Competitive Intelligence Empirical Construct Validation Using Expert In-Depth Interviews Study

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***Abstract*—For a discipline to prosper in business and science, it must be thoroughly defined, characterized, and measured. Notably, the definition must reflect its praxis. This study aims to fill this void by empirically validating the Competitive Intelligence unified view and modular definition proposed by Madureira, Popovic, and Castelli (2021). The choice for this specific definition relies on its recency, comprehensiveness, completeness, and universality. The study uses a mixed-methods approach to derive meta-inferences from the sequential integration of qualitative and quantitative methods. We tested content, external, discriminant validities, reliability, and applicability using an in-depth interview study with twenty global CI subject matter experts. The results empirically validate the unified view, the modular definition, the five core defining dimensions, and their respective descriptors. This study unfolds the impact of CI in management research across five key areas – practical, theoretical, educational, society, policy. The critical lever for this impact is the effectuation of the Body of Knowledge which subsequently effectuates the CI practice, education, and discipline, serving as the foundation for its future development in business and academia.**

Keywords—validity, reliability, applicability, scientific impact, mixed-methods, computer-aided data analysis (CADA)

I. INTRODUCTION

Scholars and practitioners have extensively defined competitive intelligence over the last century. Regardless, there is no consensual definition, a necessary condition to clearly delimit the CI Body of Knowledge (BOK). The resulting conceptual void compromises the effectuation of the discipline, curricula, and profession, considerably detaining practical, scholarly, educational, societal, and policy management research [1]. Subsequently, this void also compromises the construct empirical validation, a sufficient condition for the development of CI science and praxis. Thus, the absence of an empirically validated construct negatively impacts business executives, decision-makers, researchers, students, and educators.

To date, there have been six attempts to develop a universal definition for CI [2]–[7]. Amongst those, Madureira et al. [7] offer: 1) the greatest recency; 2) improved comprehensiveness with eight hundred and twenty definitions analyzed; 3) increased breadth encompassing all relevant related fields of knowledge, the worlds of business, science, and education, and all types of scholarly and practitioner cohorts; 4) the lowest subjectiveness using quantitative and qualitative methods, notably, a mathematically computed optimal number of the core defining dimensions; and 5) thoroughness, as the only definition from the extant literature that covers all core defining dimensions, the 5Ps of CI. As such, we use the aforementioned definition as the baseline for this study: "CI is the process and forward-looking practices used in producing knowledge about the competitive environment to improve organizational performance" [7].

The main concerns of theory development are validity – measuring the right phenomena, reliability – consistent measuring, and applicability – relevance to praxis [8], [9]. Particularly, construct validity "is one of the most significant advances of modern measurement theory and practice" [10, p. 670], and researchers cannot minimize the importance of its rigor and relevance. This overarching type of validity refers to the quality of the translation of the construct into a functioning and operating reality as the "approximate truth of the conclusion or inference that the operationalization accurately reflects its construct" [11].

Given the inexistence of empirical validation for the CI construct, confirming the validity, reliability, and applicability of the unified view and modular definition proposed by Madureira et al. [7] is of the utmost importance. Thus, this study aims to fill this foundational research gap by conducting a conclusive empirical CI construct validation drawing from top global CI subject matter experts. The main expected contributions are the increased rigor and relevance to ground future CI theory development. Furthermore, the potential reduction of polysemy and synonymy in and between CI and related terms enables the creation of a common language that clarifies and guides future praxis. Finally, study results are expected further to legitimize the CI function, profession, and science. The paper starts by describing the methodology followed, namely the sampling and the data sets, followed by the methods in tandem with its

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results. It finishes with discussing the main results and inferences, pointing to future research opportunities in CI.

