Process Capability in LGPD Context: Characterization and Potential Future Directions

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Abstract

Given the importance of data and information, it is also important to treat and develop data as a core business asset. This means that data needs to be actively managed at all stages of the data lifecycle (i.e collected, stored, analyzed, shared, and archived) through defined data practices, standards, and policies. Law 13.709 / 2018 impacts on private and public companies nationwide, considering any size and market segment, while taking into account the need to meet the requirements efficiently and sustainably. The aim of this paper is to characterize the main areas of contribution to the evaluation of the process capability for digital transformation in relation to cybersecurity in the context of the General Data Protection Law and to present some topics in which field research could be further developed. To this end, a citation / citation analysis of the literature related to process capability and process improvement models published in the main journals from 2000 to 2019 is made. The main authors are identified and a field is analyzed, with the objective of identifying the areas of contribution. The results show that contributions can be characterized in areas such as business processes, ISO, maturity models, risk management, decision support.

Keywords
LGPD, Data Protection, Process Capability

1. Introduction

Industry 4.0 is a transformation supported by technological advances in which sensors, machines, workpieces and IT systems will be connected along the value chain beyond a single company (RüBmann, 2015). Given the importance of data and information, it is also important to treat and develop data as an essential commercial asset (McKinsey Digital,2015). This means that data needs to be actively managed at all stages of the data lifecycle (i.e., collected, stored, analyzed, shared, and archived) through defined data practices, standards, and policies (Pinheiro, 2018). Law 13,709 / 2018 impacts private and public companies throughout the country, considering any size and market segment, taking into account the need to meet requirements efficiently and sustainably (Maldonado, 2019).

1.1. Objectives

The aim of this article is to characterize the main areas of contribution to the evaluation of the capability of the digital transformation process in relation to cybersecurity in the context of the General Data Protection Act and present some topics in which field research could be further developed.

2. Methodology

The research in this work was carried out in two phases. In the first phase, a research was conducted with the keywords derived from the initial readings, in papers published in journals and conferences. In the second phase, some of the main references in the field were analyzed in order to identify areas of contribution to future research and

characterization of the current research. The procedures for each phase will be explained during this document. The results of the first phase were obtained with the modification of a procedure for co-citation analysis of authors, found in the literature (Eom, 2009). The modified procedure was composed of the steps shown in Figure 1, the following:

Research Questions
RQ1. What are the characteristics of the main areas of contribution for assessing the capacity of the digital transformation process in relation to cyber security in the context of the General Data Protection Act (LGPD)?
RQ2. What are the topics on which field research could be further developed?

Systematic Literature Review
Involving the chosen Keywords
("capability model" OR "capability framework") AND "process improvement" AND ("GDPR" OR "General Data Protection Regulation" OR "Lei Geral de Proteção de Dados" OR "LGPD" OR "data protection" OR "data security" OR "compliance")

