

Article

Human Systematic Innovation Helix: Knowledge Management, Emotional Intelligence and Entrepreneurial Competency

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Abstract: This study analyzes the relationship between the innovation capacity of Spanish companies through the ability to obtain their information through the integration of these three variables: knowledge management, emotional intelligence, and entrepreneurial competency of Spanish executives. The questionnaires were distributed to executives of companies from different sectors of activity. The sample consists of 241 executives. The hypothesis was examined by structural equation modeling. Regarding the direct effects, the hypothesis testing result proves that the knowledge management of executives exerts a positive effect on Innovation, and, the entrepreneurial competency of executives exerts a positive effect on innovation. However, the influence of EI on innovation is not significant. The indirect effect shows that the integration of knowledge management, emotional intelligence and entrepreneurial competency of executives exert a positive statistical effect on Innovation at enterprises. This paper contributes with both, scientific and socio-economic impacts. Scientific impact, generating new knowledge that strengthens the value of executives as a catalyst for innovation; and, socio-economic impact, originating the human systematic innovation helix, a new socio-economic management tool to develop knowledge management capacity, socio-emotional abilities, and entrepreneurial competencies of executives, which acts as a lever to boost the results of innovation at companies.

Keywords: innovation; knowledge management; emotional intelligence; entrepreneurial competency; structural equation model



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1. Introduction

The European Union (EU) has continuously strived for more inclusive societies built on democracy and the rule of law as reflected in Article 2 of the Treaty on the European Union [1]. The EU is one of the leading forces behind the United Nations 2030 Agenda, in which world leaders are committed to ending poverty, protecting the planet, and ensuring that all people enjoy peace and prosperity [2]. The 2030 Agenda sets out 17 Sustainable Development Goals (SDG) and 169 targets, integrated and indivisible, which cover economic, social, and environmental dimensions [3]. The European Commission today integrates SDG into several European actions and initiatives and is questioning itself on the best structures, instruments, and policies to be approved by EU institutions in order to fulfill the SDG [4].

Spain is one of the most advanced economies in the EU; however, it is rated as a moderate innovator by the European Innovation Scoreboard (EIS) 2020, which shows that the innovation performance in Spain is below the EU average [5]. Every organization is a social system where its members are involved in interactions that evoke emotions that affect both their psychological and physical health, as well as the attitude of that member towards duties, the organization, and professional achievements [6,7]. Anwar, Shah, and Khan [8]

and Papadakis and Barwise [9] consider that top managers, owners, and executives are the responsible authorities for making strategic decisions in their firms.

As a result of the interest in creating more innovative and competitive firms and the fact that knowledge plays a key role in value creation within them, several researchers have analyzed the strategic role of knowledge and knowledge management in the innovation processes [10–14].

Considerable literature about innovation has been accumulated on the subject and concurs that competitive success is built upon people skills, though little emphasis has been placed on the specific skills required for innovation [15,16], arguing that the relative importance of skills depends on the originality of the innovation, with radical innovation requiring scientific, engineering and design skills, and incremental innovation requiring problem-solving skills. Sajilan S. et al. [17] noted that entrepreneurs must develop their competencies because entrepreneurs must manage all their business activities. Entrepreneurs can develop essential entrepreneurial competencies by training.

Previous studies have shown the relationship between the innovation capacity of Spanish companies and the ability to obtain information from them through cooperation with competitors, suppliers, universities, and other public institutions [18]. Furthermore, previous studies show the relationship between knowledge, behavior, and emotion; however, these impacts on the innovation of companies have been analyzed from an isolation perspective, not from an integrated perspective. From an inclusive and integrative perspective and often based on humanistic considerations [19,20], the main aim of this research is to study the influence that the integration of these three variables: knowledge management, emotional intelligence, and entrepreneurial competency exert on the Innovation in Spanish companies. This paper contributes to generating new knowledge that strengthens the value of executives as a catalyst for innovation; and, originating a new socio-economic management tool, which is called the human systematic Innovation helix (HSIH).

2. Literature Review

2.1. Innovation

In this research, we define innovation broadly as ideas, systems, technologies, products, processes, services, or policies that are new to the adopting organization [21,22]. Wang et al. [23] state that innovation is conceptually a process that begins with a ground-breaking idea and concludes with insertion into the market.

Okpara [24] understands that innovations can be classified into several forms: innovation in processes, innovation in products or services, innovation in management and work organizations, and the exploitation of human resources, and innovations centered on people, culture, structure, processes, and technology.

According to the Oslo Manual [25], the main types of innovations are: product innovations, process innovations, marketing innovations, and organizational innovations. In this study, the innovation typology adopted is focused on both, product and process innovation. Product innovation involves new or significantly improved characteristics of the service offered to customers; and, if the innovation involves new or significantly improved methods, equipment, and/or skills used to perform the service, it is a process innovation.

2.2. Knowledge Management

Today, knowledge is known as a key property and a valuable asset that is the base of constant development and the key to permanent competitive advantage of an organization but is a difficult concept to define. Davenport and Prusak (1998) define knowledge as a specific and rule-governed organizational process for capturing, organizing, retaining, applying, and knowledge sharing which renews the individuals' background knowledge to improve the organizational performance [10].

The best-known classification of knowledge follows two dimensions: the ontological (or subject that learns) and the epistemological. The multiple epistemologies of knowledge are synthesized in the work of Polanyi [26] who distinguishes between explicit and

tacit knowledge. Knowledge explicit can be expressed in words and numbers, or any other encoded data. However, knowledge tacit, such as subjective perception or emotions, cannot be instrumentalized and is transmitted in certain contexts and actions; is very personal and difficult to verbalize or communicate. Regarding the ontological dimension, Spender [27] considers two levels: individual and collective. Nonaka and Takeuchi [28] speak of individual, group, organization, and interorganization.

Knowledge management (KM) has many different definitions. In this research paper, KM is understood as the set of capabilities in which an organization can create, share, and apply knowledge resources to generate value and competitive advantage [29]. KM plays a key role in fostering innovation through the three following mechanisms: (1) knowledge acquisition (KA) from the overseas market, and the workforce, internally, offers opportunities so that companies can combine current knowledge and create new learning processes [30]; (2) knowledge sharing (KS) is identified as the process of exchanging data, information, know-how, skills, feedback, and expertise among individuals to accomplish their duties and organizational goals [31–33]; (3) knowledge application (KAP) is such that the value of individual and organizational knowledge lies primarily in their application, because of the rigidity and tacit nature of knowledge [27].

2.3. Emotional Intelligence

Emotional intelligence (EI) is a type of organizational intelligence that includes identifying the emotions of organizational human resources and applying them to make appropriate decisions in the organization [34]. The generally accepted view of Salovey and Mayer defines Emotional Intelligence (EI) as “the ability to perceive emotions, to access and generate emotions so as to assist thoughts, to understand emotions and emotion knowledge, and to reflectively regulate emotions so as to promote emotional and intellectual growth” (Mayer and Salovey, 1997, p. 5) [35].

