of a leader, *ii*) a significant lack of support for those individuals undertaking a leadership role (Ham, 2003). A well-managed hospital ward, presents the coexistence of both opening and closing leadership, being supported by both exploration and exploitation mechanisms.

The following assumptions were proposed:

- $H_{1.A}$ : opening leadership has a positive impact on exploration.
- $H_{1.B}$ : closing leadership has a positive impact on exploitation.
- $H_{1.C}$ : both opening and closing leadership have a positive impact on ambidexterity.

## 2.2. Perceived Organisational Support

Perceived organisational support (POS) measures how organisations directly benefit from employees, as well as how employees show commitment to the organisations (Sumathi *et al.*, 2013). POS is helpful in the case of stressful situations and to effectively execute jobs activities (Eisenberger *et al.*, 2001). In healthcare, there is limited empirical support on POS theories, however, organisational conditions and social support are predictors of job satisfaction (Sumathi *et al.*, 2013) or intention to leave the work place (Acker, 2004), and may be different when considering a clinician’s age, role, work experiences (Sumathi *et al.*, 2014), and public or private provenance.

With regard to POS, the following hypotheses were defined:

- $H_{2.A}$ : POS has a positive impact on exploration.
- $H_{2.B}$ : POS has a positive impact on exploitation.
- $H_{2.C}$ : POS has a positive impact on ambidexterity.

### 2.3. Organisational Creativity

Organisational creativity may be defined as the organisational capability to develop novel and potentially useful ideas (Woodman *et al.*, 1993). While creativity may support an organisation in proposing new ideas to carry out tasks and activities, it may also implies to take risks. In the healthcare sector, the desire to suggest new and creative solutions is often linked with high risks and unknown effects. Therefore, it is necessary to have a good trade-off among a clinician's requirements, quality of care, the need of constant learning, and innovation (Strating *et al.*, 2010).

The social control in the healthcare sector may affect attitudes and behaviours related to innovation, due to the poor tolerance to adverse events and mistakes. The concept of error may be disputed more, due to safety reasons, than in other sectors and this factor might contribute to a reduction in the level of creativity (Strating *et al.*, 2010).

The following hypotheses were formulated:

- $H_{3,A}$ : organisational creativity has a positive impact on exploration.
- $H_{3,B}$ : organisational creativity has a positive impact on exploitation.
- $H_{3,C}$ : organisational creativity has a positive impact on ambidexterity.

### 2.4. Environmental Dynamism

Environmental dynamism is “*the degree of change and level of unbalance in the external context*” (Dess and Beard, 1984). Environmental dynamism present different impacts on exploratory and exploitative innovations, and thus on ambidexterity (Lewin *et al.*, 1999). The increase of dynamic environments may contribute to the rapid obsolescence of products and services delivery, with a direct continuous need of acquiring and developing new competencies (Jansen *et al.*, 2005a). Changes in the environment may be the best condition to start an exploration phase and seek competencies outside the organisation (Bouzdine-Chameeva and Dupouët, 2008). In addition, regarding environmental dynamism, the presence of both exploitation and exploration may be considered as essential for the implementation of good organisational strategies (Jansen *et al.*, 2005a). In the healthcare sector, environmental dynamism is an effective predictor of innovation. Evidence demonstrates that exploration and exploitation have a positive relationship with environmental dynamism, since turbulence and pressures towards the improvements of care should stimulate innovation (Mura *et al.*, 2014). In a stable context, however, hospital wards should not be encouraged to pursue exploration or exploitation, due to the natural trend in perceiving existing routines.

The following hypotheses concerning environmental dynamism were defined:

- $H_{4,A}$ : environmental dynamism has a positive impact on exploration.
- $H_{4,B}$ : environmental dynamism has a positive impact on exploitation.
- $H_{4,C}$ : environmental dynamism has a positive impact on ambidexterity.