Electronic Search
Portal CAPES and Emerald Insight

57 identified articles

Title and abstract analysis

Exclusions and filters applied

30 selected articles

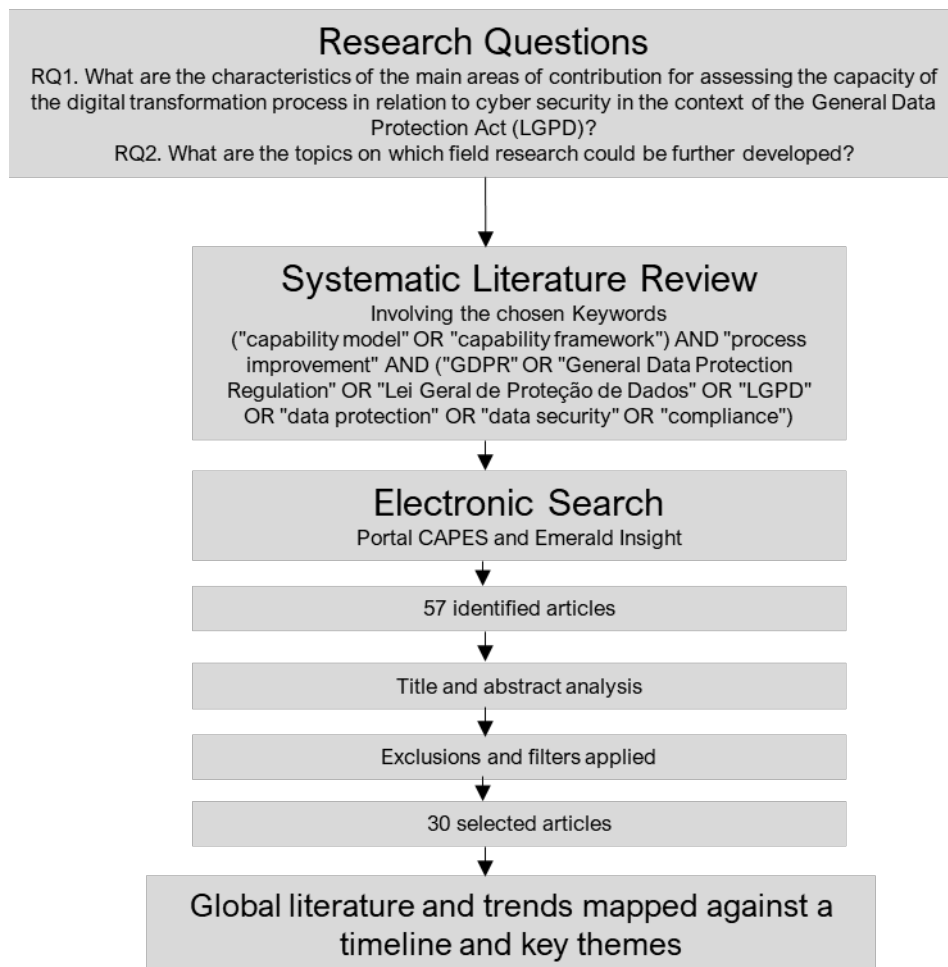**Global literature and trends mapped against a timeline and key themes**

Figure 1. Development of research methodology

Depending on the investigation of the problem issue and objectives, three research axes are established:
- Capability model
- Process Improvement
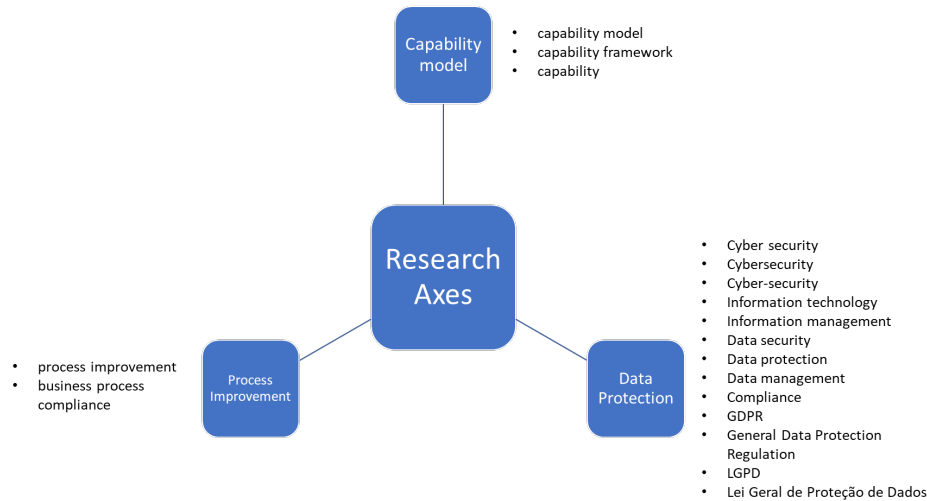- Data Protection

Figure 2 shows the words initially defined.

Figure 2. Initial keywords

After a few searches, the final set of search words was defined, shown in Figure 3:

("capability model" OR "capability framework") AND "process improvement" AND ("GDPR" OR "General Data Protection Regulation" OR "Lei Geral de Proteção de Dados" OR "LGPD" OR "data protection" OR "data security" OR "compliance")
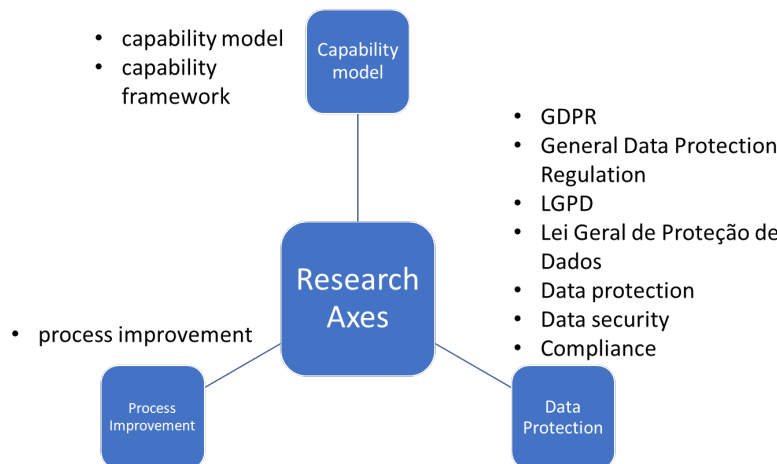

Figure 3. Definitive keywords

Reference databases were searched for field-related work in an informal and loose manner. There are two main goals with this approach. The first goal is to determine if a keyword yields relevant results. The second objective is to determine if a specific reference database contains relevant jobs that include the keyword. The result of the loose screening step is a set of reference databases and a set of keywords to search.

