



Knowledge Systems: From Latin America to the World

Sistemas de Conhecimento: Da América Latina para o Mundo

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HIGHLIGHTS

- The article documents the origins, evolution, and global impact of the Knowledge Systems Movement (KSM) in Ibero-America, highlighting its institutional bases, theoretical contributions, and practical applications in knowledge management and knowledge-based development.
- The study reveals how the Center for Knowledge Systems (CKS), the Comunidad Iberoamericana de Sistemas de Conocimiento (CISC), and the World Capital Institute (WCI) fostered international collaborations and created innovative frameworks like Knowledge Cities and Capital Systems.
- Survey and documentary analyses demonstrate that KSM members significantly contributed to research, education, consultancy, and international collaboration, reinforcing Latin America's role in shaping global knowledge management and knowledge-based development practices.
- The Triadic Knowledge Management Model and Capital Systems Framework, developed under KSM, are presented as theoretical milestones that advance the understanding of knowledge events, value alignment, and strategic knowledge management for sustainable development.
- Through extensive consultancy, research, and educational initiatives, the Knowledge Systems Movement has promoted transformative changes in Latin America, leveraging local contexts to strengthen global practices in knowledge management, innovation, and knowledge-based economic development.

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ABSTRACT

Objective: the study aims to provide an overview of the origins, development, and prospects of the Knowledge Systems Movement (KSM) in Ibero-America, as well as its international impact. It seeks to document the institutional trajectory, theoretical foundations, and practical applications of the movement, mapping its regional and global contributions.

Design/Method/Approach: this is a documentary analysis combined with an empirical exercise. A bibliographic review, documentary analysis of the institutional, theoretical, and applied bases of KSM, and a survey of senior members of the movement across the Ibero-American region were conducted.

Originality/Relevance: the study presents an original overview of KSM, composed of (a) a knowledge management (KM) and knowledge-based development (KBD) approach, (b) a professional network in the Ibero-American region, and (c) a global theoretical and applied domain. It highlights the institutional and theoretical trajectory of the Center for Knowledge Systems (CKS), the Comunidad Iberoamericana de Sistemas de Conocimiento (CISC), and the World Capital Institute.

Main Results/Findings: the results highlight KSM's contributions to research, education, consultancy, and international collaboration, both within Ibero-America and globally. E-Learning practices are supported through educational programs identified via the survey and documentary analysis. The vitality of the movement is evidenced by extensive publications and the consolidated performance of its organizations.

Theoretical/Methodological Contributions/Implications: the study contributes to the historical and conceptual systematization of KSM, presenting key shared theoretical elements and practical applications with governments and public and private companies. It reinforces KSM's role as a platform for knowledge-based development and innovation.

Social/Managerial Contributions: the research emphasizes KSM's role in strengthening education, knowledge management, and international collaboration in the Ibero-American region, while also highlighting its global impact on academic and consultancy practices.

PALAVRAS-CHAVE

Movimento de Sistemas de Conhecimento
Comunidad Ibero-Americana de Sistemas de Conocimiento
Modelo Triádico de Gestão do Conhecimento
Sistemas de Capital
Desenvolvimento Baseado no Conhecimento
Centro de Sistemas de Conhecimento
World Capital Institute

RESUMO

Objetivo: o estudo tem como objetivo analisar as etapas de institucionalização da Economia Circular (EC) das embalagens no Brasil, com base nos pressupostos da Teoria Institucional, que permite a internalização de valores e legitimação de práticas sociais. **Objetivo:** o estudo tem como objetivo apresentar uma visão geral das origens, desenvolvimento e perspectivas do Movimento de Sistemas de Conhecimento (KSM) na Ibero-América, bem como seu impacto internacional. Busca-se documentar a trajetória institucional, as bases teóricas e as aplicações práticas do movimento, assim como mapear sua contribuição regional e global.

Design/Metodologia/Abordagem: trata-se de uma análise documental combinada com um exercício empírico. Foram realizados levantamento bibliográfico, análise documental sobre as bases institucionais, teóricas e aplicadas do KSM, e uma pesquisa com membros seniores do movimento na região ibero-americana.

Originalidade/Relevância: o estudo apresenta um panorama inédito do KSM, composto por (a) uma abordagem de gestão do conhecimento (KM) e desenvolvimento baseado no conhecimento (KBD), (b) uma rede profissional na Ibero-América e (c) um domínio teórico e aplicado de alcance global. Destaca a trajetória institucional e teórica do Centro de Sistemas de Conhecimento (CKS), da Comunidad Iberoamericana de Sistemas de Conocimiento (CISC) e do World Capital Institute.

Principais Resultados/Constatações: os resultados evidenciam a contribuição do KSM para a pesquisa, a educação, a consultoria e a colaboração internacional, tanto na Ibero-América quanto no cenário global. A prática de E-Learning é destacada por meio dos programas educacionais mapeados na pesquisa e na análise documental. A vitalidade do movimento é comprovada pelas publicações extensas e pela atuação consolidada de suas organizações.

Contribuições Teóricas/Metodológicas/Implicações: o estudo contribui para a sistematização histórica e conceitual do KSM, apresentando seus principais elementos teóricos compartilhados e suas aplicações práticas em governos e empresas públicas e privadas. Reforça a importância do KSM como plataforma de desenvolvimento e inovação baseada no conhecimento.

Contribuições Sociais/Gerenciais: a pesquisa aponta o papel do KSM no fortalecimento da educação, da gestão do conhecimento e da colaboração internacional na região ibero-americana, além de destacar seu impacto global em práticas acadêmicas e de consultoria.

1. Institucional base

1.1 Center for Knowledge Systems (CKS)

Was created in 1990 at Tecnológico de Monterrey main Campus. It operated until 2015, when research and graduate activities were syndicated in national schools and CKS became the National Research Group on Knowledge Societies. Over its 25 years of existence, CKS maintained a synergistic research, graduate, and consultancy agenda (García, 2012; Ortiz, 2012).

1.1.1 Research and Development

The CKS has been credited as the first KM-dedicated R&D center worldwide (Skyrme & Amidon, 1997). It developed its own models and techniques, based on distinctive epistemic, behavioral, economic, and social grounds (Amidon, 2003: 228-230; Bennet & Bennet, 2014: 22-23; Bennet and Baisya, 2023: 316-322; Grau et al., 2017: 283-285; Carrillo, 1998, 2001a, 2021a, 2022a). Table 1 lists CKS proprietary models and methods achieving international resonance. Table 2 contains a list of books published jointly by CKS staff. In a bibliometric exercise for the Journal of Knowledge Management 20th anniversary, CKS ranked second amongst the 50 “most productive and influential universities and institutions publishing in the JKM” (Gaviria-Marín et al., 2018: 1666).