METHOD & RESULTS

The investigation is confirmatory, relying upon a multistrand design of sequential partially mixed methods with qualitative and quantitative methods equivalent status. Considering that the CI construct is foundational for information and organizational sciences [6], [12], and like other pivotal constructs is an "unobservable" theoretical concept, we used content analysis, most specifically computer-aided text analysis (CATA), as the primary tool to capture and measure this latent construct. As a research method, content analysis is the systematic, objective, quantitative analysis that uses a set of procedures to reliably classify or categorize message characteristics from rhetorical content [13]. This study follows the construct validation using CATA methodological guidelines developed by Short et al. [14], a tried and tested approach combining conceptual and empirical approaches to guarantee proper psychometric measurement.

A. Data Collection: Sample Selection & Interview Protocol

The data collection was based on purposive sampling following a concurrent sampling strategy. The decision to use in-depth interviews acknowledges its main qualities, such as the level of depth, disclosure, quality, and timeliness [15]. The most prominent criterion was the inclusion of the empirical perspective in the study, thus allowing for the applicability check of the construct. We followed the four steps suggested by Ritchie [16], starting with defining the sampling strategy, developing the in-depth interview protocol, conducting the interviews, and finally analyzing the data. As such, well-renowned CI experts from five different background cohorts were selected based on their proficiency and usage of CI. Participants varied in their profile and demographic details regarding highest education qualifications, formal training, years of experience, job descriptions, and professional positions within the CI field. Academics (scholars, authors, and educators), advisors (consultants and technology providers), thought leaders (community leaders and public speakers), professionals (practitioners developing CI), and executives (decision-makers using CI) were prompted for their point of view and perspectives on CI and the proposed unified view and modular definition. The interviews [17] were performed person-to-person via cloud-based video communication apps with semi-structured questions placed in order but flexibly. The researcher deliberately established rapport to achieve candid and unbiased communication, and rich feedback could emerge and be shared [18]. The interview started by obtaining consent to video record and mentioning the identity of experts. We paid utmost attention to the privacy of the interviewees who gave their consent to be named but not quoted verbatim. The questions that followed focused on logically addressing the research objectives. Probing questions were added to allow the experts to clarify the meaning, address the gaps in the answers, or lay out their unrestricted perspective in greater depth [19]. Generally, we started by obtaining the expert perspective of what CI is today, their working definition, and respective dimensions. Following, we collected their feedback on Madureira et al.'s [7] definition, dimensions, and descriptors. The interview ended, time availability allowing, with the experts foreseen impact and contributions of this study.

Data collection resulted in more than fifty interviews, of which the first twenty were used for this study due to time constraints. Each interview corresponds to a minimum hour-long video recording and the transcript uploaded into ATLAS.ti 8.4.5 for Mac. We included the foundational data set – Literature Definition Corpus (LDC N = 820) – containing the definitions extracted from the CI literature review covering the last century, which we used to develop the CI unified view and modular definition [7]. This data set allowed for content validity, reliability, and dimensionality analysis.

B. Data Reduction: Flexible Coding and CATA

The decision to write this specific section acknowledges the criticality of data reduction to qualitative analysis [20] as a pivotal input to the quantitative analysis strand performed next. Given the confirmatory nature of this study, we used CATA based on deductive factual (actual content, not its interpretation) and directional coding (confirmative feedback). The aim was to avoid subjectivity and interrater reliability issues. This approach allows for the automated word frequency count pivotal to quantizing the in-depth interviews. The coding framework was based on the modular definition represented by the visual abstract from Madureira et al. [7] translated into factual analytic codes representing its attributes, the core defining dimensions, subdimensions, and descriptors. We chose the "flexible coding" method [21], given that it is better suited to the realities of analyzing in-depth interviews with qualitative data analysis software. According to its authors, the goal of this approach is "to support rigorous, transparent, and flexible analysis of in-depth interview data." Therefore, we chose the word as the unit for content analysis serving as the basis for quantizing the transcripts. The final result was the statistical summarization of the analytic codes [22] applied to focused parts of the transcripts, namely the experts' definitions and feedback given the unified view and modular definition of CI.