Environmental dynamism may be conceived also as moderator of exploration and exploitation. In this view, this variable might behave as moderator of the above described independent variables (opening/closing

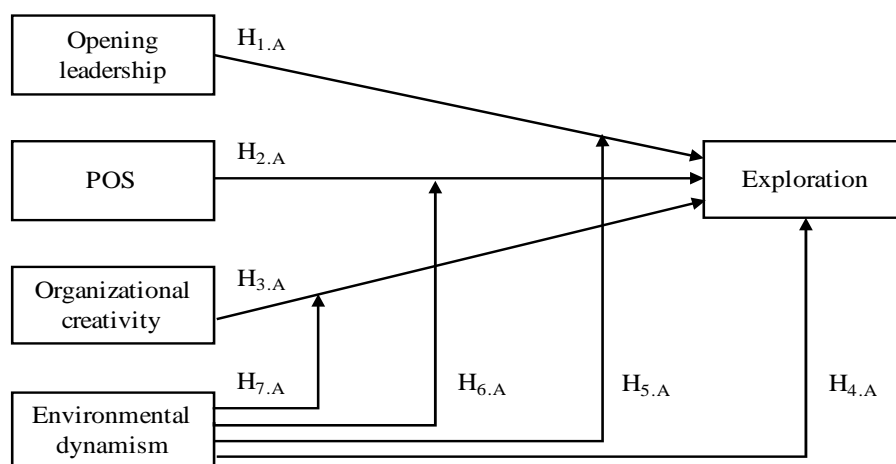
leadership, POS and organisational creativity). Turbulent context may mitigate the effect on outcomes since other experiences appear to be more problematic or unreliable. In addition, hospital wards may become more precise in selecting external knowledge to be acquired, focusing on the strength of the relation in order to foster a long-term relationship (Mura *et al.*, 2014).

The following hypotheses were proposed, considering all the three frameworks analysed:

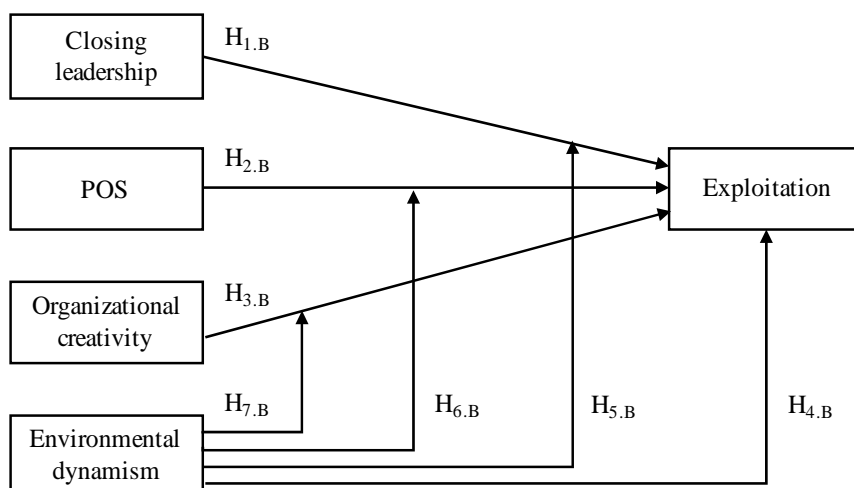
- $H_{5.A}$ ;  $H_{5.B}$ ;  $H_{5.C}$ : environmental dynamism acts as moderator with a negative impact on the relationship between closing/opening leadership and the dependent variables.
- $H_{6.A}$ ;  $H_{6.B}$ ;  $H_{6.C}$ : environmental dynamism acts as moderator with a negative impact on the relationship between POS and the dependent variables.
- $H_{7.A}$ ;  $H_{7.B}$ ;  $H_{7.C}$ : environmental dynamism acts as moderator with a negative impact on the relationship between organisational creativity and the dependent variables.

### 2.5. Synthesis of the Research Framework

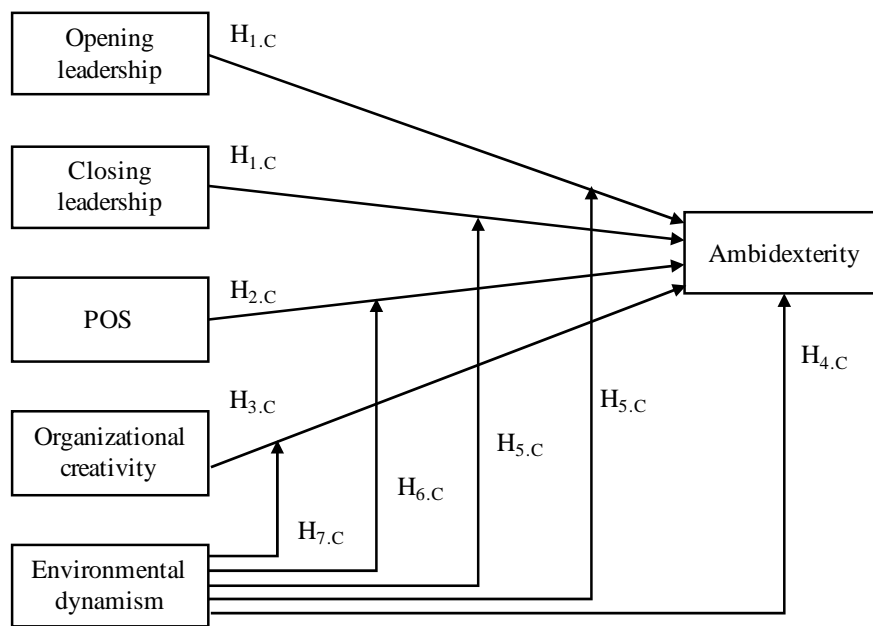
After the definition of all the hypotheses developed, a synthesis of the research frameworks developed was proposed as described in Figures 1, 2 and 3.