The criteria for selection in the databases were: date of publication from 2010 to 2019; Journal Articles and English Language - as shown in Table 1, for the Portal Capes search engine.

Table 1. Literature Review Protocol - Portal Capes search engine

Search words	("capability model" OR "capability framework") AND "process improvement" AND ("GDPR" OR "General Data Protection Regulation" OR "Lei Geral de

	Proteção de Dados" OR "LGPD" OR "data protection" OR "data security" OR "compliance")
Boolean Operator	AND, OR
Database	Portal CAPES, selecting Science Direct Journals (Elsevier), Emerald Insight, Elsevier (CrossRef), Scopus (Elsevier)
Language	English
Publication Type	Paper from journals
Period	2010 until 2019 (03/09/2019)
Result	40 articles

As shown in table 2, for the Emerald Insight search engine.

Table 2. Literature Review Protocol - Emerald Insight search engine

Search words	("capability model" OR "capability framework") AND "process improvement" AND ("GDPR" OR "General Data Protection Regulation" OR "Lei Geral de Proteção de Dados" OR "LGPD" OR "data protection" OR "data security" OR "compliance")
Boolean Operator	AND, OR
Database	Emerald Insight
Language	English
Publication Type	Paper from journals
Period	2010 until 2019 (03/09/2019)
Result	16 articles

The next step was to download all 56 articles found, in order to obtain information such as: authors, journal or conference, year, keywords, references and abstract. The interest is also to get the full text of the article for further analysis. The records were organized and analyzed to filter duplicate papers and identify papers that were unrelated to the subject of our study. This was done by analyzing the title, abstract and keywords and, when necessary, the full text. The worklist with its records was later exported to a spreadsheet in which they could be processed and analyzed. Twenty articles were removed because they were not related to the research theme, whose themes are listed in table 3.

Table 3. First article filter

Contrasting continuous quality improvement, Six Sigma, and lean management for enhanced outcomes in US hospitals	Analytical Modelling and Optimization of the Temperature-Dependent Dynamic Mechanical Properties of Fused Deposition Fabricated Parts Made of PC-ABS
Problems in the interplay of development and IT operations in system development projects	Improvement capability and performance: a qualitative study of maternity services providers in the UK
A system dynamics the efficiency thoroughness tradeoff	Assessing improvement capability in healthcare organisations
Governing major transformation portfolios in practice	Software test process improvement approaches
multi product lines	global software engineering
plywood production system model	Risk Management
social commerce	Enterprise Architecture Specification
Decision models for sustainable supply chain management	maturity model for the delivery process in supply chains

Industry 4.0 and capability development in manufacturing subsidiaries	Dynamic capabilities for CSR management: towards identifying common processes
GIS Assessment Report	Learning from the past to envision the future

Six more articles were removed because they were not related to the research theme, whose themes are listed in table 4.

Table 4. Second article filter

Management Control Systems	business case for e-procurement
Six Sigma quality	ICT applications in construction processes
entrepreneurship capabilities	Connected Health regulations

Co-citation table: After defining the articles to be used, the co-citation table is constructed. This process is made by analyzing the references of each text, storing the names of all authors referenced by the articles and listing them in an excel table. This is for the title of the articles. Then, search methods are used to count how many times each author and title were cited, to check which ones appeared most often. In order to understand the real importance, references with less than 2 citations were not counted.
For the analysis, the articles were classified by year of publication. The 9 articles that were cited on more than 2 occasions appear. The following table shows the 14 most cited authors in the articles, considering only those with 8 or more citations. The objective of the analysis is to identify the main authors and research topics in order to obtain relevant information for the work.