Table 1. CKS proprietary models and methods having international reach

Model / method	Paper section / reference call
Triadic KM Model	Section 3 on the paper
Capital Systems Framework	
Knowledge Cities Paradigm	
Competencies Development Framework	Buendía et al, 2005; Delgado, 2005; González et al., 2012; Kayakutlu, 2010; Manrique, 2008; Martínez, 2006, 2010; Martínez & Buendía, 2009
Value Practices Method	Carrillo, 2005a; Martínez & Carrillo, 2011; Icaza, 2021
360° External Intelligence Framework	Carrillo & Olavarrieta, 2009; Carrillo et al., 2022; Olavarrieta and Carrillo, 2011a, b & 2012a, b; 2014; Olavarrieta et al, 2013
Knowledge Markets Taxonomy	Carrillo, 2010; 2012, 2014a, c, 2016, 2017a, 2019, 2021b; Carrillo & Villa, 2014; Duran, 2014; Duran et al., 2011
Knowledge Based Development field of study	Bennet & Bennet, 2008; Carrillo, 1996b, 2001a, 2004, 2008, 2014b, 2015; Carrillo & Batra, 2012, Carrillo & Flores, 2012; Cheng et al., 2004; Chou & Passerini, 2009; Dang & Umemoto, 2009; Flores & Carrillo, 2010a, 2012; Escriba-Esteve & Urrea-Urbieto, 2002; Malone & Yohe, 2002; Mansell, 2002; Martinus, K. 2010; McElroy et al., 2006; Millar & Choi, 2010; Passerini, 2007; Raza et al, 2006, 2007; Sharma et al., 2009; Spender, 2010; Wiig, 2007

Table 2. Books published jointly by CKS staff and faculty

Title	Reference call
<i>Aprendizaje Organizacional, 1ª & 2ª Ed.</i>	Zapata, 2008, 2011 (Ed.)
<i>Administración de Conocimiento y Desarrollo Basado en Conocimiento</i>	Martínez & Corrales, 2010 (Eds.)
<i>Prácticas de Valor de Gestión Tecnológica en México</i>	Carrillo, 2005 (Coord.)
<i>Desarrollo Basado en Conocimiento</i>	Carrillo, 2008 (Ed.)
<i>Sistemas de Capitales y Mercados de Conocimiento</i>	Carrillo, 2014 (Ed.)

1.1.2 Education

CKS developed early KM curricula. Since 1998 it offered the KM Specialization within an M.Sc. Program and since 2004 the KM Concentration Program for B.Sc. Students. CKS was invited in 2000 to develop the curriculum for the Knowledge Management Consortium International and participated on KM curriculum design for Universidad de Deusto and Pontificia Universidad Católica del Peru. CKS participated in 8 doctoral

programs from Mexico and abroad, its faculty directed over 25 doctoral and 40 master's dissertations. CKS offered a Diploma Course plus executive training programs in Mexico and abroad (García, 2012; Ortiz, 2012). Prominent KM practitioners from Ibero-America are CKS alumni.

1.1.3 Consultancy

CKS carried out over 100 national and international contracts with government, companies, NGOs, and international agencies (section 4.2 below). Table 3 contains a sample of consultancy clients. CKS was always financially self-sufficient, applying itself a capital system (CSC, 2004).

Table 3. Sample of CKS corporate and government consultancy clients

Government	Corporate
CFE (Mex)	Aeromexico (Mex)
CONOCER (Mex)	AHMSA (Mex)
Federal Ministry of Economy (Mex)	Arca (Mex)
Federal Ministry of Education (Mex)	Banorte (Mex)
Nuevo León State Government (Mex)	BBVA-Bancomer (Mex)
Pemex (Mex)	Alfa (Mex)
Department of Caldas Government (Col)	Cerveceria Cuauhtemoc (Mex)
Municipality of Manizales (Col)	CocaCola-FEMSA (Mex)
Municipality of Medellín (Col)	CYDSA (Mex)
SENA (Col)	DSI (USA)
Ciudad del Saber (Pan)	EDS (USA/Mex)
National Ministry of Culture (Spn)	Enexor (Mex)
	Gamesa (Mex)
	Geotex (USA/Mex)
	IBM (USA/Mex)
	IMSA (Mex)
	LALA (Mex)
	Lamosa (Mex)
	Liverpool MX (Mex)
	MABE (Mex)
	Maseca (Mex)
	Microsoft (USA/Mex)
	Mondragon Group (Spn)
	Motorola (USA)
	Museo de Monterrey (Mex)
	Polar (Ven)
	Prolec (Mex)
	Sycsa (Mex)
	TV Azteca (Mex)
	Vitro (Mex)
	Xignux (Mex)

1.1.4 Networking

Since its inception, CKS engaged in alliances with pioneer KM and IC organizations (Table 4) International networking in Latin America is documented next.

Table 4. Sample of CKS Alliances with KM and IC associations

Country	Association
USA	Knowledge Management Consortium International, George Washington University, the Knowledge Sciences Center at Kent State University, The

	World Bank Institute, the Global Development Learning Network (GDLN), the Mountain Quest Institute and Entovation International
UK	GKR network at Leeds University; Journal of Knowledge Management and Pascal Observatory
Spain	Basque Country Knowledge Cluster, Knowledge Society Research Center at the Autonomus University of Madrid, as well as the National University of Distant Education, The University of Deusto, the Mondragon University and The University of Extremadura
France	Sorbonne University, Poitiers LABCIS, INTACK network, and Arenotech
European Community	European Association of Living Labs

1.2 Comunidad Iberoamericana de Sistemas de Conocimiento (CISC)

CISC emerged from CKS in 2000 (Carvajal, 2009; Rodriguez et al., 2014; Scheel, 2002; Carrillo et al., 2000; Carrillo, 2017b, 2023). CISC developed strong ties with international organizations (Table 5). This relational context proved fertile for CISC consolidation.

Table 5. Sample of ICKS Collaborations with KM and KBD associations

Country	Association
Brazil	University of Caxias do Sul, Federal University of Santa Catarina and Institute of Applied Economic Research
Canada	International Development Research Centre –IRDC
Colombia	The National University, and Del Rosario University at Bogotá, Universidad of Valle at Cali, University of the North at Barranquilla
Chile	Comisión Económica para América Latina y el Caribe –CEPAL
Uruguay	Organización Internacional del Trabajo/CINTERFOR
Mexico	Asociación de Directivos en Investigación Aplicada y Desarrollo Tecnológico, Consejo Nacional de Ciencia y Tecnología, Instituto Politécnico Nacional, Universidad Nacional Autónoma de México, and Centro de Investigación y Docencia Económica
Spain	Mondragon Innovation and Knowledge, Intellectus Madrid and Universidad Politécnica de Cataluña, Barcelona
Perú	Pontificia Universidad Católica del Perú and Universidad Nacional de San Agustín

CISC mission is “To foster knowledge-based development of people, organization and societies from the Ibero-American Region”. From 2003 through 2018, CISC operated as federation of about 30 semi-autonomous cells, each a local KM-KBD community of practitioners, academics, entrepreneurs, or government officers. Cells clusters formed a region (Table 6). A Technical Secretariat was hosted by CKS.