At the present, the representative views about Emotional Intelligence (EI) include the ability model and mixed models. The mixed model was proposed by Bar-On and Goleman. In the organizational context, emotions properly managed to drive many of the greatest productivity gains, innovations, and accomplishments of individuals and teams [36]. The Bar-On model includes the components of interpersonal skills, adaptability, stress management, and general mood; this approach refers to EI as a series of interpersonal skills that affect an individual’s behavior at various events in his life [37].

In this research, the EI is represented by the ability model proposed by Mayer and Salovey [38], being the EI composed of four dimensions arranged hierarchically, including: self-emotions appraisal, others’ emotions appraisal, use of emotion, and regulation of emotion. So perceptual emotion has a key role in facilitating thinking, understanding emotions and emotional knowledge, and the ability to regulate emotions to promote emotional and intellectual growth.

2.4. Entrepreneurial Competency

Bird [39] claimed that “entrepreneurial competencies (EC) are defined as underlying characteristics such as generic and specific knowledge, motives, traits, self-images, social roles, and skills which result in venture birth, survival, and/or growth” (Bird, 2019, p. 115). EC are obviously carried by individuals—the entrepreneurs who begin or transform organizations and who add value through their organizing of resources and opportunities.

In the present article, the EC construct is based on four factors: skills, expertise, problem solving, and adaptability competencies, involving the 12 items of EC by Phana and Subchat [40].

2.5. Hypothesis and Research Model

2.5.1. Knowledge Management and Innovation

The value of employees is not only reflected in their work, but also in their innovative ideas [41], which can be transformed into products and services. A high level of

participation would create the conditions to encourage employees to bring new ideas and exchange knowledge in the ongoing innovation process and, in turn, enhance innovative outcomes [42,43]. The use of KM fosters the creation of new projects leading to a positive influence on entrepreneurial innovation through the instigation, storage and transfer, and application and use of knowledge [44,45]. Luengo-Valderrey and Moso Díez [46] provide empirical evidence that knowledge workers have the greatest impact on innovation performance and there is also a strong correlation between workers and investment in internal KM. The findings of Huang and Li [47] highlight the importance of knowledge management in the process of innovation and help scholars and managers to better understand the mediator of knowledge management through which social interaction benefits innovation performance. Zheng et al. [48] point out that KS activities contribute significantly to innovation efforts and help ameliorate organizational performance at the firm level.

The current literature focuses on these distinctions due to the crucial influences of explicit and tacit KS on key organizational outcomes such as firm performance, organizational productivity, absorptive and innovation capacity, and sustainable competitive advantage [23,28,49]. Cao et al. (2021) argued that KS processes positively mediate the relationship between high-involvement Human Resources Management practices and innovation capability. In addition, fostering the willingness of employees for sharing tacit knowledge (refers to the process in which individuals share their personal knowledge such as experiences and expertise, uncommon understandings, insights, and intuitions) and, explicit knowledge (the individuals' process of sharing codified knowledge and formal information) is one of the most optimal solutions for firms to pursue product and process innovation capability [50]. The empirical results obtained by Voon-Hsien Lee et al. [51] provide empirical evidence that KM practices (i.e., knowledge sharing, knowledge application, and knowledge storage) are positively and significantly related to technological innovation (i.e., product and process innovation). Therefore, it is hypothesized:

Hypothesis H1. *The knowledge management of executives exerts a direct and positive effect on innovation at enterprises.*

2.5.2. Emotional Intelligence and Innovation

Several studies have claimed that superior EI includes some concrete abilities, as follows: (1) to identify, evaluate, and provide personal emotions precisely [52]; (2) to integrate and manage personal emotions in order to facilitate better thinking-quality skills [53]; (3) to be aware of other people's emotions for better management of personal relationships [54] and (4) to exploit various emotional forces to facilitate problem-solving efficiency [55].

Employees with higher levels of EI may have a better understanding of people's emotions, better control of their emotions, and rarely express negative emotions at work [56]. Many academics believe that the EI of the leader leads to establishing a positive environment and can effectively predict employee performance [57]. Blázquez and Bermúdez (2019) empirically demonstrate that senior executives' EI exerts a positive, direct influence on innovation in Spanish companies [58]. Regarding the relationship between EI and innovation, it could be suggested that EI facilitates innovation by increasing and promoting cooperation and coordination between employees and various departments in the organization [35,59,60].

In addition, Kaasa et al. (2007) report that EI, especially its structural aspects in the forms of formal and informal networks and civil partnerships, has positive effects on innovation activities [61]. Several previous studies have found a positive relationship between EI and innovation [62]. Zampetakis et al. [63] found that EI is one of the most important factors in organizational innovation and Laursen et al. [64] conclude that high levels of EI are correlated with high innovation. It seems that EI can play a prominent role in generating creative ideas and realizing the entrepreneurship process. EI seems to have a significant positive influence on employees' innovation, which encourages entrepreneurship motivation among the employee [65]. Hence, it is hypothesized:

Hypothesis H2. *The emotional intelligence of executives exerts a direct and positive effect on innovation at enterprises.*

2.5.3. Entrepreneurial Competency and Innovation

There is a gap between problems taught at management schools and those found in the real world [66] for this reason it is thus increasingly important that problem-solving abilities are taught in order to address the complex issues faced in the business world. As it is suggested by Mohaghegh and Furlan (2020), managers can adopt a flexible approach to problem-solving by adopting both intuitive problem solving to have short-term success and systematic problem solving for coping in the long run with problems at their root causes, solve them fundamentally, and achieve strategic capabilities [67].

On the one hand, considering the role of expertise, some researchers have found firms and teams that are effective in integrating diverse expertise possessed by individual specialists tend to perform better [68–70]. On the other hand, the adaptability of employees is also a key factor that is known to impact organizational outcomes such as job satisfaction and job performance [71]. An adaptable employee is an asset for the organization [72] and the customer [73] because they are known to positively impact organizational performance [71,74]. Collective intelligence is a form of intelligence that results from the mutual engagement between people, which is thought to result in better solutions to problems than would otherwise be possible, because of the synergistic effects that result from the collective handling of tasks and the aggregation of advice and criticism, and it was found by Lee J-Y and Jin C-H to affect work process, operations, and service innovation [75].

Executive entrepreneurs with highly developed EC are more likely to introduce innovation to their businesses [76]. The existence of a link between EC and innovation is proved by a study conducted by Mohsin et al. [77], which shows that ECs influence corporate innovation. They argue that entrepreneurs must have the right competencies for undertaking innovative projects. In general, all dimensions of EC influence innovation, meaning that ECs are very crucial in fostering innovation capability.