3. Characterization of Process Capability In the LGPD Context

This section will describe the results of the first phase of this paper, the characterization of the research. The results of each of the four steps presented will be detailed and discussed starting with the screening step.
Among the 67 articles selected for this study, 56 were cited 2 times, 6 articles were cited 3 times, two articles were cited 4 times, two others were cited 5 times, and finally 1 article was cited 8 times. Aiming at the construction and organization of the data approached in the area of cybersecurity, Figure 4 presents the estimated number of 9 articles made from 1967 to 2018. The peak of the graph is concentrated in the year 2007, reaching approximately the maximum limit. of 9 articles published in this study, followed by the year 2014 which resulted in 6 publications and, thirdly, it is interesting to note that the mark of 4 articles published are derived from the years 1977, 2006, 2009, 2010, 2012 and 2016.
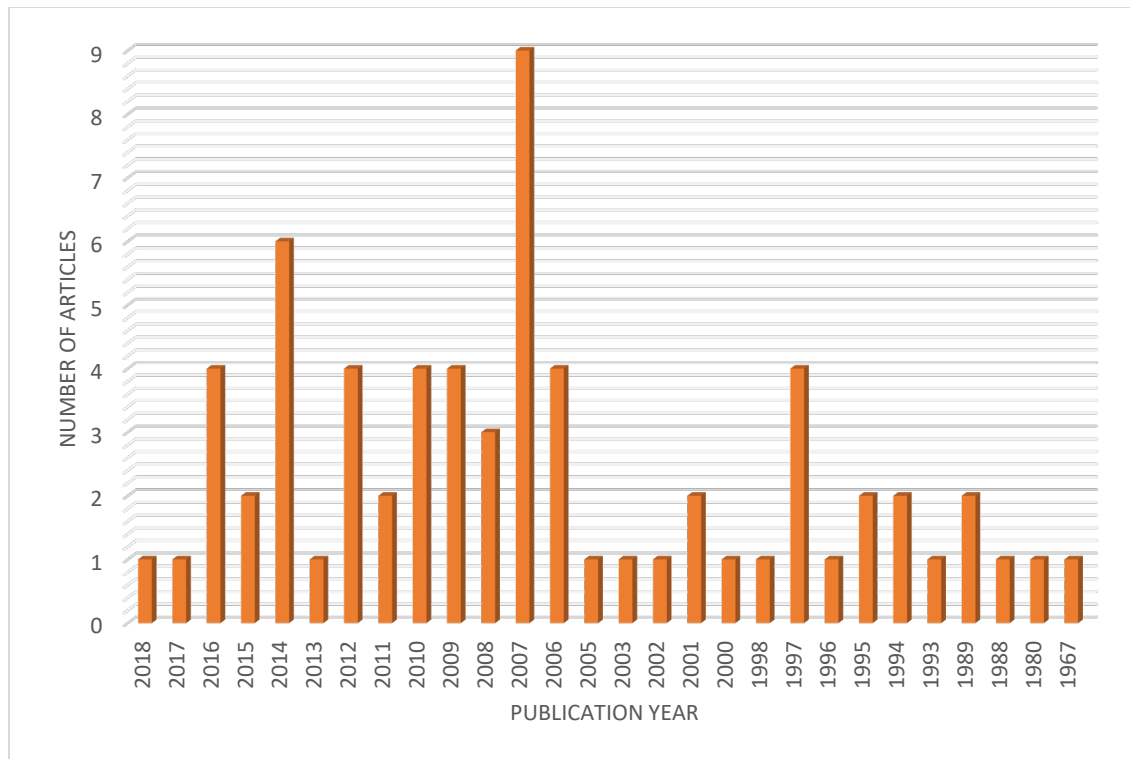
Figure 4. Cybersecurity publications between 1967 and 2018

Table 5 represents the articles that were most often cited in the co-references, with their respective authors and year of publication. The most cited article, "Dynamic Capabilities and Strategic Management" appears with 8 citations, while "Towards a Business Process Management Maturity Model" and "Situational Method Engineering" both have 5 citations.

Table 5. Most cited articles in co-references

Article	Authors	Year	Times cited
Dynamic Capabilities and Strategic Management	Teece, D.J., G.Pisano and A.Shuen	1997	8
Towards a business process management maturity model	M. Rosemann, T. De Bruin	2005	5
Situational method engineering	Bucher T, Klesse M, Kurpjuweit S, Winter R	2007	5
The critical success factors of business process management	Trkman, P	2010	4
Business process management as competitive advantage	Hung, R.Y.-Y	2016	4
Case Study Research: Design and Methods	Yin, R.	1994	3
Dynamic Capabilities: What are they?	Eisenhardt, K.M. and J.A.Martin	2000	3
Business process management as competitive advantage: a review and empirical study	Hung, R.	2006	3
Business process orientation: gaining the e-business competitive advantage	McCormack K, Johnson WC	2001	3

For the most cited authors, represented in Chart 6, 14 authors were considered, all with 8 citations or more. The highlights were Rosemann, M and McCaffery, F, for obtaining a large number of publications in the area, actively contributing to the theme.