Table 6. CISC regions, cells, and hosts

Region	Cell	Host
Argentina	Buenos Aires -Consultores	Red de Consultores Independientes
	Buenos Aires – UADE	Universidad Argentina de la Empresa
	Cuyo	Universidad Nacional de Cuyo
Brazil	Bento Gonçalves	Universidade de Caxias do Sul
	Brasília	Centro Universitário de Brasília
	Caxias do Sul	Universidade de Caxias do Sul
	Florianópolis	Universidade Federal de Santa Catarina
Central America	Costa Rica	Consultores Independientes, San José
	Guatemala	Consultores Independientes, Cd. Guatemala
	Panama	Ciudad del Saber
	San Salvador	Centro Nacional de Registros
Chile	Santiago	FACEA Universidad Central de Chile
	Talca	Consultores Independientes, Talca
	Valparaíso	Universidad de Talca
	Barranquilla	Universidad del Norte
	Bogotá	U. del Rosario, U. Nacional, U. Central
	Bucaramanga	Universidad de Bucaramanga

Colombia	Cali	Universidad de Valle
	Caribe Colombiano	Universidad del Atlántico
	Eje Cafetalero -Caldas	Gobierno de Caldas
	Manizales	Universidad de Manizales, Incubar
	Medellín	Alcaldía de Medellín, Incubadora Antioquia
	Valledupar	Fundación Puerto Digital
Ecuador	Guayaquil	Universidad Católica de Guayaquil
España	Alicante	Cámara de Comercio e Industria de Alicante
	Barcelona	Universitat Politècnica de Catalunya
	Extremadura	Universidad de Extremadura
	Madrid -UAM	IADE, Universidad Autónoma de Madrid
	Madrid -UNED	Universidad Nacional de Ed. A Distancia
	San Sebastián	Universidad de Deusto -San Sebastián
	Tenerife	Universidad de La Laguna
	Valencia	Universidad Politécnica de Valencia
Mexico	Ciudad del Carmen	Pemex Exploración y Producción -PEP
	Ciudad de México	Asoc. Mex. Adm. Del Conocim. - ADDCOIN
	Central de Veracruz	Marketing Soft Solutions
	Culiacán	Universidad de Occidente
	Monterrey	Tecnológico de Monterrey
	Pachuca	Centro de Des. Tec. Romualdo Tellería A.
	Puebla y Tlaxcala	BUAP y consultores asociados
	Quintana Roo	U. Riviera Cancún, ULSA, U. De Caribe
Peru	Arequipa	Universidad Nacional de San Agustín
	Lima	Pontificia U. Católica del Perú
	Trujillo	Universidad Privada del Norte
Portugal	Lisboa	Consultores Independientes, Lisboa
Uruguay	Montevideo	FCEA- Universidad de la República
Venezuela	Caracas	Consultores en Gestión de Capital Humano
	Valencia	Industrias Polar

CISC held an itinerant annual conference, shifting to videoconferencing since the COVID-19 pandemic. After CKS reconfiguration, it was no longer possible to host the Technical Secretariat. CISC evolved into its current structure: an online regional network sustained by three interdependent nodes: Mexico, Brazil, and Peru. Table 7 lists books published under CISC auspices, while Table 8 lists regional KBD programs CISC partnered with.

Table 7. Some CISC regional program partnerships

Country	Program collaboration partnership
Mexico	ADIAT KM & Innovation Program, CONACyT-ADIAT Best Technological Innovation Practices, and the Ministry of Economy PYMES Development Program
Colombia	PFANGCTI with Del Rosario University,
Peru	Arequipa Ciudad de Conocimiento with UNSA
Brazil	RGDS Major's Development Program and Observatorio Brasileiro de Desenvolvimento Baseado em Conhecimento with UCS,
USA	Políticas de Innovación y Gestión Tecnológica training program

Table 8. Books published under CISC auspices

Title	Reference call
<i>Conocimiento para el Desarrollo</i>	Mujika, 2005 (Ed.)
<i>Conocimiento para Innovar: Cómo evitar la miopía en la Gestión del Conocimiento</i>	Arbonies, 2006
<i>Regiones Iberoamericanas del Conocimiento</i>	Mujika, 2007 (Ed.)
<i>Construyendo una Ciudad del Conocimiento en Bogotá</i>	Chaparro, 2007

<i>Sistemas de Capitales y Mercados de Conocimiento</i>	Carrillo, 2014 (Ed.)
<i>Desarrollo Basado en Conocimiento</i>	Carrillo, 2008 (Ed.)
<i>Desarrollo Basado en el Conocimiento: Transferencia del Conocimiento</i>	Casado, 2009
<i>Cumbre Mundial de Ciudades de Conocimiento</i>	Arce, 2017

1.3 World Capital Institute (WCI)

CKS early entrance in the KM and IC world, then led by consultancy firms (Carrillo, 1996a, 1998, 2001b, 2006f; Skyrme & Amidon, 1997), placed it in a privileged position. WCI was created in 2004 as an independent think-tank focused on KBD through today. WCI programs are: i) events including the annual conference (Knowledge Cities World Summit –KCWS), ii) awards: Most Admired Knowledge Cities –MAKCi, iii) R&D and editorial program. WCI promotes knowledge as the main leverage to development (Carrillo, 2001a; Von Mutius, 2005; Van Wezemael, 2012; Nesello et al., 2020). Its core topics are KBD, Knowledge Cities, and Alternative Economics. WCI programs have been studied, e.g., KCWS (Arce, 2017; Michelam et al., 2021) and MAKCi (Carrillo & Chase, 2007; Garcia, 2008, 2021).

The R&D and editorial program includes books and special issues. The worldwide inception of KBD and Knowledge Cities as R&D topics was leveraged through WCI guest edition of 7 special issues for the *Journal of Knowledge Management*: 4(6), 2002; 5(8), 2004; 5(10), 2006; 5(11), 2007; 5(12), 2008; 5(13), 2009 and 14(5), 2010. WCI created in 2010 the *International Journal of Knowledge-Based Development*, Scopus and WOS indexed. All editors have been WCI associates. Table 9 lists WCI editorial program books. WCI remains the KSM flagship, rooted in Latin American, with headquarters in Queretaro.