Umar et al. [78] also found that business success in Malaysia was influenced by ECs and firm innovation. All dimensions of ECs influence innovation. It means that the ECs are very crucial in fostering innovation capability.

Pranowo et al. [79] findings show that EC exerts a positive and significant effect on innovation capability. This finding is consistent with a study conducted by Mohammad-kazemi et al. [80], who also observe that there is a correlation between EC and innovation. Therefore, it is hypothesized:

Hypothesis H3. *The entrepreneurial competency of executives exerts a direct and positive effect on innovation at enterprises.*

2.5.4. Knowledge Management, Emotional Intelligence, Entrepreneurial Competency and Innovation

An organization's ability to innovate is key to its performance, productivity, and export capabilities [81,82]. The ability of a firm to innovate resides in the knowledge, skills, and abilities of its employees. To achieve the vision of exemplary innovation, organizations need more innovative employees in new product development and other functions, yet it is still unclear which types of capabilities are best to develop in individuals to fit this purpose [83,84]. In particular, recent reviews of the literature have concluded that past research has failed to adequately identify which types of employee knowledge and skills are most important for different stages of the innovation process [83,85].

Recent research has contributed to innovation management literature by identifying a taxonomy of executives' profiles which presents the different levels of knowledge management and EI and differences in their ability to innovate [86]. Perez-Luno et al. [87] indicate in their study how EI and knowledge exert a direct influence on innovation. Brooks and Nafukho [88] observe that EI can influence organizational performance by generating innovation, sharing knowledge, and reducing deal expenditures, etc. Zulfadil et al. [89]

suggested that EI directly influences knowledge Sharing, conflict in teams, the structure mechanism, and team performance.

As we have noted before, KM, EI, and EC have been considered independent factors that exert an influence on innovation. Previous empirical research that has been managed to study the impact of the integration of KM, EI, and EC and their effect on Innovation has been unacknowledged. As a result, this study is produced to fill these theoretical gaps and advance the understanding of the integrative influence of these three variables: KM, EI, and EC on Innovation.

On the basis of the abovementioned literature, it is hypothesized:

Hypothesis H4. *The integration of knowledge management, emotional intelligence and entrepreneurial competency of executives exert a direct and positive effect on innovation at enterprises.*

2.5.5. Theoretical Framework and Research Model

This research model proposed is based on the following theories: resource-based view (RBV) which focuses on managing heterogeneous intangibles in favor to achieve a sustained competitive advantage [90,91]. This approach explains that heterogeneity between business organizations stems from differing degrees and scope of control over valuable, rare, inimitable, and non-substitutable resources (VRIN criteria). Moreover, the theory of resources is based on dynamic capabilities [92–94]. Dynamic capability is the “firm’s ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environment”, Teece et al. (1997, p. 516).

However, Eisenhardt and Martin (2000) argue that possessing VRIN resources and capabilities as well as dynamic capabilities development is a necessary but not sufficient condition for achieving and sustaining competitive advantage [95]. For this reason, we proposed these theories should be completed with the following systemic perspective:

From a systemic focus in which the starting point is the individual joining the organization [96], our theoretical framework is based upon the Dual Model of Intelligence proposed by Norman and Shallice [97], and the winner of the 2002 Nobel Prize for Economics, Daniel Kahneman [98], who explains: “The mind has two systems: System 1 (Fast brain), fast, intuitive and emotional, operates quickly and automatically, with little or no effort and no sense of voluntary control” and, System 2 (slow brain), slower, hard and rational, focuses attention on the hard-working mental activities that demand it. Its operations are often associated with the subjective experience of acting, choosing, and concentrating.

Figure 1 represents the Dual Model of Intelligence from the individual to the organization. At the individual level, we find the integration of the three subsystems: cognitive, affective, and motor. By transforming the individual level to an organizational level, we would find a new management of human talent. In system 1, the integration of knowledge management (KM), emotional intelligence (EI), and entrepreneurial competency (EC) in one unit, which originates the fusion between: “Knowing and Knowing—Doing”, “Feeling and regulating emotions”, and “Knowing how to act and improve”. That integration of KM, EI, and EC in system 1 contributes to focusing attention on making the best decisions to innovate in system 2.

Next, Figure 2 represents the research model and proposed hypothesis. It is proposed a causal relationship between KM, EI, EC, and Innovation. Knowledge management is understood in terms of: knowledge acquisition (KA); knowledge sharing (KS) and knowledge application (KAP). Emotional intelligence (EI) underlines four dimensions: emotional autonomy (EA), emotional awareness of others (EAO), use of emotions (UE), and emotional regulation (ER). Entrepreneurial competency (EC) is based on 12 items that consist of four dimensions: abilities (AB), experience (EX), problem solving (PS), and adaptability (AD). Finally, to measure the innovation, we considered different criteria. Four criteria to measure product innovation (PRODI): level of originality (LO), use of the latest technological advances (ULT), number of innovations (NOI), and speed of innovation (SI); and,

three criteria to measure process innovation (PROCI): technological competitiveness (TC), speed of innovation (SI), and use of the latest technological advances (ULT).

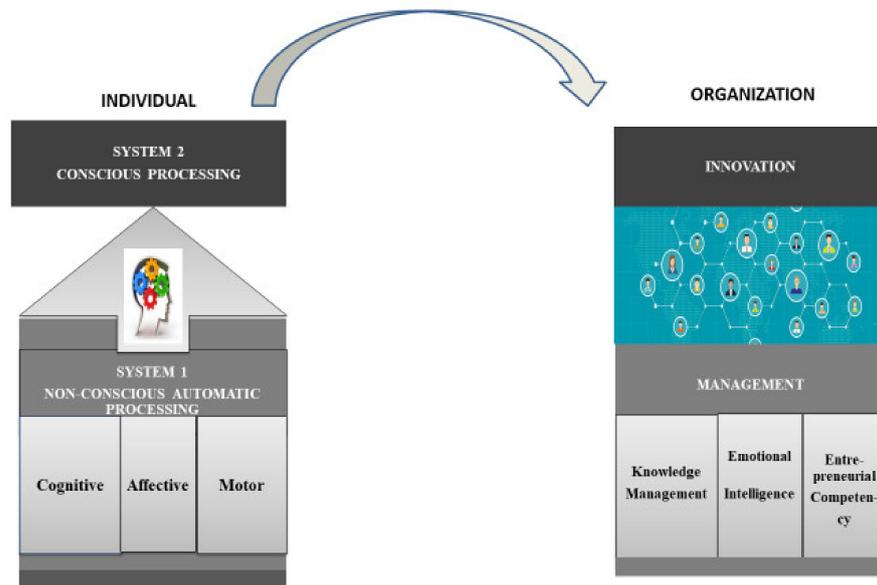


Figure 1. The dual model of intelligence from individual to the organization.