Table 6. Most cited authors in co-references

Author	Citations	Author	Citations
Rosemann, M	31	Richardson, I	9
McCaffery, F	23	R. Rabiser	9
Eisenhardt, K.M.	13	L. Buglione	8
M. Piattini	12	F.J. Pino	8
Winter R	11	Casey, V.	8
F. García	10	Ma, S.	8
Mayer, N	10	P. Grünbacher	8

We can compare the results shown in Figure 4 with the interpretation of 'Table 5 - Most cited articles in co-references' and with 'Table 6 - Most cited authors in co-references', which show the amount of citation of each author, such as the number of articles that were published, showing the development demand during the years 1967 to 2018.

4. Future Research

Regarding future developments that could be derived from the analysis performed in this paper, there are two main areas of contribution to be noted: (i) building the model that allows decision making for companies immersed in this LGPD context and; (ii) the implementation of the model.
Within these two main directions, it is possible to identify seven directions.

1. Business process management. The processes of collection, analysis and approval of safety information Zou (2017).
2. Continuous monitoring in a real life environment. The communication system Zou (2017). Validation of the cybersecurity framework of socio-technical systems requires time and continuous monitoring in a real-life environment (Malatji, 2019).
3. Structure, use of various standards and best practices. Quality of service; quality assessment framework. Domınguez-Mayo (2015). The framework for governance and information and technology management. (Steuperaert, 2019).
4. New Regulation Compliance. Lack of common or shared understanding of compliance management concepts is a barrier to effective compliance management practice Abdullah (2016).
5. Service Models, continuous quality assessment framework. The framework for governance and information and technology management. (Steuperaert, 2019).
6. Risk Analysis. The risk in relation to the regulatory body Mc Caffery (2010).
7. Business and context analysis. The importance of context awareness (Van Looy, 2018).

Table 7 shows the areas and the relationship of the concepts within the analyzed articles.

Table 7. Directions of research

Author	Building the model	Implementation of the model	Business process management	Continuous monitoring	Standards and best practices	New Regulation Compliance	Continuous quality assessment framework	Risk Analysis	Business and context analysis
Abdullah (2016)	X		X						

Balint (2016)		X	X	X					X
Baraforta (2017)	X		X					X	
Benmoussa (2015)		X	X		X				X
Buglione (2013)	X		X	X			X	X	X
Carroll (2016)	X				X		X		X
Concha (2012)	X		X		X				
Cuzzocrea (2019)		X	X						X
Denner (2018)	X		X						X
Díaz-Ley (2010)		X	X	X	X		X		X
Domínguez-Mayo (2015)	X		X				X		
Eadie (2012)	X				X	X	X		
Fawcett (2012)		X	X	X				X	X
Gonzalez-Rojas (2016)	X					X	X		
Harun (2012)		X	X		X				
Malatji (2019)	X						X		
Malatji (2019)	X		X				X		X
Mayer (2019)	X					X	X		X
Mc Caffery (2010)	X					X		X	
McHugh (2012)		X				X			
Nadarajah (2014)	X		X		X		X		
Ongena (2019)	X		X						X
Reyes (2010)	X		X						
Shrestha (2016)	X		X				X		
Smart (2010)		X	X	X			X		X
Steuperaert (2019)	X				X	X			
Tsou (2018)	X				X				
Van Looy (2018)	X								X
Van Looy (2019)	X		X						
Zou (2017)	X		X	X					X

5. Conclusions

The main objective of this work was to characterize the main areas of contribution to the assessment of the capability of the digital transformation process in relation to cyber security in the context of the General Data Protection Law and to present some topics in which field research could be further developed. This was done by analyzing the papers published in this field of knowledge between 2000 and 2019, in a total of 30 papers.

Research lines were found to go in different directions, without being aligned with the research problem related specifically to the General Data Protection Law (LGPD), which provides us with a field of action to be explored.

In any case, existing research supports the construction and implementation of decision making models. Thus, the main research directions we see are: 1) Business process management; 2) Continuous monitoring in a real life environment; 3) Structure, use of various standards and best practices; 4) New Regulation Compliance; 5) Service Models, continuous quality assessment framework; 6) Risk Analysis; 7) Business and context analysis.

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