Table 9. Books published under WCI Editorial Program

Title	Reference call
<i>Knowledge Cities</i>	Carrillo, 2006a (Ed.)
<i>Knowledge Management and Intellectual Capital: Emerging Perspectives</i>	Batra and Carrillo, 2009 (Eds.)
<i>Knowledge-Based Development for Cities and Societies</i>	Metaxiotis et al., 2010 (Eds.)
<i>Building Prosperous Knowledge Cities</i>	Yigitcanlar et al., 2012 (Eds.)
<i>Knowledge and the City</i>	Carrillo et al., 2014 (Eds.)
<i>Knowledge for the Anthropocene</i>	Carrillo & Koch, 2021 (Eds.)
<i>City Preparedness for the Climate Crisis</i>	Carrillo & Garner, 2021 (Eds.)
<i>A Modern Guide to Knowledge: From Knowledge Economies to Knowledge in the Anthropocene</i>	Carrillo, 2022

2. Theoretical base

2.1 Triadic KM model

Studies on KM evolution reveal ‘generations’ (Table 10). The KSM approach is based on Third-generation KM (Batra, 2012; Carrillo, 2001b, c; Fachinelli et al., 2017; Garcia, 2008; Laszlo & Laszlo, 2002; Martínez, 2010; Yigitcanlar & Inkien, 2019). A knowledge event is defined as a discrete phenomenon resulting from the alignment of three necessary and sufficient conditions: a k-object, a k-agent, and a k-context (Figure 1). The alignment of relevant parameters becomes a fourth, integrative concept. Alignment is the degree of correspondence among the relevant attributes of knowledge objects, agents, and contexts.

Table 10. Three KM generations

Concept	Generation		
	1 st Generation: Object-centred	2 nd Generation: Agent-centred	3 rd Generation: Context-centred
Knowledge	Information content	Flow capacity	Value alignment

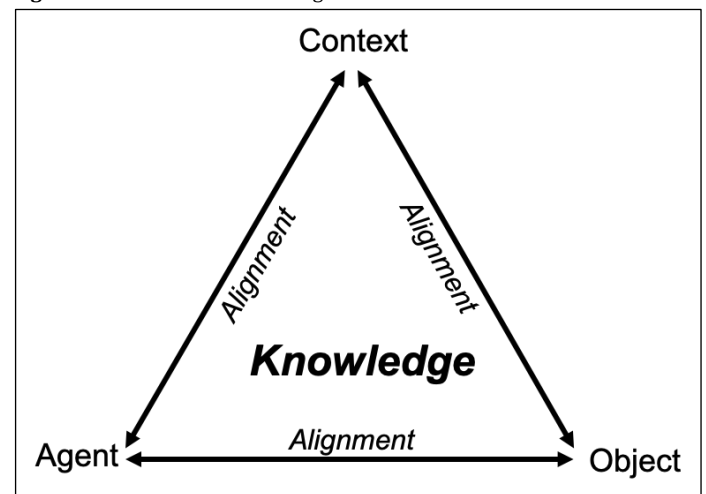
Management	Accumulate and retain stock	Facilitate and increase circulation	Dynamically adjust for sustainable balance
KM	A technique to secure possession	A platform to maximize knowledge flow	A strategy to facilitate value alignment and balance

2.1.1 Knowledge event

Knowledge can be understood as content to be acted upon or a value-creating event (Bennet & Bennet, 2014; Carrillo, 1998). A knowledge event emerges when object, agent, and context attributes dimensionally correspond with each other. KM seeks to effectively and mutually align these (Carrillo, 1998; Carrillo & Galvis-Lista, 2014; Carrillo et al., 2019; Fachinelli, Giacomello, et al., 2014, 2017; Van Wezemael, 2012; Von Mutius, 2005; Martinez, 2001; Martensson, 2000).

Fire (chemical chain reaction) requires a convergence of heat, oxygen, and flammable material (reactants) in appropriate proportion, just as knowledge requires its three elements to converge parametrically. Aggregating objects, agents, and contexts increases the likelihood of knowledge, but is not sufficient, just as non-insulated storage of combustible materials increases the risk of fire but does not start it. For intentional fire, flammable materials, oxygen, and heat must concur in adequate combination. By appropriately adjusting temperatures, oxygenation, and flammability, fire can be managed. Fire prevention and suppression is obtained by removing any of these factors. Likewise, KM facilitates alignment among knowledge objects, agents, and contexts by identifying their relevant dimensions and enabling their correspondence (Figure 1).

Figure 1. Elements of a knowledge event



2.1.2 Knowledge object

In first-generation KM, knowledge objects are understood as in instructional design: units of subject matter content. In the composite term ‘KM’, knowledge is associated with content and management with content-handling structures, such as databases, repositories, taxonomies, etc. Object-centered KM is based on variations of the knowledge lifecycle: operations on knowledge reifications corresponding to inventory management in industry (identify, categorize, store, retrieve, distribute and use). First-generation KM evokes an industrial mindset by objectifying knowledge. Instead of assuming that the known can be separated from the knower, KSM asserts that knowledge is constructed by an agent, so these can only be interdependently managed. Accordingly, a knowledge object implies a knowledge agent.

2.1.3 Knowledge agent

KM agency is expressed through categories including knower, k-agent, and human capital, veering to express situated and social action. Just as k-

objects are defined as functions of agents, agency implies separation neither between individual and social knowledge, nor between knowledge and action. Repository design must consider motivation, user-friendliness, and collaboration as much as content structure and consistency; otherwise, intended users will not engage. Agent management is characterized by exchange-intensive processes such as organizational learning, value practices, and competency development. Second-generation KM places a strong emphasis on flow and transfer. Agent actions are determined by situational variables and by each other: no agency without context.

2.1.4 Knowledge context

Given that k-objects are constructed through situated practice, k-context acquires relevance. Insofar meanings depend on worldviews, knowledge is context dependent. An important challenge in KM is creating an environment conducive to k-sharing. As individuals and groups interact, and organizations clarify context, identity arises through sensemaking. Identity management facilitates knowledge-sharing. The context in which content is embedded has semantic and economic significance. K-context is the set of circumstances that provide direction and choice capacity for matching meaningful agent-object transactions among infinite possibilities. This strategic level enables third-generation KM (Carrillo & Galvis-Vista, 2014; Fachinelli et al., 2017). Once relevant objects are aligned by capable agents in meaningful contexts, knowledge is generated, and value created.

2.1.5 Alignment

Knowledge cannot be managed merely through processes and technologies. Strategic alignment becomes essential. In essence, KM is alignment of knowledge object, agent, and context (Carrillo, 1998). This is accomplished by identifying, measuring, and designing the correspondence between their attributes, so objects become relevant, agents capable and contexts meaningful (Table 11).

Table 11. Definition and alignment of key KM concepts

KM concept	Definition	Process capacity	Alignment
k-object	Explicit or tacit associations abducted from real objects by knowledge agents	Perceivable and accessible	No object without agent
k-agent	Individuals or groups carrying out the knowledge act	Competent and engaged	No agency without context
k-context	Contingencies providing semantic and economic significance to object-agent associations	Meaningful and valuable	No context without alignment

2.2 Capital Systems

Conventional Intellectual Capital (IC) models comprise three categories: human, structural, and relational. These convey an inductive taxonomy (Carrillo, 2002). The Capital Systems Model aims at capturing a complete and consistent set of value dimensions. The taxonomy should consist of few proto categories, with empirically documented subcategories hierarchically nestled (Table 12). Capital systems reflect actual communities, as 'an economy of what matters' (Carrillo, 2022).