The reduction process resulted in three additional data sets. The second data set of the study – Dimension Word Lists (DWL N = 5) – is made of the "word lists" for each of the CI dimensions, the 5Ps: Process, Purview, Product, Purpose, and Practices [7]. The third data set – Experts Feedback Corpus (EFC N = 20) – is the per expert feedback to the CI definition and unified view. In other words, this data set includes the word counts by each expert of the CI construct and its dimensions and descriptors, the CI domain. Finally, the fourth data set – Experts Definition Corpus (EDC N = 20) is the working definition corpus prompted to each expert and extracted from the interviews.

C. Data Analysis: Empirical Construct Validation

Rigor and relevance to practice are two critical issues in research [9], [11, p. 26]. Rigor relies on applying a scientifically sound methodology, notably, on the validity of the propositions reached [11]. In the context of this study, validity is the assessment of whether what is observed is representative of the construct. The focus of this section is thus the validity, reliability, and applicability checks of the unified view and modular definition. We followed Short et al.'s [14] recommended validation procedures using CATA, suggesting that such a process can effectively validate the latent CI construct as Fig. 1.

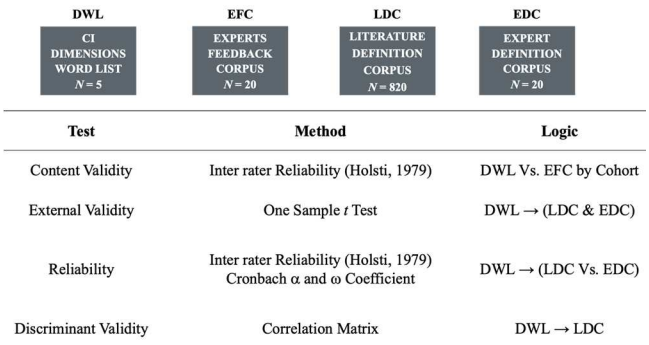

Fig. 1. Data Sets and Data Analysis Roadmap for CI Construct Validation

Content Validity

Following Short et al. guidelines [14], we started by choosing the working definition; the CI unified view and modular definition from Madureira et al. [7]. An initial assessment of CI dimensionality resulted in importing the 5Ps, or the core defining dimensions from the same theory to be validated. Consequently, the most critical step consisted of developing an exhaustive list of keywords for each of the 5Ps. As per [14], [23] recommendations, multiple discrete deductive word lists were created. The process was based on the original twenty keywords from the original topic modeling from Madureira et al. [7], to which we added an exhaustive list of synonymous with the aid of Rodale's [24] Synonym Finder. We eliminated repeated words by selecting the word with the highest explanatory power to the respective dimension they were attributed to in the end. The terms used in the graphical abstract [7] absent from the original keywords were used to inductively complete the list, as per Short et al.'s [14] recommendation. Finally, the expert's opinion regarding the final word lists served to validate the word lists. To guarantee the correct word meaning was conveyed, the interviewer explained the terms in detail and context using the graphical abstract. The feedback from the experts is included in the EFC data set as word counts. The DWL and the EFC data sets were then compared for agreement to compute and assess the interrater agreement. According to Short's et al. [14] recommendation, we used Holsti's [25] formula:

$$PA0 = 2A / (nA + nB + \ldots + nF) \quad (1)$$

where *PA0* is the proportion of agreement observed, *A* is the number of agreements between all the raters, and *nA*, *nB*, …, and *nF* are the individual number of coded words for each cohort. Moreover, we compared the DWL and EFC data sets by stakeholder cohort to reinforce the content validity check analysis.

The results of the content validity analysis are summarized in Tables I, II, and II.

External Validity

As per Short's recommended procedures [14], we started by identifying the appropriate samples and narrative texts. The first sample is the expert's working definition corpus, the EDC. The second sample is the original LDC data set used as the baseline for comparison. We then conducted a one-sample t-test (compared to a test statistic of zero) for the LDC and EDC data sets. The results allowed us to assess and compare the presence of language consistent with the CI definition in the definitions from the literature review and within the expert's working definitions extracted from the in-depth interviews.