**Figure 1: Conceptual framework for exploration**



**Figure 2: Conceptual framework for exploration**



**Figure 3: Conceptual framework for ambidexterity**

### 3. Methods

The study design was structured into three distinct phases, focusing on the hospital ward's point of view.

#### 3.1. Adaptation of Existing Scales to the Healthcare Domain

The main objective of the study design first phase was to create survey items that adequately represented the constructs of interest in a language that respondents may understand, by keeping questions simple and specific for the healthcare context. All the scales useful to test the hypotheses related to the above mentioned variables, were selected due to their validation in the extant literature, considering both the industrial and healthcare sectors (Rosing *et al.*, 2011; Eisenberg *et al.* 1986; Zhou and George, 2001; Volberda and Van Bruggen 1997, Jansen *et al.*, 2005). A questionnaire was developed in the English language, translated in the Italian one (in order to avoid comprehension issues), and then administered.

An Exploratory Factor Analysis (EFA) was initially carried out to establish if changes introduced in the adaptation process for healthcare sector affected the structure of the scales, thus proving the validity of each construct, in order to establish their internal consistency. In particular, all the items presenting a factor loading higher than 0.3 were included in the definition of the variables, due to the maximisation of the variance of each construct. In addition, to ensure their reliability, the assessment of Cronbach's alpha was applied, in order to investigate how well the items measured the same constructs (Price and Mueller, 1986), thus allowing the replicability of the scales within future research activities. In particular, a value greater than 0.7 (providing an indication of strong item covariance) was assumed to test items and create the new

variables (Nunnally, 1978), in order to verify the study hypotheses.

### 3.2. Data Collection

The sample of the study was composed of head physicians, hospital managers of second level, and clinicians having comparable organisational and managerial functions with respect to head physicians, all afferent to Italian hospital wards (both clinical and administrative/managerial ones). All the second level hospitals medical managers and other healthcare professionals were included in the study, having the same responsibilities, even if applied in different hospitals fields, in order to obtain a wider and realistic vision of the hospital setting, as a whole.

In October 2015, all the professionals involved in the study completed the self-reported questionnaire previously defined, using a specific online survey tool, in order to reach an easier questioning of a large number of people in the least time (Reis and Gosling, 2010). The anonymity of the respondents was maintained by not requiring their name and surname, in the expectation that they would be more honest concerning the organisation of reference.

In addition to the personal information related to each respondent (working organisation, professional role, seniority and working experience, type of healthcare organisation) and the related ward's main characteristics (total number of clinicians per ward, as well as average age of members working in the ward), the questionnaire was composed of 15 qualitative and other quantitative responses. With regard to the qualitative section, a 7-item Likert scale was implemented, ranging from a minimum value of 1 to a maximum value of 7.

In particular, the tool aimed at getting the professionals' insight concerning: *i*) influence of ward chief towards innovation and efficiency; *ii*) the specific style of leadership, in terms of opening or closing leadership; *iii*) hospital commitment, depending on the behaviour of the top management, considering the relationship between the management and the ward; *iv*) trust within a working team, in order to investigate the presence or the absence of co-operative behaviours; *v*) attitudes in favour of innovation, stimulating the ward's creativity, in terms of suggesting innovative ideas to obtain better performance; *vi*) degree of change and level of unbalance in the external context, regarding the dynamism of the healthcare sector; *vii*) wards exploratory and exploitative behaviours, useful for the definition of ambidexterity. An ambidextrous organisation may be able to explore new opportunities and exploit existing competencies. In literature, ambiguity concerning the nature of the ambidexterity construct emerged (Cao *et al.*, 2009; Wulf *et al.*, 2010). Some authors recognise the existence of different ways to compute ambidexterity, all of which may have a positive impact on the field of research. Cao and colleagues (2009) introduced two different paradigms to underline the concept: the balanced dimension and the combined dimension of ambidexterity. The multiplicative interaction effect between exploration and exploitation is one of the most used measures in literature (Jansen *et al.*, 2005a), however, there are other measures equally verified. The sum between values of the two dimension was proved to be empirically superior to other measures of the construct (Lubatkin *et al.*, 2006; Wulf *et al.*, 2010).