Table 12. Capital taxonomy

Capital System Universe of value orders of collective preference	Metacapital Multiplicative (divisive)	Referential Structure: rules of belonging	Identity Auto-significance	Capacity to differentiate value elements belonging into the system and to consequently adjusting action
			Intelligence Alo-significance	Capacity to identify

		Articulating Function: rules of relationship		significant agents and events in the system and responding accordingly
			Monetary Exchange	Capacity to represent and exchange value elements
	Productive Additive (subtractive)		Relational Bonding	Capacity to establish and develop bonds with significant others
			Input	Natural services, cultural heritage, and exogenous value
			Agential	Capacity to perform value-increasing actions
			Instrumental	Capacity to leverage the performance of value-increasing actions
			Output	Cumulative addition to or subtraction from a system

A capital system can be defined as a universe of collective preference orders within a human activity structure. Includes all elements stakeholders recognize as valuable at level individual, organizational, social, and global level. Each category is subdivided into value functions. According to their value operation, each holds a negative (liability) or positive (asset) sign. Any entity's value blueprint is rendered by capturing its capital system. Ideally, each value element occurs in just the right proportion to achieve full balance, continuously adjusting it. Value systems are unique, like personalities and cultures. No capital has primacy: the equilibrium of all value elements approaches an ideal value system. Capital systems research has been conducted and published globally (Table 13).

Table 13. Some Capital Systems publications on international sources

Batra et al., (2013)
Carrillo (2002, 2004, 2006 b, c, 2014a)
Carrillo & Guajardo, 2014
Carrillo et al., (2014, 2022)
Correa & Guevara, (2014)
Fachinelli et al., 2014, 2015, 2016, 2017
Flores (2014)
Garcia, B. (2007, 2010)
Garcia C. (2014)
Gil & Carrillo, 2013, 2014a, b
Gil et al., 2018
Leal (2005, 2014)
Olavarrieta (2011)
Olavarrieta & Carrillo, 2014
Olavarrieta & Rodríguez, 2014
Passerini & Wu (2008)
Rivera & Carrillo, 2014, 2016
Rivera et al., 2021
Schiuma & Lerro (2018)
Sharma et al., 2008
Valerio (2014)

Waltzer et al., 2022

Webb, (2008)

3. Application base

3.1 Third-generation KM processes

Operationalizing KM into measurement-driven definitions renders it actionable. Extant KM literature documents the diversity of processes, according to KM generations (Carrillo, 1996a, 1998; Chavez & Garza, 2014; Firestone & McElroy, 2002; López et al., 2008; Rowley, 2003; Vazquez, 2014; Vasquez & Gabalan, 2009). The KSM approach is particularly amenable to process operationalization. It comprises three blocks, dealing with objects (instrumental capital), agents (human capital) and context (metacapitals). Each of the three major processes can be described in terms of expected outcomes (Carrillo, 2023; Martinez, 2001). Operationalization is key to KM process instrumentation, whether for software development (Carrillo & Galvis-Vista, 2014; Carrillo, 1998) or knowledge cities benchmarking (Carrillo & Chase, 2007; García & Chávez, 2014).

3.2 Consultancy and applied programs

3.2.1 International consultancy

KSM entities have executed over 70 national and 30 international contracts. Table 3 above lists CKS corporate and government clients. The CKS public sector portfolio includes Pemex (22 contracts), and CFE. Table 14 lists international consultancy projects through KSM collaborations. A testimony of the vitality of KM public sector consultancy in Latin-America is provided by Ferreira (2016) volume, including CKS experiences (Carrillo, 2016b). The most prominent area of KSM consultancy has been knowledge cities.

Table 14. Sample of international consultancy projects through KSM collaborations.

Recipient country	Sponsor
Belgium	European Commission
Mexico	Inter-American Development Bank
Uruguay / Mexico	International Development Research Center
Switzerland	International Telecommunications Union
Switzerland	Cemex
USA	Kellogg Foundation
USA	World Bank
Spain	National Ministry of Culture
Spain	Legazpi Municipality
Spain	Ibi Municipality
Colombia	Bogota Chamber of Commerce
Colombia	Caldas Department
Colombia	Manizales Municipality
Colombia	Medellin Municipality
Brazil	Bento Gonçalves Municipality
Brazil	Florianopolis Chamber of Commerce
Palestine	Bethlehem Municipality

3.2.2 Knowledge cities

This model has been applied globally, as a strategic framework for urban KBD: (see Table 15).

Table 15. Sample of Knowledge Cities publications on international sources

Asheim (2012)

Carrillo (2004, 2005b, 2006 a, d, 2007, 2009, 2010b, 2022b, 2024)

Carrillo et al. (2014)

Donnet et al., (2010)

Dvir and Pasher (2004)

Edvardsson et al., (2016)

(Edvinsson (2006a, b)

Ergazakis et al., (2002, 2006a, b, 2010)

Garcia, (2004, 2006, 2014)

Gonzalez et al., 2004

Gonzalez & Carrillo (2012)

Lambooy (2006)

Martínez (2006)

Martins and Viedma (2006)

Matthiessen et al. (2006)

Metaxiotis & Ergazakis (2008)

Metaxiotis et al., (2010)

Powell (2012)

Rogerson & Tremblay (2008)

Rubalcaba & Garrido (2006)

Sarimin & Yigitcanlar (2012)

Tresman et al (2007)

Yigitcanlar, (2009, 2012)

Yigitcanlar & Inkinen (2019)

Yigitcanlar et al., (2007, 2012).

This model is the basis for the MAKCi Awards, held since 2007 at the annual KCWS conference (Carrillo, 2006a; World Capital Institute & Teleos, 2007; Leal & Garcia, 2008, 2012, 2021). Over 100 cities have used this model worldwide (Figure 2). A variety of direct applications to regional development and policy analysis have been documented at the city, regional and municipal levels.

Figure 2. Knowledge City/region cases (relative circle size) by country, from primary KSM authors. (Table 16)



4. Transformational impacts in Latin America

To assess the transformational impacts in Latin America, a mixed methods approach was employed. This involved conducting a consultation with CISC members who have actively participated for at least a decade across various countries. The consultation aimed to gather evidence of their actions in research, education, and consultancy in KM and KBD and their connections with other CISC cells internationally. Additionally, a documentary analysis of annual assembly minutes and foundational documents, such as principles and statutes, was carried out. This dual approach contributes to reliability and validity by triangulating data from experienced members and official records, thereby providing a qualitative

study that captures both the depth and breadth of CISC's impact in the region. By analyzing both the data from research and development projects and the comprehensive documentation of CISC's events and assemblies, we aim to provide a holistic view of CISC's impact. Together, these analyses highlight the role of CISC in promoting KBD and driving transformative changes in the region.