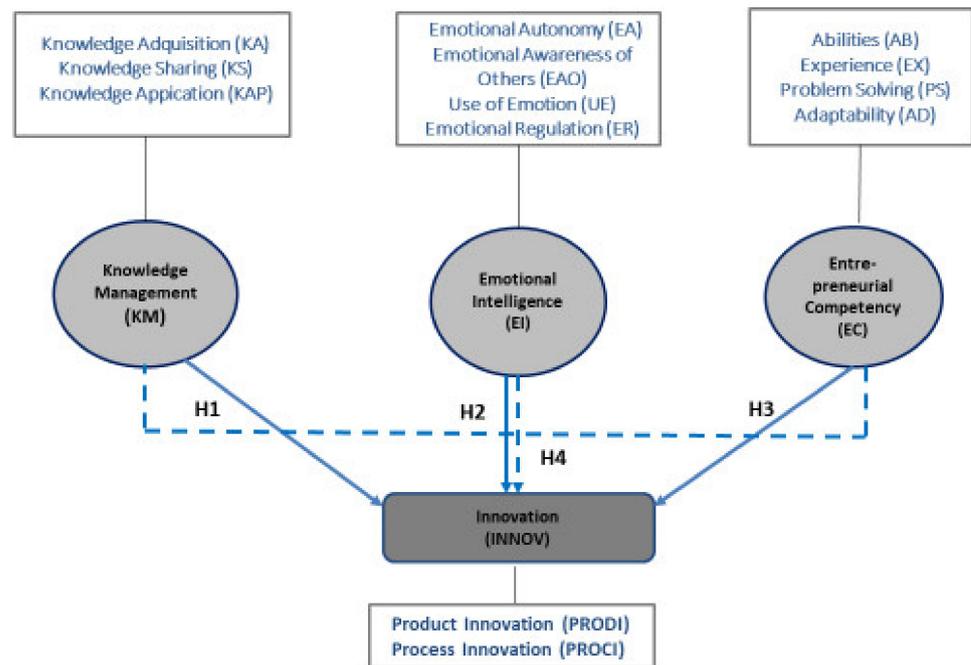


Figure 2. Research model and hypothesis.

The scales of measurement used are:

Lin and Lee [99] and Gold et al. [100] to measure Knowledge Management.

Wong and Law [101] to measure Emotional Intelligence.

Phana and Subchat [40] to measure Entrepreneurial Competency.

Prajogo and Sohal [102] to measure Innovation.

3. Method

To comply with the proposed aim to study the influence that the integration of these three variables: KM, EI, and EC exert on the Innovation at Spanish companies. The sample

consists of 241 executives over 25 years old employed by Spanish enterprises engaged in a wide range of activities. No sector of activity has been omitted, the most representative sectors being: services sector (43.15%); professional, scientific, and technical activities sector (12.45%); technology (7.05%); and industry sector (6.64%).

In the first quarter of 2020, a self-administered online survey was used to collect the respondents from LinkedIn social networking platforms because of the ease of accessibility and the inability to access other directories. The total number of surveys collected was 400, and, after making two reminders, the total number of respondents was 255, but 14 outliers were identified and eliminated to prevent distortion of the subsequent analysis. Therefore, the response rate reached 63.75%.

As is shown in Table 1, 41 items represent the research indicators. All the constructs included in the study were measured on 7-point Likert scales. In the cases of KM, EC, and EI constructs, each respondent was required to express their level of agreement or disagreement for each item through a 7-point Likert scale based on the proposal of [103–108] with the following answer categories of responses: 1 <<strongly disagree>>, 4 <<neutral>>, 7 <<strongly agree>>. In the case of innovation, the following categories of responses were required: 1 <<much less in relation to its main competitors>>, 4 <<neutral>>, 7 <<much more in relation to its main competitors>>.

Table 1. Research indicators.

Construct	Dimensions	Code	Statement
INNOVATION (INNOV)	Product Innovation	PRODI1	The degree of newness of our firm's products/services.
		PRODI2	The use of the latest technological innovations in our new product and services.
		PRODI3	The speed of new product or service development.
		PRODI4	The number of new p. or s. that our firm has introduced to the market.
	Process Innovation	PROCI1	Our firm's technological competitiveness.
		PROCI2	The speed with which we adopt the latest technological innovation in our processes
		PROCI3	The newness or the technology used in our processes.
KNOWLEDGE MANAGEMENT (KM) 0.676 *	Knowledge Adquisition	KA1	Knowledge has been obtained from clients.
		KA2	Knowledge has been obtained from the collaborators.
		KA3	Knowledge has been obtained from the employees.
	Knowledge Sharing	KS1	Knowledge is shared between executives and employees.
		KS2	Knowledge is shared among colleagues in the same department.
		KS3	Knowledge is shared with others departments.
	Knowledge Application	KAP1	Knowledge is managed for practical use efficiently.
KAP2		Knowledge is used for practical use effectively.	
EMOTIONAL INTELLIGENCE (EI) 0.742 *	Emotional autonomy	EA1	Most of the time I have a good grasp of my own feelings.
		EA2	I have good understanding about my own emotions.
		EA3	I really understand what I feel.
		EA4	I always know if I am or I am not happy.
	Emotional Awareness of Others	EAO1	I always perceive my friend's emotions through their behaviour.
		EAO2	I am a good observer of others' emotions.
		EAO3	I am empathetic to the feelings and emotions of other people.
		EAO4	I have a good understanding of the emotions of people around me.
	Use of Emotion	UE1	Whenever I set a goal, I always try to do my best to achieve it.
		UE2	I am a self-motivated person.
		ER1	I am able to control my temperament and manage difficulties rationally.
		ER2	I am quite capable of controlling my own emotions.
Emotional Regulation	ER3	When I am very annoyed, I can always calm down quickly.	
	ER4	I have good control of my own emotions.	

Table 1. Cont.

Construct	Dimensions	Code	Statement
ENTREPRE- NEURIAL COMPETENCY (EC) 0.831 *	Abilities	AB1	I have de ability to lead change
		AB2	I have skills to motivate my work team.
		AB3	I am able to allocate resources effectively.
	Experience	EX1	I have been managing a team for more than five years.
		EX2	I am a person who looks forward to new projects.
		EX3	I know how my company works and what my functions are.
	Problem Solving	PS1	Before acting, I identify the context where the problem has arisen.
		PS2	I participate in the analysis of my company's problems.
		PS3	I am a good manager of conflicts that occur in my company.
		PS4	Sharing internal and/or external information favours problema solving.
	Adaptability	AD1	I am flexible to the changes that occur in my company.
		AD2	I make use of the collective intelligence of my work team to face the processes of change.