### 3.3. Data Analysis

Since the study involved only one representative per ward (in general the ward's head clinician, or a subject presenting a comparable role that is unique in the organisation), the problem of Common-Method Variance (CMV) was initially considered. One of the potential source for common method bias is related to the fact that a single respondent answers the questions concerning both input variables and outcome (Podsakoff *et al.*, 2003). The CMV problem was addressed and solved both with *ex ante* and *ex post* solutions.

- With regard to the *ex ante* approach, in order to control the common method bias, the anonymity of responders was maintained, so they would feel safer in answering all the questionnaire. With regard the qualitative investigation, all the requests were developed as clear and understandable as possible, keeping questions simple and specific, thus avoiding complicated syntax and vague concepts.
- With regard tool the *ex post* approach, the Harman's single-factor test was conducted for the investigation of ambidexterity measures, in order to assure the validity of the sample, thus solving the CMV problem, verifying an acceptable level of bias (variance explained from the EFA is less than 50%). At each step, all the items below the above mentioned value were deleted from the specific dimension, in order to have more precise and defined measurement scales. All the investigated variables were loaded into an exploratory factor analysis through an un-rotated factor solution (Podsakoff *et al.*, 2003).

Once the CMV problem had been defined, data derived from the questionnaire were analysed considering descriptive statistics, frequencies and distributions. The principal statistical indicators (as mean, standard deviation, skewness and kurtosis) were computed in order to have a wide comprehension of the variables distribution, evaluating as to whether some of them should be discarded in the case of abnormal behaviours and of outlier presence.

Preliminary analyses were performed in order to ensure no violation of the assumptions of normality, linearity and homoscedasticity.

In addition, inferential analyses were conducted, particularly, the relationships between variables were investigated using the person product-moment correlation coefficient in order to test the existence of small (from 0.10 to 0.29), medium (from 0.3 to 0.49) or large (from 0.5 to 1) correlations among them (Cohen, 1988). The exact value equal to  $-1$  or  $+1$  indicated a perfect correlation among variables.

A final investigation of the relationship among variables, using a hierarchical sequential linear regression model (with enter methodology), was implemented in order to test the hypotheses, defining the predictors of exploration, exploitation and ambidexterity. This method allows for the development the hypotheses, through incremental models, in order to establish the impacts of control variables, input variables, and moderators respectively. The option "exclude case pair-wise" was implemented, it being the preferable methodology, particularly for a small sample, and to avoid any kind of data exclusion.

All the statistical analysis were performed using the Statistical Package for Social Science (IBM SPSS



## 4. RESULTS

### 4.1. *The sample under investigation*

During a time horizon of 60 days from the 1st of October to 30th of November 2015, 116 questionnaires were administered. Analysing the level of accuracy of the answers collected, 80 questionnaires were taken into account, achieving an effective response rate of 68.97%.

As result, the study involved 80 healthcare professionals, referring to different Italian hospital wards, of which the most part were from Northern Italy (96%).

The sample was composed predominately of males (64%), with an average age of  $52.77 \pm 0.828$  years (ranging from a minimum of 32 years to a maximum of 65 years) and of individuals that had been working in the healthcare organisation for an average of  $15.10 \pm 1.208$  years.

Stratifying the target population by their professional role, it emerged that 54% were head physicians, followed by other hospital managers of second level (34%) and clinicians having comparable functions (12%). The respondents had worked, on average, in their organisational role for  $14.91 \pm 0.723$  years. 8.8% of the sample worked in administrative/managerial departments and 91.2% worked in clinical departments that were articulated in 38 different typologies of wards.

Professionals were affiliated to the wards of public (91%) and private (9%) hospitals, most of them without a defined research orientation (82% *versus* 18%). With regard to the specific ward's strategy, results showed that 40% of the wards presented a clinical excellence, followed by profit maximisation (33%) and technological orientation (27%).

### 4.2. *Reliability of the Variables*

The reliability of the scales and the related constructs derived from literature evidence were tested, using Cronbach's coefficient alpha, thus proving the freedom of the scale from the random error and establishing their internal consistency.