4.1 Analysis of the Survey Conducted with CISC Researchers

This section delves into details of a survey conducted with CISC researchers. Results reveal the extensive involvement of CISC members in research and development, education, consultancy projects and international collaboration. These professionals have made significant contributions to the advancement of KM and KBD in Ibero-America. By examining the roles and impacts of individual members this section highlights the diverse expertise and practical applications of their work. The data showcases how CISC members have led large-scale initiatives, conducted qualitative and quantitative analyses, and collaborated on international projects, demonstrating the breadth and depth of their contributions to KM and KBD in the region.

4.1.1 Research and Development

Data analysis reveals the profound participation of the members of Comunidad Iberoamericana de Sistemas de Conocimiento (CISC) in R&D projects. This involvement is evidenced by their participation in projects focused on KM, KBD, capital systems, knowledge cities and regions, innovation, and public health initiatives in complex contexts, showcasing their interdisciplinary approach.

Table 16. Some knowledge city/region applications by country

Country	Knowledge City / Region Case
Arab Countries	Mohamed et al., 2008
Australia	Alizadeh, 2010; Hu, 2012; Imukuka et al., 2012; Jerome, 2010; Johnson, 2012; Searle & O'Connor, 2012; Yigitcanlar & Martinez-Fernandez, 2010; Yigitcanlar et al., 2008
Austria	Schneider, 2007
Bahrain	Mohamed, 2009
Brazil	D'Arisbo, 2014; Fachinelli, Carrillo et al., 2014; Fachinelli and Macke, 2012; Fachinelli, Giacomello et al., 2014; Fachinelli et al., 2018; Nespolo et al., 2017; Waltzer et al., 2022
Canada	Darchen & Tremblay, 2010
Chile	Ramírez, 2007
China	Chen, 2004, 2006
Colombia	Chaparro, 2007; Lopez & Jollanes, 2008; Vasquez & Gabalan, 2009; Zuluaga, 2013
Croatia	Jelic, 2006
Denmark	Bidault-Waddington, 2006; Lorenzen et al., 2012
El Salvador	Pleitez & Flamenco, 2009
Ethiopia	Mohamed et al., 2010
Finland	Inkinen & Vaattovaara, 2010
France	Petrucelli et al., 2009
Germany	Mugellesi & Pallaschke, 2010; Simmie & Strambach, 2006; Wesselman et al., 2012
Greece	Ergazakis et al., 2007; Metaxiotis & Ergazakis, 2012
India	Batra, 2012; Batra et al., 2013; Chawla, & Joshi, 2010; Sharma & Goswami, 2009
Israel	Dvir et al., 2006; Goldberg et al., 2006; Levin-Sagi et al., 2006; Pasher & Shachar, 2010
Japan	Martinus, 2012
Italy	Lerro & Schiuma, 2009; Petrucelli, 2008, 2010
Malaysia	Rahman et al., 2010; Yigitcanlar & Sarimin, 2010

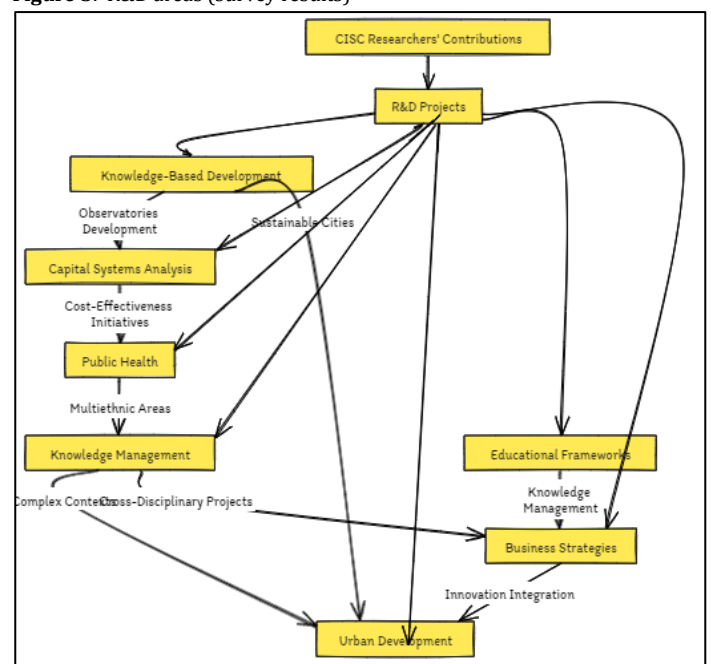
Mexico	Carrillo, 2005b, 2006c; Flores, 2006; Flores et al., 2018; Garcia & Chavez, 2014; Garcia et al., 2009; Morales, 2007
Netherlands	Fernandez-Maldonado, 2012
Peru	Carrillo & Arce, 2020; Carrillo et al., 2022; Lara, 2000
Puerto Rico	Rivera-Vazquez et al., 2009
Saudi Arabia	Reffat, 2010
Spain	Arbonies, 2006; Arbonies & Mosso, 2002; Azua, 2006; Bañegil & Sanguino, 2006; Casado, 2009; Lasheras, 2006, 2007; Zapata et al., 2009
Singapore	Evers et al., 2010; Wong et al., 2006a, b; Wong, 2010
South Africa	Buckley and Giannakopoulos, 2010
Taiwan	Chen & Choi, 2004
Turkey	Cevikayak & Velibeyrglu, 2012
United Kindom	García, 2004, 2006a, b; Garner & Dornan, 2012; Petrucelli, et al., 2010
United States	Bennet & Bennet, 2010; Chatzkel, 2004, 2006; Lopez-Saez et al., 2010

Projects reported by respondents instantiate this involvement. These include the development of observatories for KBD, methodologies for diagnosing and enhancing capital systems, leadership education for KBD, innovation capabilities development and public health initiatives addressing cost-effectiveness in multiethnic areas. Projects span various domains, including urban development programs aimed at creating sustainable cities, educational frameworks for knowledge management, and business strategies integrating knowledge and innovation.

In general, the participation of the researchers in R&D projects demonstrates a wide array of contributions across various domains and industries. The members were deeply involved in conceptualizing and implementing methodologies to enhance organizational knowledge and promote sustainable development. Many engaged in cross-disciplinary projects, merging insights from fields such as public health, education, urban development, and business management. Their roles ranged from leading large-scale initiatives and conducting detailed qualitative and quantitative analyses to collaborating with international teams to address region-specific challenges.

This extensive involvement underscores the diverse expertise within the CISC and highlights the practical impact of their research in driving forward the agenda of knowledge-based development. These examples illustrate the diversity and depth of the contributions of CISC members, reflecting their ability to integrate theory and practice to promote knowledge-based development in the region (Figure 3).