Note: * Validity check for constructs using average variance extracted (AVE). Source: Compiled by the authors.

The descriptive statistics and demographic profile are included in Table 2. Underline that the percentage of women (32%) is lower than men (68%), being between 41–55 years old. Examining the characteristics of the companies, the main percentage is private enterprises (66.4%) compared to public enterprises (27.8%). According to employees, 66.4% of employees have a seniority system over 10 years, working a percentage of 31.1% for companies with less than 25 employees and 34.9% for companies with more than 500 employees.

Table 2. Descriptive statistics and demographic profile ($n = 241$).

Gender System	Freq.	%	Age	Freq.	%	Employees	Freq.	%	Seniority	Freq.	%	Class	Freq.	%
Male	164	68.0	<25	1	0.4	<25	75	31.1	<1	9	3.7	Public	67	27.8
Female	77	32.0	26–30	19	7.9	25–50	29	12.0	1–5	46	19.1	Private	160	66.4
			31–35	20	8.3	51–75	7	2.9	6–1	26	10.8	Others	14	5.8
			36–40	46	19.1	76–100	14	5.8	>10	160	66.4			
			41–45	58	24.1	101–250	16	6.6						
			46–55	76	31.8	251–500	16	6.6						
			56–55	19	7.9	>500	84	34.9						
			>66	1	0.4									

Source: Compiled by the authors.

4. Results

Based on the Dual Model of Intelligence proposed by Norman and Shallice and Daniel Kahneman, this study is aimed to originate a new socio-economic management tool to develop the socio-emotional abilities and competencies of executives, which acts as a lever to boost the results of innovation at companies. Both product innovation and process innovation are used for boosting the competitiveness and growth of the EU to achieve an innovative Europe. Figure 3 shows the proposed model with the coefficients of the exogenous and endogenous variables that have been set to 1, as suggested by Hair et al. (1999). For the estimation and representation of the proposed model, the AMOS statistical package version 23 was used. The approach used to estimate the parameters was based on the structures of covariances, or SEM (structural equation models) [106,107].

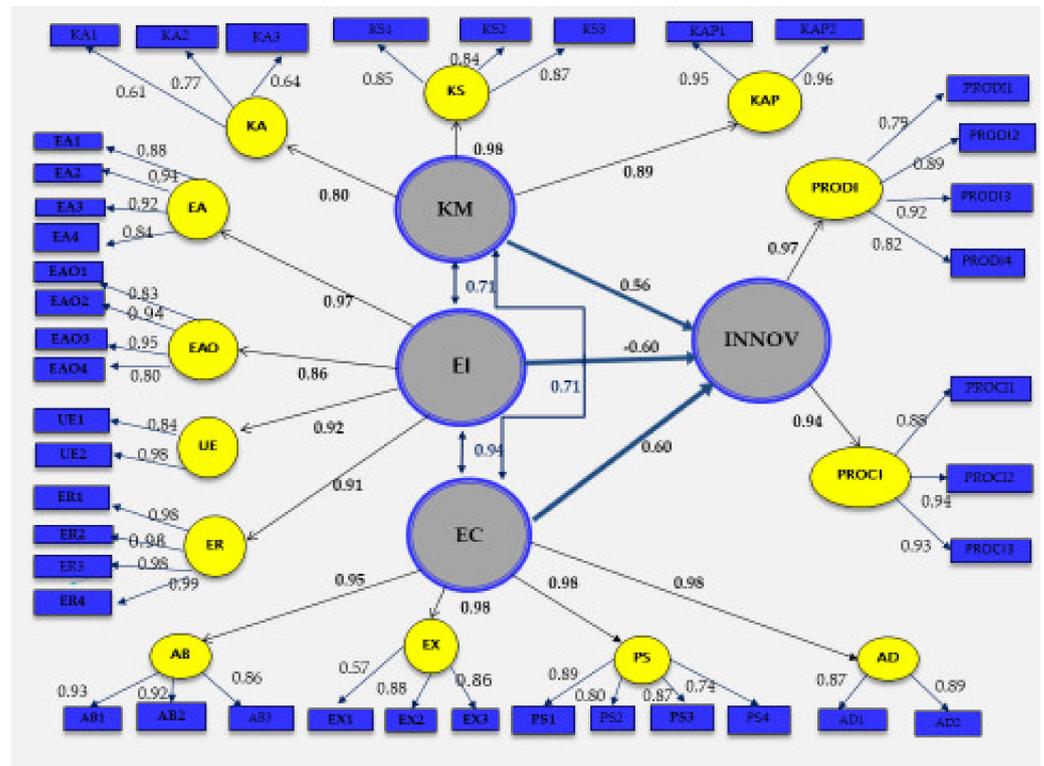


Figure 3. Structural equation model. Maximum likelihood estimation (standardized estimates).

Once the model is estimated, it is necessary to use goodness-of-fit statistics to assess its quality [108]. Discriminant validity was also established using the criteria of the average variance extracted (AVE). The AVE and interconstruct correlations of KM, EI, EC, and INNOV can be found in Table 1, where we can verify that no construct presents validity problems, with the AVE > 0.5. However, the square root of AVE is lower than the interconstruct correlations, (KM ↔ EI = 0.713; KM ↔ EC = 0.712; EI ↔ EC = 0.930). In 1981, following the recommendation of Fornell and Larcker [109], the square root of AVE should be greater than the interconstruct correlations, thus distorting discriminant validity. In 2009, Martínez-García and Martínez-Caro [110] pointed out that content validity is the response to problems derived from statistical analyzes is the appropriate theoretical solidity of the proposed scales. In the present study, the definitions of the variables KM, EI, EC, and INNOV are conceptually different and their respective measurement scales are sufficiently well justified on a theoretical level: Lin and Lee [99] and Gold et al. [100]; Wong and Law [101]; Phana and Subchat [40]; and Prajogo and Sohal [102].

To measure the reliability of the model, that is, to study the internal consistency to know if the items of the scales are correlated with each other, the alpha coefficient of Cronbach [111] has been calculated, obtaining a result of 0.938 > 0.8 minimum acceptable, which means that the instrument does pass the reliability test Gerbing and Anderson [112], with each of the 41 items that make up the scale being perfectly defined.

Table 3 details the goodness-of-fit statistics obtained for the estimated model.

The goodness-of-fit statistics obtained are within the recommended margins according to the scientific literature [113,114]. Browne and Cudeck [115] and Jöreskog and Sörbo [116] suggested that an RMSEA value of < 0.08 suggests a reasonable model-data fit. In this research, RMSEA is 0.080. The CFI (0.825) and NFI (0.745) indexes are lower than the minimum acceptable fit criterion. However, despite significant model test statistic discrepancies, it may be possible to retain the model in a theoretically meaningful way.