Table IV presents the results for this validation procedure.

Reliability

Short et al., [14] procedural recommendation for evaluating reliability relies on comparing word counts between relevant samples to assess the similarity of the operationalization of the construct in different contexts. For this purpose, we used Holsti's interrater reliability approach to assess this similarity between the samples, the LDC and EDC data sets. Additionally, we computed the Cronbach's (α) and the Omega (ω) coefficient for the CI Construct and by dimension in both samples. The aim was to measure the proportion of CI construct total variance attributable to a common source. In other words, we assessed the presumably actual score of the CI constructs underlying the dimensions. The reason for calculating ω is that it relaxes the assumption of a tau-equivalent model, strengthening the acceptability of the model, according to Nunnally [26].

Tables V, VI, and VII summarize the results for the reliability validation procedures.

Discriminant Validity

Discriminant validity, or dimensionality, refers to the degree to which each word for a dimension strongly relates with the other words of the same dimension, while, in parallel, it is also uncorrelated with words that define other dimensions of a construct. Short et al. [14] suggests examining the correlation matrix to perform this validation assessment. Therefore, we calculated the correlation matrix for the LDC.

Table VII summarizes the results for this dimensionality validation procedure.

TABLE I. FINAL WORD LISTS BY CI DIMENSION

CI Dimension	Word Sourcing and Contribution to Final Word Lists		
	Topic Modeling	*Synonyms*	*Graphical. Abstract*
D1 - PROCESS	competitive, analysis, collection, making, systematic, plan, networking, development	procedure; operation, course, line, policy, polity, guidelines; method, methodology, technique; approach; wise, manner, means, mode, fashion, style, ways; standard operating, SOP, rule, manner, process, course action; transaction, proceedings, step	activities
D2 - PURVIEW	competitor, market, customer, product, firm, company, industry, capability, advantage, develop, technology external, internal, environmental, environment, business, sale	jurisdiction, bailiwick, province; sphere, compass, orbit, area, territory, responsibility, scope, field	macro, micro, meso
D3 - PRODUCT	knowledge, datum, data, human, machine, value, create, form, asset, learning, organizational, model, application intelligence, information, actionable, network, forecast, foresight, artificial, agent, systems	production, produce, product, output, turnout, goods, offerings; work, handiwork, artifact, representation, symbol, image, creation, result, effect, outcome	machine, natural, nature, knowledge, learning
D4 - PURPOSE	system, support, signal, function, provide, executive, specific, goal strategy, decision, plan, management, marketing, identify, change, opportunity,	reason, point, why, principle, guiding, principle, basis, root, idea; motive, motivation, mainspring, drive, driver, driving, force, cause; rationale, explanation, background, meaning; rationalization, justification, excuse, intention, intent, aim, spirit; objective, object, target, mark, destination, end, view, mind, ultimate, aim, expectation, expected, aspiration, vision, dream, ideal, wish, hope, desire, desideratum, ambition, drive, pursuit; intentness, central, idea, main, heart, gist, kernel, core, essence; concern, interest; profit, gain, return, vision	purpose, performance, planning, early, warning, weak signals
D5 - PRACTICES	research, future, activity, term, corporate, scenario, individual, ability, learn, organization, strategizing, strategic	habit, custom, modus, operandi, common, practice, usual, things, general, usual, procedure, routine, convention, ways, done, conduct, trade	capabilities, short, medium, long, learn, organization, management, scenario, corporate, forecasting, research

TABLE II. HOLSTI (1969) INTERRATER RELIABILITY

CI Dimension	DWL Vs. EFC			
	Agreement (A)	*nA*	*nB*	*PA0 = 2A / (nA + nB)*
D1 - PROCESS	27	35	27	87%
D2 - PURVIEW	23	29	23	88%
D3 - PRODUCT	38	42	38	95%
D4 - PURPOSE	60	81	60	85%
D5 - PRACTICES	26	34	26	87%