Initially, an Exploratory Factor Analysis (EFA) was conducted in order to examine the dimensionality of multi-item measures. A Confirmatory Factor Analysis was not utilised because of the small size of the sample, it requiring more parameters to be estimated (Pinzone *et al.*, 2014). Some items related to *i*) environmental dynamism, *ii*) exploration, and *iii*) exploitation were deleted, since their component value was below the threshold of 0.3. In this view, the reliability of the scales was tested considering only the items validated by applying the EFA.

All scales related to both dependent and independent variables under assessment were accepted, since they presented a value of Cronbach's alpha largely above 0.7. Detailed information is reported in Table 1.

**Table 1. Resume of variables**

Construct	N	Number of items in the original scale	Number of validated items	Explained variance (%)	Cronbach's alpha
Opening Leadership	78	7	7	66.588	0.813
Closing Leadership	80	7	7	71.732	0.933
Organisational Support	80	8	8	78.763	0.961
Organisational Creativity	80	13	13	73.461	0.968
Environmental Dynamism	80	17	14	63.221	0.836
Exploration	80	9	8	80.405	0.784
Exploitation	80	12	12	76.264	0.874

#### 4.3. Hypotheses Testing

Opening leadership, closing leadership, organisational support (POS), organisational creativity and environmental dynamism were deeply analysed as independent variables, in order to define their positive or negative impact on the dependent variables. In this view, both the strength and the linear relationship between variables were described.

Table 2 reports a strong relationship ( $p < 0.01$ ) between ambidexterity and both exploration and exploitation, demonstrating how well the first variable is explained by the two constructs. With regard to exploration and exploitation, a good correlation was reported, suggesting that a ward needs prior existing knowledge in order to be able to acquire new information from external contexts (Cohen and Levinthal, 1990).

Exploration is influenced by opening leadership ( $p < 0.05$ ), organisational support ( $p < 0.01$ ), and organisational creativity ( $p < 0.01$ ). The same trend emerged considering exploitation that is also positively influenced by closing leadership and environmental dynamism ( $p < 0.01$ ).

**Table 2. Correlations among variables**

Construct	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Ambidexterity	1							
(2) Exploration	.826**	1						
(3) Exploitation	.806**	.397**	1					
(4) Opening leadership	.465**	.475*	.353**	1				
(5) Closing leadership	.295**	.022	.557**	.209	1			
(6) POS	.403**	.373**	.394**	.494**	.515**	1		
(7) Org. creativity	.501**	.408**	.402**	.121	-.010	.242*	1	
(8) Env. Dynamism	.278*	.210	.305**	.037	.196	.139	.226*	1

*Significance levels: \*  $p < 0.05$ ; \*\*  $p < 0.001$*

With regard to the independent variables, organisational support, opening/closing leadership and organizational creativity are strictly related. A good correlation is reported between environmental dynamism and organisational creativity, demonstrating that in the case of increase in the dynamism level, physicians are more stimulated to propose creative and innovative ideas.

After having tested the correlation among variables, a regression analysis was conducted to test hypotheses,

thus examining the Adjusted R<sup>2</sup> in order to control the explanatory power of each model (Tabachnick and Fidell, 2007).

**Table 3: Hierarchical regression for dependent variables**

Independent variables	Dependent variables			
	Exploration	Exploitation	Ambidexterity (calculated as sum)	Ambidexterity (calculated as product)
• Opening Leadership	0.375**		0.389***	-0.286*
• Closing Leadership		0.506***	0.288**	-0.272*
• Organisational support	0.128	-0.012	-0.029	0.218
• Organisational Creativity	0.270*	0.529***	0.499***	-0.017
• Environmental dynamism	0.224 <sup>ψ</sup>	-0.014	0.094	-0.077
<b>Moderators</b>				
• Opening Leadership x Env. Dynamism	0.001	—	0.052	0.014
• Closing Leadership x Env. Dynamism	—	0.066	0.191	0.286 <sup>ψ</sup>
• Organisational Support x Env. Dynamism	-0.010	0.067	-0.086	0.094
• Organisational Creativity x Env. Dynamism	0.007	-0.132	-0.126 <sup>ψ</sup>	0.236*
R <sup>2</sup>	0.426	0.546	0.616	0.385
Adjusted R <sup>2</sup>	<b>0.318</b>	<b>0.463</b>	<b>0.529</b>	<b>0.303</b>
F value	3.957***	6.614***	9.741***	4.725***
Δ R <sup>2</sup>	0.000	0.016	0.020	0.206
F(ΔR <sup>2</sup> )	0.364	0.878	1.160	5.702***
<i>Significance levels: *** p &lt; 0.001; ** p &lt; 0.01; * p &lt; 0.05; <sup>ψ</sup> p &lt; 0.1</i>				