The following table, Table 4, contains the estimates of the parameters of the model—ML, the critical proportion (C.R.), P, valor and, the regression weights. The critical proportion (C.R.) is the quotient between the estimation of the parameter and the estimate of the

standard error. In view of the results contained in said table, it is verified that all the critical ratio values are greater than 2, except the relationship between EI and INNOV, which is -2.071 . Consequently, all estimated parameters are significant except for one, which signifies that the influence that EI exerts on innovation is not significant.

Table 3. Goodness-of-fit statistics.

Statistic	Abbreviation	Criteria	Estimated Model
Absolute fit			
Chi-squared	χ^2		1934.744
Degrees of freedom	gl		758
Chi-squared/degrees of freedom	χ^2/gl	<3 good	2.552
Incremental fit			
Comparative Fit Index	CFI	≥ 0.95 good; ≥ 0.9 traditional	0.825
Normed Fit Index	NFI	≥ 0.95	0.745
Parsimony fit measures			
Parsimony Normed Fit Index	PNFI	>0.5	0.656
Others			
Root Mean Squared Error of Approximation	RMSEA	≤ 0.05 good; 0.5–0.10 moderate; >0.10 bad	0.080

Source: Authors.

Table 4. Maximum likelihood estimates of the research model proposed.

			Estimate	C.R.	<i>p</i>	Regression Weights
INNOV	←	EI	−0.537	−2.071	0.038	−0.600
INNOV	←	EC	0.561	2.509	0.012	0.603
INNOV	←	KM	0.774	4.119	**	0.558
KAP	←	KM	1.883	5.712	**	0.893
KS	←	KM	2.075	5.845	**	0.977
KA	←	KM	1	–	–	0.801
EA	←	EI	1	–	–	0.966
EAO	←	EI	0.725	6.778	**	0.860
UE	←	EI	0.956	6.952	**	0.924
AB	←	EC	1	–	–	0.953
EX	←	EC	0.928	9.429	**	0.977
PS	←	EC	0.954	7.794	**	0.980
AD	←	EC	1.132	10.224	**	0.984
PRODI	←	INNOV	1	–	–	0.970
PROCI	←	INNOV	1.305	9.135	**	0.945
ER	←	EI	2.433	8.691	**	0.908
PRODI1	←	PRODI	1	–	**	0.791
PRODI2	←	PRODI	1.290	15.417	**	0.890
PRODI3	←	PRODI	1.393	14.983	**	0.919
PRODI4	←	PRODI	1.252	14.865	**	0.818
PROCI1	←	PROCI	1	–	–	0.880
PROCI2	←	PROCI	1.089	21.192	**	0.936

Table 4. Cont.

			Estimate	C.R.	<i>p</i>	Regression Weights
PROCI3	<←	PROCI	1.014	21.003	**	0.927
KS3	<←	KS	1	–	–	0.868
KS2	<←	KS	0.788	13.025	**	0.836
KS1	<←	KS	0.945	12.897	**	0.850
KAP2	<←	KAP	1	–	–	0.960
KAP1	<←	KAP	1.024	22.415	**	0.949
KA3	<←	KA	1	–	–	0.642
KA2	<←	KA	1.273	6.275	**	0.770
KA1	<←	KA	1.127	5.546	**	0.609
AE4	<←	AE	1	–	–	0.839
AE3	<←	AE	1.164	10.503	**	0.917
AE2	<←	AE	1.198	10.607	**	0.939
AE1	<←	AE	1.146	9.586	**	0.877
EAO4	<←	EAO	1	–	–	0.797
EAO3	<←	EAO	1.288	11.861	**	0.948
EAO2	<←	EAO	1.412	11.564	**	0.938
EAO1	<←	EAO	1.024	9.767	**	0.831
UE2	<←	UE	1.336	10.439	**	0.985
UE1	<←	UE	1	–	–	0.843
ER4	<←	ER	1	–	–	0.991
ER3	<←	ER	1.38	18.55	**	0.976
ER2	<←	ER	0.921	21.608	**	0.983
ER1	<←	ER	0.883	19.834	**	0.978
AB3	<←	AB	1	–	–	0.864
AB2	<←	AB	1.081	12.655	**	0.922
AB1	<←	AB	1.203	13.133	**	0.931
EX3	<←	EX	1	–	–	0.857
EX2	<←	EX	1.168	10.775	**	0.885
EX1	<←	EX	1.264	5.728	**	0.573
PS4	<←	PS	1	–	–	0.742
PS3	<←	PS	1.267	8.457	**	0.874
PS2	<←	PS	1.212	7.617	**	0.805
PS1	<←	PS	1.086	8.684	**	0.893
AD2	<←	AD	1	–	–	0.893
AD1	<←	AD	0.966	11.337	**	0.869

Note: ** < 0.05. Source: Authors.

In relation to the regression weights, the results from this study may shed light on the role that the KM, EI, and EC of Spanish executives play in innovation. We divided two types of effects: (A) direct effect and (B) indirect effect.

(A) Regarding the direct effect, underline that the results obtained show that hypotheses H1 and H3 have been confirmed. It means that the KM of executives exerts a positive effect on innovation (0.56) and the EC of executives exerts a positive effect on innovation

(0.60). However, H2 has not been confirmed, because the influence of EI on innovation is not significant (-0.60). If we analyze the constructs according to their influence on innovation, we find:

(1) Entrepreneurial Competency (EC). The following factors: EX, PS, and AD have the same level of influence on innovation, 0.98, which are followed very close by AB with 0.95. If we analyze the items by importance order, we find:

(a) Experience (EX). The items with higher weight are: EX2: I am a person who looks forward to new projects (0.88) and EX3: I know how my company works and what my functions are (0.86). The last one is item EX1: I have been managing a team for more than five years (0.57).

(b) Problem-Solving Capacity (PS). We found that PS1: Before acting, I identify the context where the problem has arisen (0.89) and PS3: I am a good manager of conflicts that occur in my company ((0.87) are the higher weight, which are followed by PS2: I participate in the analysis of my company's problems (0.80) and PS4: Sharing internal and/or external information favors problem solving (0.74).

(c) Adaptability (AD). The items are very close by importance order. The first one is AD2: *I make use of the collective intelligence of my work team to face the processes of change* (0.89). It is followed very close by AD1: *I am flexible to the changes that occur in my company* (0.87).

(d) Ability (AB). There are two items with the higher weight: AB1: *I have the ability to lead change* (0.93) and AB2: *I have skills to motivate my work team* (0.92). The item with less weight is AB3: *I am able to allocate resources effectively* (0.86).