Figure 3. R&D areas (survey results)

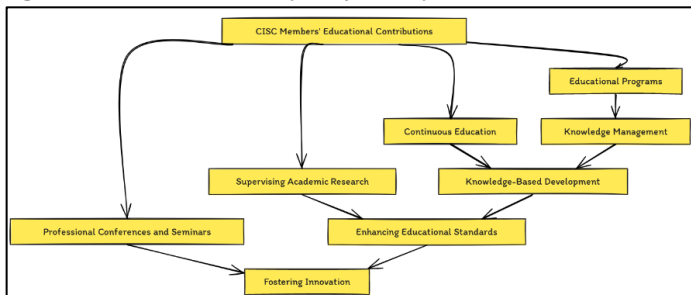


4.1.2 Education

Data analysis reveals the extensive involvement of the CISC members in educational initiatives, underscoring their significant contributions to advancing knowledge and fostering innovation in Latin America. A member from Brazil exemplifies this contribution through their coordination of a pilot specialization in KM at UCS during 2010-2011. This project involved the collaboration of CISC member professors from various countries and included an international module at the CISC cell in Mondragón, Spain. In a similar vein, a member from Mexico has been instrumental in developing and teaching a diploma program in Electronic Government at Tecnológico de Monterrey, leveraging the Generic Capital Systems framework. Another member from Mexico contributed significantly to educational development by designing and teaching master's courses in Information Technology Management, specializing in KM, thus influencing the curriculum and instructional design. Members from Brazil participated in programs like the KBD and Capital Systems in the Master's in Administration at UCS, while the member from Peru co-directed programs such as EmprendedorExt, highlighting their ongoing commitment to professional development and lifelong learning. A member from Peru highlighted their role as an instructor in multiple doctoral courses at the University of Extremadura, focusing on Capital Intelligence and KBD Systems. Furthermore, pioneer distance education programs in KM and KBD have been developed by CISC members. A member from Mexico created and directed back in 1989 the Sinapsis Program, the first satellite broadcast distance education in the region, that included KM courses. This program provided the grounds for Universidad Virtual at Tecnológico de Monterrey, the first Internet-based graduate program in the region. Collaborative Masters and Executive Education programs were developed between Mexico, Peru and Brazil. The World Bank Innovation Program

These examples illustrate the diversity and depth of the educational contributions made by CISC members, reflecting their ability to integrate theoretical insights with practical applications to enhance KM and KBD education in the region. Members from Mexico, Brazil, Peru and Colombia supervised numerous doctoral and master's theses, guiding research that incorporates theoretical and practical components of KBD and Capital Systems. These members also contributed as supervisors and panel members, ensuring rigorous academic standards and contributing to the advancement of knowledge in their respective fields. CISC members actively participated in various academic and professional events, sharing their expertise and fostering collaboration. They attended multiple CISC assemblies and Knowledge Cities World Summits, often as speakers. Members from Mexico, Peru, Brazil, Colombia, Ecuador, El Salvador and Spain participated and co-organized significant conferences, reflecting the vibrant academic and professional engagement of CISC members. Overall, the analysis of educational involvement among CISC members reveals a robust engagement in developing and delivering educational programs, contributing to continuous education, supervising academic research, and actively participating in professional conferences and seminars. Their contributions have significantly advanced the field of KM and KBD, demonstrating a strong commitment to enhancing educational standards and fostering innovation across Latin America (Figure 4).

Figure 4. Education activities. (Survey results).



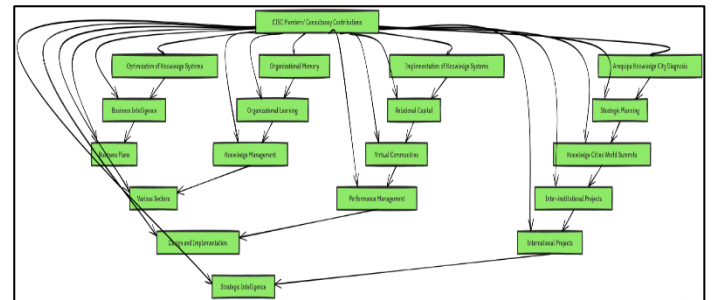
4.1.3 Consultancy

Data analysis reveals the extensive involvement of CISC members in consultancy projects, highlighting their significant contributions to the implementation and optimization of knowledge systems in organizations across Latin America. Researchers from CISC in Mexico, Brazil, and Peru exemplify this contribution through their roles as consultants in the "Diagnosis of Arequipa as a Knowledge City," where they provided key recommendations following the research project (Fachinelli, 2018). Similarly, members from Mexico have been actively involved in multiple consultancy projects, such as providing expertise on Organizational Memory, Relational Capital, Virtual Communities, and Organizational Learning for companies like CEMEX, PEMEX, and Volkswagen and have served as a consultants for numerous companies, including Aeromexico and Microsoft, focusing on the implementation of knowledge systems for project management and strategic planning. A member from Peru contributed as a business intelligence and performance management consultant in Monterrey, Mexico, bringing innovative approaches to corporate knowledge management. These examples illustrate the diversity and depth of the consultancy contributions made by CISC members, reflecting their ability to apply theoretical knowledge to practical challenges in various organizational contexts.

Members participated in CISC assemblies as both community members and presidents, while others took on roles as participants and co-organizers at KCWS editions. They attended multiple conferences, contributing as speakers and organizers, demonstrating their active engagement in disseminating knowledge and fostering professional networks. CISC members engaged in various inter-institutional and international projects, such as evaluating MAKCi candidates and collaborating with institutions like the European Commission and the World Bank, showcasing their global impact on knowledge management practices.

Members provided consultancy services to numerous organizations, implementing and optimizing knowledge systems. They worked on strategic projects with companies such as Aeromexico and Coca-Cola FEMSA, focusing on business intelligence and performance management, and enhancing organizational knowledge capabilities. Members also worked on innovative business plans with organizations like Corporación Biotec and led the design and implementation of knowledge systems in various multinational corporations. Their diverse consultancy experiences reflect their expertise in applying strategic intelligence and knowledge management in different sectors and institutions (Figure 5).

Figure 5. Consultancy projects (survey results)



4.2 Documentary analysis of CISC Events and Assemblies

This section analyzes key documents from CISC's assemblies and events. By reviewing the Informes de Comités, Informes de Actividades de Células, and Planes de Trabajo de Comités, we gain insights into the organizational structure, strategic initiatives, and collaborative efforts across CISC members. These documents detail CISC's educational initiatives, consultancy projects, and research and development activities, highlighting the community's commitment to enhancing educational standards, implementing innovative KM and KBD practices, and fostering international collaboration.

4.2.1 Documents

Comunidad Iberoamericana de Sistemas de Conocimiento (CISC) is a non-profit organization dedicated to promoting KM and KBD at the Ibero-

American region. It comprises professionals interested in the study, research, application, and dissemination of Knowledge Systems, primarily focusing on Latin America, Spain, and Portugal, with connections to the United States, Canada, and the European Community.