With regard to exploration, results show that opening leadership ( $\beta = 0.375$ ;  $p < 0.01$ ), organisational creativity ( $\beta = 0.270$ ;  $p < 0.05$ ) and environmental dynamism ( $\beta = 0.224$ ;  $p < 0.1$ ) are antecedents of exploration (Adjusted R<sup>2</sup> = 0.318 and F=3.957). Focusing on the environmental dynamism, a positively significance relationship emerged with regard to exploration, thus demonstrating that a turbulent context may motivate clinicians to propose new solutions and to search for innovation, outside of the organisation.

Exploitation was well explained by closing leadership ( $\beta = 0.506$ ;  $p < 0.001$ ) and organisational creativity ( $\beta = 0.529$ ;  $p < 0.001$ ), thus reaching an Adjusted R<sup>2</sup> equal to 0.463. On the one hand a close leader is necessary to better exploit internal resources and to be efficient in ward activities; while on the other hand, to be creative is not only necessary to explore new knowledge but also to administer this new information in successful ways. A negative effect emerged between organisational support and exploitation ( $\beta = -0.012$ ;  $p > 0.1$ ). No significant effect of the dimension environmental dynamism was reported with regard to exploitation, both in terms of a dependent variable and in terms of a moderator.

With regard to ambidexterity, it emerged that both opening ( $\beta = 0.389$ ;  $p < 0.001$ ) and closing ( $\beta = 0.288$ ;  $p < 0.01$ ) leadership, as well as organisational creativity ( $\beta = 0.499$ ;  $p < 0.001$ ) were required to achieve ambidextrous behaviours, thus mostly explaining the variance of the dependent variable (Adjusted R<sup>2</sup> = 0.529). In this view, the significant presence of opening and closing leadership were confirmed as necessary behaviours to pursue ambidexterity, integrating organisational creativity as fundamental component in order to build innovation. As previously noted, organisational support did not present any significance: on the one hand, clinicians prefer to operate autonomously; on the other hand, the lack of resources that organisations

face towards the employees emerged.

## 5. DISCUSSION

The results reported in the previous section aimed to show the existence of possible determinants and predictors of ambidexterity; representing an original contribution to the scientific evidence available today and being something that literature has not yet completely investigated, within the specific healthcare context, since the increasing importance of knowledge may have relevant implications for innovation development.

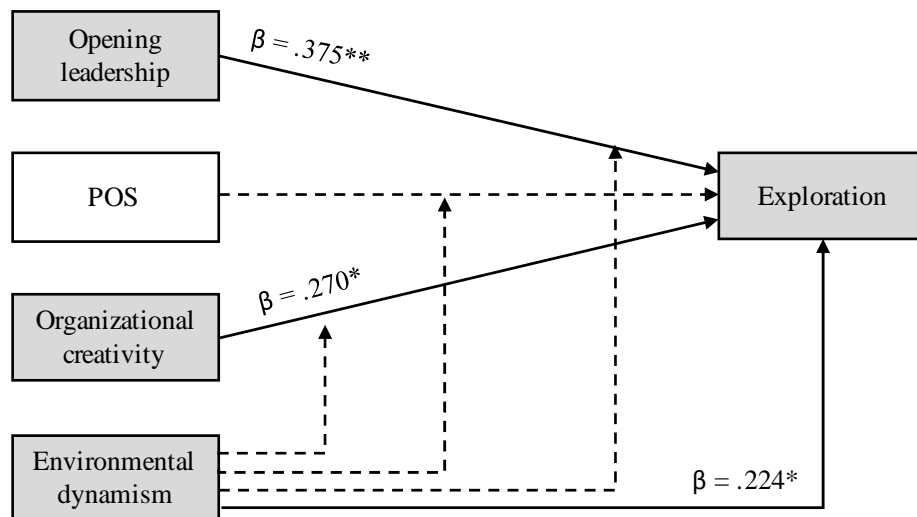
Considering the analysed variables, the following considerations emerged within the specific field of interest.