(2) Knowledge Management (KM). The factor with a higher weight is KS with 0.98, followed by KAP with 0.89 and KA with 0.80. If we analyze the items by importance order, we find:

(a) Knowledge Sharing (KS). KS3 is the item with a higher weight: Knowledge is shared with other departments (0.87). It is followed by KS1: Knowledge is shared between executives and employees (0.85) and KS2: Knowledge is shared among colleagues in the same department (0.84).

(b) Knowledge Application (KAP). It is KAP2 the item with a higher weight: *Knowledge is used for practical use effectively* (0.96). Next, the KAP1: *Knowledge is managed for practical use efficiently* (0.95).

(c) Knowledge Acquisition (KA). The KA2 acquires the highest value (0.77): knowledge has been obtained from the collaborators (0.77). It is followed by KA3: knowledge has been obtained from the employees (0.64) and KA1: knowledge has been obtained from clients (0.61).

(3) Emotional Intelligence (EI). There are three factors with the higher weight: UE (0.92), EA (0.91), and ER (0.91), followed by EAO (0.86). If we analyze the items by order of importance:

(a) Use of Emotion (UE). It is UE2 the item with a higher weight: *I am a self-motivated person* (0.98). It is followed by UE1: *Whenever I set a goal, I always try to do my best to achieve it* (0.84).

(b) Emotional Acquisition (EA). The items with higher weight are: EA2: I have a good understanding about my own emotions (0.94) and EA3: I really understand what I feel (0.92). Being EA1: Most of the time I have a good grasp of my own feelings (0.88) and EA4: I always know if I am or I am not happy (0.84).

(c) Emotional Regulation (ER). The item with the highest weight is ER4: I have good control of my own emotions (0.99). It is followed very close by: ER1: I am able to control my temperament and manage difficulties rationally; ER2: I am quite capable of controlling my own emotions and ER3: When I am very annoyed, I can always calm down quickly; all but one achieved a value of 0.98.

(d) Emotional Awareness of Others (EAO). The following indicators have the higher weights: EAO3: *I am empathetic to the feelings and emotions of other people* (0.95) and EAO2: *I am a good observer of others' emotions* (0.94). It is followed by EAO1: *I always perceive my*

friends' emotions through their behaviour (0.83) and EAO4: I have a good understanding of the emotions of people around me (0.80).

(B) Regarding the indirect effects of KM, EI, EC on innovation shows that hypothesis H4 has been confirmed. It means that the integration of KM, EI, and EC of executives exerts a positive statistical effect on innovation in enterprises. Being more significant the influence on product innovation (0.97) than on process innovation (0.94). If we analyze the items by importance order, we find:

(1) Product Innovation (PRODI). It is PRODI3 the factor more significant: The speed at which a new product or service is developed (0.92). It is followed by PRODI2: The use of the latest technological innovations in the new products and services (0.89) and, PRODI4: The number of new products/services that our firm has introduced to the market (0.82). PRODI1 being the item that is less significant: The degree of newness of the firm's products/services (0.79).

(2) Process Innovation (PROCI). The item with the highest weight is PROCI2: The speed which is adopted the latest technological innovation in the processes (0.94). It is followed by PROCI3: The newness of the technology used in the processes (0.93). Being the item less significant PROCI1: our firm's technological competitiveness (0.88).

Transforming Europe leadership requires creating an innovative culture. It is a very complex process that needs considering a systemic focus in which the starting point is the individual joining the organization. Furthermore, an innovative culture process needs to be implemented from the top level to the base level of organizations, to achieve an inclusive society. Innovation and human resources management play an increasingly important role in sustaining "leading edge" competitiveness for organizations in times of rapid change and increased competition.

Next, Figure 4 shows the Human Systemic Innovation Helix (HSIH), a socio-economic tool to promote product and process innovation by developing knowledge management capacity, socio-emotional abilities, and entrepreneurial competencies of Spanish executives of different sectors of activities.

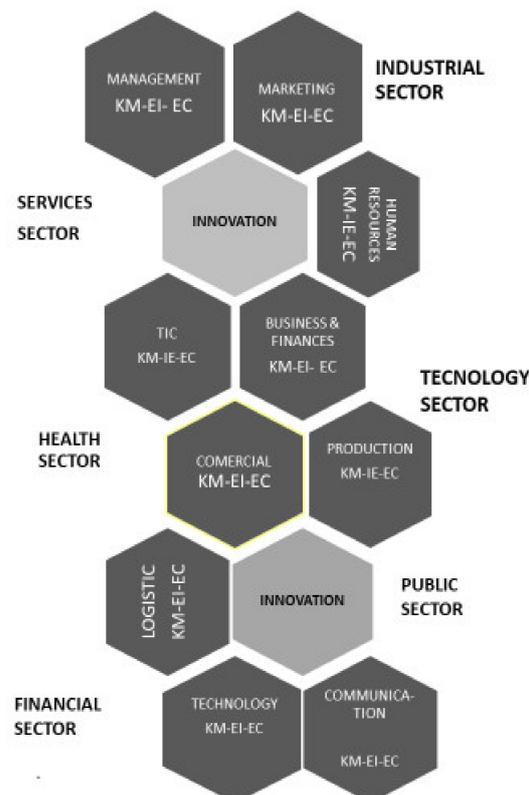


Figure 4. Human systematic innovation helix (HSIH).

5. Discussion and Conclusions

5.1. Theoretical Implications

Nowadays, according to the Horizon Europe 2030 Development, despite enjoying the first position worldwide in research and strong industries, Europe is not aiming to transform this leadership in the field of innovation and entrepreneurship. Entrepreneurship defines as an individual being willing in taking a risk to create value [117]. Entrepreneurship also refers to the opportunity recognition process and pursuit that leads to growth that creates value and bears risk [79]. Huang [118] noted that innovation capability as the ability (1) to develop new products to satisfy market requirements; (2) to apply proper processes and technologies to produce new products; (3) to develop and adopt new products, processes, and technologies to satisfy future requirements; and (4) to respond to unexpected technological actions taken by competitors and to create sudden opportunities.

Spain's innovation performance relative to that of the EU has increased in 2015 and 2016 [119]. As one of the 28 EU Member States, how could Spain overcome the challenge to achieve a Sustainable Europe by 2030?

Focusing on transforming Spanish leadership in the field of innovation and entrepreneurship, we propose to create the Human Systemic Innovation Helix (HSIH), a new socio-economic management tool to develop socio-emotional abilities and entrepreneurial competencies of executives, which acts as a lever to boost the results of innovation at companies.