TABLE III. HOLSTI (1969) INTERRATER RELIABILITY

CI Dimension	DWL Vs. EFC by Cohort				
	CIP	*Leader*	*Advisory*	*Executive*	*Academic*
D1 - PROCESS	85%	91%	92%	83%	92%
D2 - PURVIEW	82%	88%	91%	82%	91%
D3 - PRODUCT	89%	92%	94%	89%	95%
D4 - PURPOSE	73%	84%	88%	73%	89%
D5 - PRACTICES	81%	90%	90%	83%	90%

TABLE IV. LDC & EDC ONE-SAMPLE *t-Test* RESULTS

CI Dimension	LDC				EDC			
	N	*Mean*	*SD*	*t-Test* [a]	*N*	*Mean*	*SD*	*t-Test* [a]
D1 - PROCESS	820	2.16	22.3	2.76*	20	2.50	1.36	8.24*
D2 - PURVIEW	820	1.98	22.5	2.51*	20	1.90	1.62	5.25*
D3 - PRODUCT	820	4.23	30.8	3.92*	20	2.60	1.14	10.18*
D4 - PURPOSE	820	1.64	20.9	2.24*	20	0.80	0.77	4.66*
D5 - PRACTICES	820	1.71	21.4	2.28*	20	0.70	0.87	3.62

[a.] Note: The results of this table were based on CATA using word lists for CI dimensions presented in table I * $p < 0.01$.

TABLE V. HOLSTI (1969) INTERRATER RELIABILITY

CI Dimension	LDC Vs. EDC			
	Agreement (A)	*nA*	*nB*	*PA0 = 2A / (nA + nB)*
D1 - PROCESS	9	29	9	47%
D2 - PURVIEW	11	22	11	67%
D3 - PRODUCT	11	36	11	47%
D4 - PURPOSE	6	58	6	19%
D5 - PRACTICES	6	28	6	35%

TABLE VI. LDC CRONBACH α AND ω COEFFICIENT

Construct / Dimension	LDC			
	Mean	*SD*	*α*	*ω*
CI	2.34	2.00	0.76	0.77
D1 - PROCESS	2.16	2.76	0.67	0.70
D2 - PURVIEW	1.98	2.51	0.72	0.74
D3 - PRODUCT	4.23	3.92	0.73	0.73
D4 - PURPOSE	1.64	2.24	0.71	0.74
D5 - PRACTICES	1.71	2.28	0.73	0.75

TABLE VII. EDC CRONBACH α AND ω COEFFICIENT

Construct / Dimension	EDC			
	Mean	*SD*	*α*	*ω*
CI	2.34	0.60	0.26	0.41
D1 - PROCESS	3.50	1.62	0.35	0.50
D2 - PURVIEW	4.10	1.62	0.03	0.34
D3 - PRODUCT	2.60	1,14	0.20	0.41
D4 - PURPOSE	0.80	0,77	0.08	0.15
D5 - PRACTICES	0.70	0,87	0.34	0.42

TABLE VIII. LDC CORRELATION MATRIX [b]

Construct / Dimension	LDC				
	D1	*D2*	*D3*	*D4*	*D5*
D1 - PROCESS	-				
D2 - PURVIEW	0.51**	-			
D3 - PRODUCT	0.50**	0.33**	-		
D4 - PURPOSE	0.45**	0.33**	0.44**	-	
D5 - PRACTICES	0.38**	0.35**	0.35**	0.39**	-

[b.] Note: *p < 0.05. **p < 0.01.

D. Data Interpretation: Inferences and Meta-inferences

Although there is no generally accepted rule of thumb for interrater reliability coefficients, it is suggested interpreting as indicative of high-reliability values greater than 0.80 according to Riffe et al. [27] and Krippendorff [28], or coefficients between 0.75 and 0.80 according to Ellis [29]. Whatever the perspective considered, the results are over 0.80 for all dimensions overall (Table II) and across all stakeholder cohorts (Table III), confirming content validity.