- The coexistence of two different styles of leadership (both opening and closing leadership) may be required to reach ambidextrous behaviours. This is consistent with previous literature, demonstrating that ambidextrous leadership explains the variation that lead different leadership styles into innovation (Rosing *et al.*, 2011): a good head physician/ward manager, to be innovative, should not only monitor and control the professionals, but also promote ideas and risk-taking. In this view, healthcare managers should be active, pursuing change adaptation, and being promoters of innovative processes (Tran and Voyer, 2015), thus being able to switch between opening and closing attitudes.
- Despite literature (Eisenberg *et al.*, 1990) having reported that organisational support should positively affect the achievement of innovation, at least in the present study, no significance emerged with regard to how a healthcare organisation may help its professionals in performing exploration, exploitation or ambidexterity activities. Clinicians prefer working autonomously and do not share their own abilities, creating distance between the hospital direction and the ward dimension (Kumar, 2013). Hospitals, instead, are continuously facing a lack of financial funds and this factor does not incentivise organisational support towards clinicians. This results underline how the healthcare sector is different from others: in the industrial setting, exploitation and exploration require intense and close collaborations throughout the company.
- The presence of organisational creativity positively affects all the dependent variables and is strictly related to the leadership behaviour previously described, due to the fact that clinicians are a source of innovative ideas and solutions: they understand the complexity of the healthcare sector, thus allowing professionals to spread successful practices (Cohen 2014). The results demonstrate that creative ideas are a necessary condition for innovation, in terms of exploring new sectors as well as exploiting better the existing activities. New ideas are not only important for acquiring new knowledge, but also for better use of these innovative solutions in the ward, for the knowledge sharing among the working team. Both creation and transferability of ideas are equally important in the organisations (Lenfant, 2013).
- Environmental dynamism does not act as moderator: hospitals prefer to maintain the internal stability

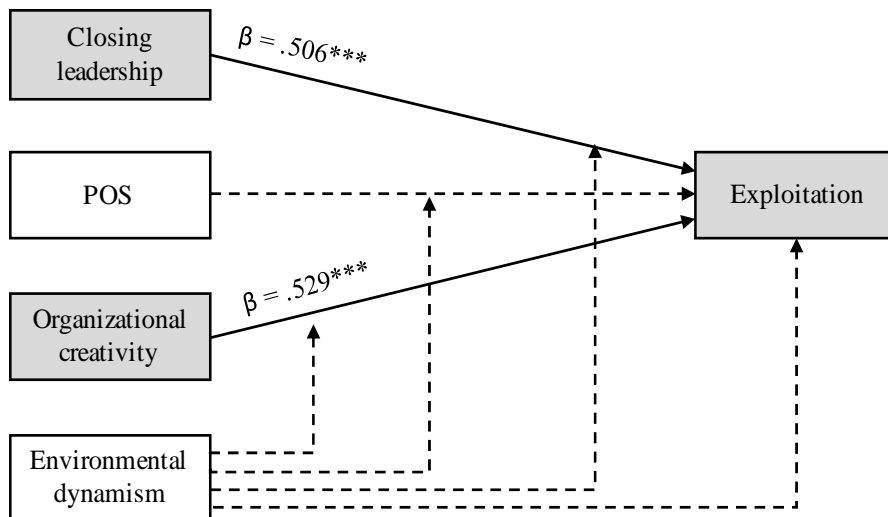
and are more resilient to change (Mura *et al.*, 2014), if compared with the industrial sector companies. Exploration registered a positive relation with the environmental dynamism: turbulent context may motivate clinicians in proposing new solutions and searching for innovation, outside the organisation.

- The preferable method to calculate ambidexterity, within the healthcare setting, is represented by the sum between exploration and exploitation values, justified by the fact that the construct of ambidexterity calculated as a sum is best explained by the independent variable utilised in the framework, thus producing an Adjusted R<sup>2</sup> equal to 0.529 in comparison with an Adjusted R<sup>2</sup> equal to 0.303 related to the variable ambidexterity calculated as a product between exploration and exploitation.