5.2. Managerial Implications

The results obtained from this study may shed light on the role that the KM, EI, and EC of Spanish executives play in innovation from an integrated point of view, confirming the H4 proposed. Furthermore, hypotheses H1 and H3 have been confirmed. It means that the KM of executives exerts a positive effect on innovation and the EC of executives exerts a positive effect on innovation. However, the H2 has not been confirmed, because the influence of EI on innovation is not significant. This study has critical practical implications for executives:

Firstly, these results show the importance of EC on innovation and how these four factors: experience (EX), problem-solving capacity (PS), adaptability (AD), and ability (AB) contribute significantly to innovation at Spanish enterprises. This finding is in line with Toner [16]; Mohaghegh and Furlan [67]; Tiwana and McLean [69]; Wu and Shanley [70]; Cullen et al. [71]; Lee and Jin [75]; Mitchelmore et al. [76]; Mohsin et al. [77]; Umar et al. [78]; Pronowo et al. [79] and Mohammadkazemi [80]. Experience means that enterprises need executives who can look forward to new projects, executives who know how their companies work and what their functions are. Furthermore, enterprises need executive with problem-solving capacity; which means executives who can identify the context where the problem has arisen before acting; executives with the capacity to lead the conflicts that occur in their companies, and, of course, executives who can participate in the analysis of their companies' problems. Adaptability requires executives who can make use of the collective intelligence of their work team to deal the processes of change and executives who are flexible to the changes that occur in their companies. Finally, relative to ability underlines Spanish enterprises that need executives who have the ability to lead change, executives who have skills to motivate their work team, and executives who are able to allocate resources effectively.

Secondly, these results show the importance of KM on innovation and being knowledge sharing (KS) the factor with highest weight followed by knowledge application (KAP) and knowledge acquisition (KA) by order of importance. These findings are in line with Jiménez-Jiménez and Sanz-Valle [42]; Tasai [43]; Cantner et al. [44]; Calabrese and Orlando [45]; Luengo-Valderrey and Moso-Díez [46]; Huang and Li [47]; Zheng et al. [48]; and Shao et al. [49]. Regarding KS by order of importance: knowledge would be shared with other departments, between executives and employees, and among colleagues in the same departments. Knowledge application means that knowledge is used for practical use effectively and knowledge is managed efficiently for practical use. Finally, relative

knowledge Acquisition, the most important item, is the knowledge that has been obtained from collaborators. Next, knowledge has been obtained from the employees, and last, knowledge has been obtained from clients.

Although the role of EI on innovation is not significant, it underlines that UE, EA, and ER are the factors with a higher weight on innovation, followed by EAO. These findings are in line with Kaasa et al. [61]; Molina-Morales and Martínez-Fernández [62]; Zampetakis et al. [63]; Laursen et al. [64] and Tajpour et al. [65]; Blázquez and Bermúdez [86]; Brooks et al. [88]; Zufadil et al. [89]. Use of emotions means that enterprises have executives who are self-motivated people, are always trying to do their best to achieve their goals. Emotional acquisition means executives who have a good understanding of their own emotions, executives who really understand what they feel, have a good grasp of their own feelings most of the time, and always know if they are or are not happy. Emotional regulation is relative to executives that have good control of their own emotions, executives who are able to control their temperament and manage difficulties rationally, and finally, executives who are quite capable of controlling their own emotions and can always calm down quickly when they are very annoyed. Emotional awareness of others means executives who are empathetic to the feelings and emotions of other people; executives who are good observers of others' emotions, executives who always perceive their friends' emotions through their behavior, and finally, executives who have a good understanding of the emotions of the people around them.

On the other hand, the indirect effects of KM, EI, and EC on innovation show that hypothesis H4 has been confirmed. It means that the integration of KM, EI, and EC of executives exerts a statistically positive effect on innovation at enterprises; having a more significant influence on product innovation than on process innovation. The speed at which new products or services are developed and the speed at which is adopted the latest technological innovation in the processes, are the more significant factors in both product and process innovation, respectively.

Previous studies have analyzed the relationship between knowledge, behavior, and emotion; however, this relationship has been analyzed from an isolated perspective. The results obtained in this empirical research are in line with the Dual Model of Intelligence proposed by Norman and Shallice [97], and the winner of the 2002 Nobel Prize for Economics, Daniel Kahneman [98]. Moving from an individual level to an organizational level, we find a new management of human talent which analyzes the relationship between the innovation capacity of Spanish companies through the ability to obtain their information through the integration of these three variables: knowledge management, emotional intelligence, and entrepreneurial competency of Spanish executives. It is suggested that executives of Spanish enterprises should use the valuable unconscious information that facilitates the integration of KM, EI, and EC, originating the fusion between "Knowing and Knowing—Doing", "Feeling and regulating emotions" and "Knowing how to act and improve" (System1) to consciously focus on the best information that helps executives to make the best decisions to innovate (System 2).

The Human Systemic Innovation Helix (Figure 4) represents enterprises that are made up of different activity departments: management; marketing; human resources; technology; commercial; business and finances; production; logistics; communication; etc.; which are led by executives with different levels of knowledge management capacity (KM), socio-emotional abilities (EI), and entrepreneurial competencies (EC) capacity. If the executives from different departments act in a systematic way, taking advantage of the integration of KM, EI, and EC, these capacities exert a positive and direct influence on the innovation of each department innovation of the company. Consequently, there should be an increase in the products and processes innovations from enterprises from different sectors of activity.

This research contributes to a socio-economic transformation. On the one hand, a scientific impact generates new knowledge that strengthens the value of the human factor as a catalyst for innovation; and with an economic impact, transforming Human Talent

Management. Integrating a psychological aspect, emotional intelligence (EI), knowledge management (KM), and entrepreneurial competency (EC) exert a direct influence on the innovation of companies.

On the other hand, generating added value to companies from a multidisciplinary and inclusive perspective generates an impact on the organizational culture and on society. Furthermore, this study contributes to creating the Human Systematic Innovation Helix, a new socio-economic management tool to develop socio-emotional abilities and competencies of executives, which acts as a lever to boost the results of innovation at companies. Both, product and process innovation for boosting the competitiveness and growth of the EU to achieve an innovative Europe; 5. Social Innovation, aligning the objectives of human resources to the business strategy of the company, through the establishment of national and international synergies that strengthen the incorporation of research and innovation in society.

5.3. Limitations and Further Research

The results show that the Human Systematic Innovation Helix has a direct and positive influence on innovation in Spanish companies; however, we point out some limitations detected in this study. First, there is a lack of homogeneity in the number of responses according to the range of activities companies. Second, the difficulty of obtaining a larger sample of data has been obtained through the LinkedIn social networking platform. Lastly, we have not been identified the most suitable technology for boosting the HSIH.

Therefore, we provide suggestions to overcome the limitations for future research. First, to analyze the role of the HSIH in the culture of innovation at enterprises from different sectors. In addition, it would be necessary to identify the most suitable technology for boosting the HSIH. We propose that the technology used should be focused on the key role of the human factor as a catalyst for innovation, to speed up the creation of collaborative networking, and integrate the information systems at all levels.

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