The zero t-Test results of the LDC and EDC data sets indicate that language consistent with a definition of CI is present in both samples. Table IV shows that all dimensions were different from zero and significant. Therefore, we considered it confirms overall external validity.

The interrater reliability coefficients from Table V show moderate interrater reliability between the LDC and the EDC. Table VI shows both Cronbach α and the ω coefficient results for the LDC above the 0.70 commonly recognized thresholds for acceptance. Notably, the results are closer to the 0.80 thresholds for high internal consistency and reliability. Finally, Table VII shows the same results for the EDC, which reveal a more moderate level of reliability.

Regarding dimensionality (Table VII), the LDC data set exhibits an optimum level of correlation between dimensions no higher than 0.40 ($p < 0.01$) [14]. Thus, the results confirm the multidimensionality and discriminant validity of the CI construct.

Overall, the results and respective inferences confirm the empirical validation of the CI construct exhibiting content, external, discriminant validities, and reliability. Furthermore, the feedback from top subject matter experts from all cohorts should ensure its applicability in practice.

DISCUSSION

The validation of the CI unified view and modular definition proposed by Madureira et al. [7] is groundbreaking for the CI discipline. It is the first and the only one of six universal CI definitions to be scientifically validated. Notably, this definition was built on the shoulder of giants and validated based on feedback provided by twenty top subject matter experts from different cohorts. Hence, it is a solid theoretical and empirical base for the development of CI in a new era where it is needed the most. Furthermore, it should inform the effectuation of the CI function in business, the curricula in education, and the discipline in science. These first-order impacts will probably lead to an improved society capable of tackling grand challenges, increasing competitiveness and value creation, and better policy development through a deeper understanding of important issues. These factors should guarantee its adoption, relevance, and future development of the praxis and theory of CI.

The study does not come without its limitations. We considered only twenty of the fifty global expert in-depth interviews held during this study. Considering the remaining interviews can reinforce the validity checks, notably the reliability. Therefore, we will continue processing the collected data to strengthen this contribution further and expand CI science. Several paths for future research are opened, ranging from developing new and improved CI constructs given the longitudinal dynamics of CI to confirming the results presented in this study. An important path is to research the impact of this study on management research, namely in the areas that make a difference: science, practice, education, society, and policy [1]. In addition, the generalization of the CI construct proposed by Madureira et al. [7] can be a very fruitful and challenging area for research. Inversely, disproving it can also be the path chosen by researchers. Researching the applicability check [9] is another path this research opens. Finally, the findings of this study can be confirmed using different methodologies rather than the CATA-based method used in this study [14].

CONCLUSION

This confirmatory and global in-depth interview study of leading subject matter experts aimed to empirically validate the CI unified view and modular definition proposed by Madureira et al. as "the process and forward-looking practices used in producing knowledge about the competitive environment to improve organizational performance" [7]. Confirmation of content, external and discriminant validities, as well as its reliability filled this foundational gap for the first time in a more than a century-long history of the CI discipline.

Scholars and practitioners now have a solid ground for developing. Therefore, it advances prior knowledge while creating a more rigorous and relevant baseline, opening future research and theory development paths. According to Colquitt and Zapata-Phelan's [30] taxonomy of theoretical contributions for empirical articles, this article should classify as an "Expander." This research also introduces a new construct and grounds predictions with an existing theory

tested with data collected from global top CI subject matters. It also potentiates the delivery of high theoretical and empirical contributions to the CI field. Furthermore, by igniting the virtuous cycle of CI [7], the immediate effectuation of the CI discipline, profession, and education should become a reality. Therefore, it should produce an effective impact in practical, scholarly, educational, society, and policy development, elevating the stature of CI science.

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