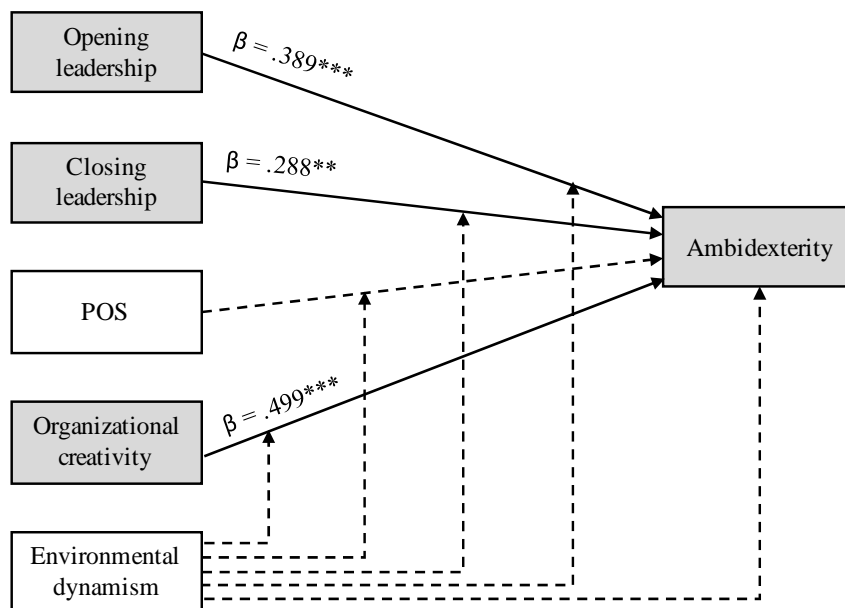
In this view, Figures 4, 5 and 6 analytically describe the most significant results achieved during the hypotheses' testing process.



**Figure 4: Exploration framework with verified hypotheses**



**Figure 5: Exploitation framework with verified hypotheses**



**Figure 6: Ambidexterity framework with verified hypotheses**

The findings of the study may significantly impact on the managerial practices.

One of the most relevant challenge occurring within the healthcare setting is the resistance to change. Thus, a clinician, acting as a leader, should promote the possible changes as a result of participating in leadership programmes, overcoming the resilience (Kumar, 2013), and avoiding the block of investment. As the use of multiple control systems (in this case, in terms of opening and closing leadership) may require considerable managerial attention, management should prioritise where to focus their attention and resources (Marginson, 2002; Widener, 2007).

In addition, a good leader should motivate physicians toward the development of a creative and open mind,

revealing the significance of organisational creativity, that is strictly related to leadership: a stronger relationship among different medical units may be created, to have a wider vision and develop an inter-departmental creativity.

With regard to organisational support, it is necessary that clinicians should be supported by top management departments in order to foster innovation. Literature gave two possible solutions that may be implemented in the healthcare sector: *i*) create a co-ordination mechanism to incentivate the communication between managerial and clinical departments (Oborn *et al.*, 2013), as also advocated by Clinical Governance principles (Scully and Donaldson, 1996), and *ii*) promote and support training and educational activities, thus allowing clinicians to participate in learning programmes, or in professionals' membership associations (Gumus *et al.*, 2011).

In addition, physicians should conceive the turbulence in the environment as a trigger point to innovate, and not as a way to create static structures (Zahra and George, 2002): environmental dynamism may encourage clinicians to establish innovation fields with diverse perspectives.

## 6. CONCLUSIONS

Taken together, the results of the study provide insight into the contrasting role of innovation within the healthcare sector. In this view, the original contribution of the present paper was to underline and investigate the incremental measure of ambidexterity, providing healthcare professionals with qualitative and quantitative indicators.

The findings may contribute to enlarge the existing research, from two points of view. They provide an incremental measures of ambidexterity, from both a qualitative and a quantitative perspective. In addition, the study gives an empirical support in the specific field, applying the theme of ambidexterity in the healthcare sector, thus covering the previously mentioned literature and knowledge gaps.

Accordingly, the results give solutions to hospital wards, thus paving the way to the determination of an efficient leadership style, together with a creative and open mind, useful to foster innovation and to present ambidexterity.

However, despite the relevance of the results, the study presents several limitations that should be considered in the interpretation of the findings.

Different from other previous studies (He and Wong, 2004; Lubatkin *et al.*, 2006), the analysis used exploration, exploitation and ambidexterity only as dependent variables, without considering whether and how ambidexterity may effectively affect performances within the healthcare setting, thus presenting a static picture of the context analysed. In addition, the small size of the sample might be considered one of the main limitations, from a methodological point of view, as well as the collection of data only from one respondent per ward.

These limitations were, therefore, amply overcome by testing the common method bias in order to ensure

that the data had no major problems with the response bias.

The collection of a large amount of qualitative and quantitative data may also be considered a limitation for the significant risk of missing, or not, completed data and information. This situation may be easily solved with a greater involvement of the hospital wards and institutional data-flow.

Finally, moving on from these considerations, the authors of the present paper suggest that it might be useful in the future to conduct a similar study that collects more than one respondent per ward, in order to understand better how clinicians and hospital managers interact and examine how these dynamics may affect innovation.

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