CISC's principles emphasize promoting development through knowledge in people, organizations, and societies. It encourages participation, commitment, and service within organizations, focusing on sustainable and integral development through people rather than technology. The organization uses technology to benefit people and organizations, fostering collaboration over consolidation. CISC observes phenomena with a systemic and interrelated perspective, defining success through sustainable value creation. It incorporates economic, environmental, and social aspects into its concept of development, ensuring equity in participation, opportunities, and benefits distribution.

The statutes of CISC define its structure, membership, and operations. Membership includes active and observer members, where active members participate in CISC activities, and observers stay connected for learning purposes. The organization comprises local groups called células, focusing on KM and KBD. These groups are coordinated regionally to ensure cohesive efforts across countries. CISC's governing bodies include a Council, Executive Committee, and Technical Secretariat, which manage and coordinate activities.

CISC operates based on respect for group initiatives, collective learning, and trust. Each cell is autonomous and responsible for its activities, promoting local knowledge-based development. Interaction and communication are ensured through electronic platforms, with the Liaison Office promoting initiatives via the CISC website. The Liaison Office was hosted for over 20 years by CKS, Mexico.

Overall, CISC's principles and statutes highlight its commitment to knowledge-based development, collaborative initiatives, and sustainable growth in the Ibero-American region. The organization supports flexible, autonomous operations with a strong focus on collective learning and knowledge dissemination.

4.2.2 Minutes and Assemblies

This subsection analyzes the minutes and records from various CISC assemblies and events. These documents highlight the discussions, decisions, and actions taken during the assemblies, providing a comprehensive view of CISC's strategic directions and practical outcomes. The analysis illustrates the impact of these gatherings on promoting sustainable development and knowledge-based economies in Latin America, following the division into education, research and development, and consultancy, and showing how each area is addressed in these meetings.

This subsection analyzes the minutes and records from various CISC assemblies and events, highlighting the discussions, decisions, and actions taken during these gatherings. The documents reveal significant educational initiatives undertaken by CISC and its various cells, emphasizing the community's commitment to knowledge-based development through education.

In Mexico, El Salvador, Colombia, Brazil, Ecuador and Spain, educational activities included training in KM and advanced seminars on KBD. The Plan de Trabajo Comités 2011-2012 emphasized updating curricula, supporting teaching capabilities, and creating certification conditions for educators within the CISC network. Key projects, such as KBD Currícula, shaped postgraduate programs in KM and KBD, benefiting students across different regions. Educational modules were also delivered in Bento Gonçalves, reinforcing the practical implementation of CISC's educational framework.

Consultancy activities have been crucial in applying KM and KBD in practical settings. In Mexico, consultancy projects included collaborations with companies like MABE and PROLEC-GE. In Bogotá, the International Conference on Intellectual Capital and Knowledge Management (ICICKM 2012) was established in collaboration with Universidad del Rosario. Other prominent consultancy initiatives include CMAN-Corredor Multimedia Agrópolis del Norte and Santander Digital in Colombia, integrating KM into public and private sectors. Assemblies in Alicante and Guayaquil discussed projects such as CISC 2.0 and strategies for innovation and organizational memory with major organizations like PEMEX.

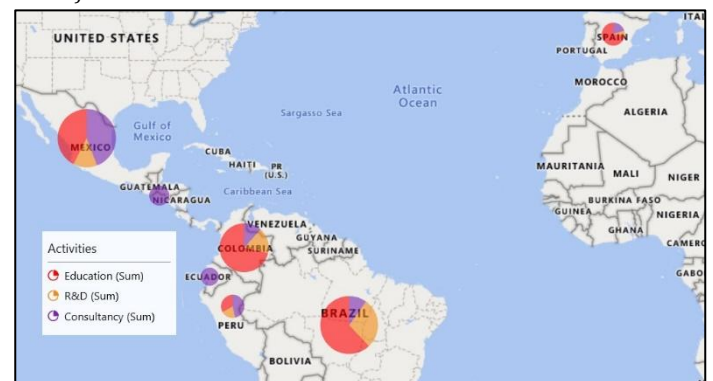
R&D activities have driven innovation and knowledge creation. In Monterrey, R&D initiatives included participation in IFKAD 2011 in Tampere, presenting research on intangible assets and publishing multiple papers. Projects aimed at advancing knowledge systems development and promoting best practices in knowledge management were emphasized in the Plan de Trabajo Comités 2011-2012. Assemblies in Alicante and Guayaquil discussed leveraging collective intelligence and developing new curricula based on the latest research findings, while the IX Asamblea highlighted evaluations of existing projects and new strategies to enhance R&D impact.

In conclusion, CISC's actions in Latin America have focused on education, consultancy, and research and development. Significant educational initiatives occurred in Mexico, El Salvador, Colombia, Peru and Brazil. Consultancy projects were prominent in Mexico, Bogotá, and Colombia. R&D activities were driven by efforts in Monterrey, Peru and Brazil and discussed extensively in assemblies held in Alicante and Guayaquil. These actions reflect CISC's diverse expertise and collaborative efforts in advancing knowledge and innovation across the region.

4.2 General Analysis

The following map provides an overview of CISC members' participation in R&D, Education, and Consultancy activities across various countries, highlighting their contributions in these areas (Figure 6).

Figure 6. Senior CISC members activity distribution by country (survey results)



Mexico has significant involvement in both Education and Consultancy, indicating strong contributions in these areas. Brazil focuses substantially on Education, highlighting its emphasis on academic activities. Colombia also shows notable contributions in Education, reflecting a robust academic presence. Spain, Peru, Ecuador and El Salvador have a balanced distribution between Education and Consultancy. In R&D contributions, Brazil and Mexico are primary contributors, with Colombia showing significant involvement.

The map visually represents the distribution of activities across the regions. The active presence of CISC cells in various Latin American countries demonstrates the movement's deep commitment to regional development through knowledge management. The study shows that the transformational impact of CISC's initiatives is closely tied to the unique characteristics and needs of each region. By tailoring their actions to the specific contexts of countries like Mexico, Brazil, Peru, Colombia, and others, CISC effectively promotes sustainable development and innovation. This regional customization underscores CISC's dedication to leveraging local strengths and addressing local challenges, thereby fostering significant and lasting improvements in each area.

5. Conclusion

This exercise documents KSM throughout Ibero-America and its global reach. By recollecting evidence on its origins, evolution and current situation, its legacy gains visibility. The survey and documentary analyses, highlight KSM role in promoting KM and KBD. Several international accolades testify the KM pioneering work from KSM actors. Emerald's Award

of excellence to the Outstanding Special Issue 2005, the most downloaded paper award from the Journal of Open Innovation, 2017, The second most productive and influential institution publishing in JKM, 2018, the Third most-productive and influential author, JKM, 2018. An informed recollection of KS experiences shows a vibrant regional and a significant contribution from Latin-America to the World.

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