

# AI-driven Business Models in the Data-information-intelligence Economy: The NRT Methodology

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**Abstract:** The exponential rise of Artificial Intelligence (AI) coupled with the continuous growth of big data led to the need for transforming traditional business models into AI-driven business models. These AI-driven business models are crucial in providing much needed Strategic Intelligence (SI) to strategic decision-makers. This research paper seeks to introduce the nominal ranking technique (NRT) methodology as a strategic methodology for streamlining the management of big data towards innovation. The NRT methodology is a structured and systematic approach, innovatively developed for the management of big data. The NRT methodology is further reinforced with the Pareto principle, also known as the 80/20 rule. The Pareto principle in the management of big data considers that 80 percent of insights derived often stems from 20 percent of the big data. When the NRT methodology is applied in the management of big data, four primary elements are considered, namely - 1) standard of inclusion of data, information and intelligence, 2) data cleansing, 3) relationship of data, information and intelligence, and 4) VARCS principles. VARCS refer to the validity, accuracy, reliability, credibility, and sufficiency of data, information and intelligence. The NRT methodology considers the volatile, uncertain, complex and ambiguous (VUCA) environments in which the world operates. The NRT methodology is an iterative process that can be applied in large-scale data-information-intelligence management initiatives, as it encourages adaptability based on ongoing findings and challenges. Overall, the strategic insights derived from the application of the NRT methodology highlight its potential as a valuable tool in the data-information-intelligence economy. By enhancing decision-making frameworks, promoting collaboration, identifying key variables, providing visual representations of data, and fostering continuous improvement, the NRT methodology significantly contributes to the effectiveness and success of complex business environments. Research data collected and analysed from content analysis determined that businesses are concerned about the strategic nature and use of data, information, and intelligence for strategic decision-making and innovation.

**Keywords:** Artificial Intelligence, AI-driven Business Models, Big Data, NRT Methodology, Pareto Principle, Strategic Intelligence

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## 1. Introduction

In the data-information-intelligence economy, AI-driven business models are required to remain competitive and sustainable as a business. The NRT methodology provides a structured and systematic approach to managing big data in the data-information-intelligence economy. The NRT methodology considers four primary elements, positioned in a structured manner to ensure strategic management of big data. Data that have not gone through an analysis process cannot be used as information. Similarly, information that have not gone through an analysis process cannot be used as intelligence. As such the NRT methodology provides the structured and systematic approach to analyse data into information, and information into intelligence. Intelligence then provides the foundation on which sound decisions are based. The objective of this research paper is to introduce and illustrate the structured and systematic approach of the NRT methodology in managing big data, that can be adapted in an AI-driven business model in the data-information-intelligence economy.

## 2. Literature Review

AI continues to experience exponential growth, equally contributing to the growth of big data. The literature review covers in short AI, AI-driven business models, and the data-information-intelligence economy.

### 2.1 AI-driven Business Models and the Data-information-intelligence Economy

#### 2.1.1 AI-driven Business Models

AI as a concept is not new, AI is the new norm. The first wave of AI was experienced in the early 1950's. To be precise, John McCarthy first coined the term "Artificial Intelligence" in 1956 (Marr, 2018). Ever since AI was coined in 1956, major advancements has been experienced (Tzirides et al, 2024). AI involves tasks of computers to understand human reasoning (McCarthy, 2007). According to Haenlein and Kaplan (2019) AI is a system's ability to interpret data, to learn from the data, and to use the learnings to achieve specific goals and tasks, by being able to adapt.

As business environments rapidly changes due to the exponential growth experienced in and by AI, new and innovative business models are required. AI-driven business models use AI technologies to create, deliver, and capture value innovatively for the business. Traditional business models rely on manual processes. AI-driven business models integrate machine learning, data analytics, and automation with AI, to enhance business operations and sustainability (Gibson, 2024).

### **2.1.2 The Data-information-intelligence Economy**

In the data-information-intelligence economy, turning raw data into actionable intelligence is crucial. The relationship of data, information and intelligence is fundamental, with Chollet (2019) and Abu et al (2020) emphasising the importance of clean data as an input to accurate information leading to viable intelligence for strategic decision-making. According to a paper published by KPMG (2019) data is regarded as the most significant asset many organisations have, with global investment increasing in an effort to discover the full potential that can be mined from the data.

The process of managing big data has to be strategic, in order for strategic intelligence to be manifested.

## **3. Research Methodology**

The NRT methodology was employed in the data collection and data analysis of a PhD study which entailed a much larger content analysis component than can be reported in this research paper. This research paper reports only on a portion which was part of a larger PhD study. In order for research data to be collected and analysed, a concurrent mixed method research strategy in a single-phase of data analysis was used. This led to the content analysis of the University of Johannesburg (UJ) Information and Knowledge Management (IKM) Department Strategic Information Management (SIM) business case studies (BCSs) (De Koker, 2025). According to Saunders et al (2016), “content analysis is an analytical technique that codes and categorises qualitative data in order to analyse them quantitatively”. The content analysis in the case of this research is the application of the NRT methodology developed by De Koker (2019).

### **3.1 NRT Methodology**

The NRT methodology is a structured and systematic approach to making sense of big data. Developed by De Koker (2019) and further expanded, tested and applied by De Koker and Du Plessis (2024), the NRT methodology allows for data collection and data analysis to take place concurrently. The NRT methodology was adapted from the nominal group technique (NGT), originally developed in the late 1960s by Delbecq and Van de Ven (1971), as a procedure to facilitate effective group decision-making. NGT focuses on humans and group work for decision-making. NRT focuses on the ranking of data, information, and intelligence based on pre-determined criteria for decision-making.

The structured and systematic NRT methodology combines four primary elements. The four primary elements are; 1) Standard of inclusion, 2) Data cleansing linked to the Pareto principle, 3) Relationship of data, information and intelligence linked to the Pareto principle, and 4) VARCS principles. VARCS refer to the validity, accuracy, reliability, credibility, and sufficiency of data, information and intelligence.

The UJ IKM Department SIM BCSs are strategic information management (SIM) business case studies developed by strategic information management professionals, with a focus on the strategic management of information in business.

In order for the NRT methodology to be employed, the researcher had to pre-determine keywords that was used in the ranking of BCSs, in essence the ranking of the data-information-intelligence in the BCSs. The pre-determined keywords emphasise the point by Saunders et al (2016), that “defining explicit rules to code and categorise data in content analysis is important”. The pre-determined keywords are further necessary as inclusion criteria, used in the selection process of determining the rank of the BCSs. The pre-determined keywords were: artificial intelligence, business intelligence, business model, business model canvas, commercialisation/ commercialization, competitive intelligence, complex, complexity, complexity science, complexity theory, Cynefin, Cynefin framework, data, decision intelligence, decision-making, ecosystem, fourth industrial revolution, human intelligence, information and knowledge management, information management, information, innovation, intelligence, knowledge management, strategic, strategic information, strategic information management, strategic intelligence, and systems thinking.

The pre-determined keywords stem from the bigger PhD study as mentioned and were specifically pre-determined from the conceptualisation of the PhD study.

## 4. Results and Discussion

This section addresses the results and discussion of the research paper. The research objective was to introduce and illustrate the structured and systematic approach of the NRT methodology in managing big data. The content analysis in the form of the NRT methodology followed the structured and systematic approach grounded in the four primary elements, discussed below.

### 4.1 Standard of Inclusion

The standard of inclusion, in the form of inclusion criteria, determines the eligibility of data to be included in the analysis of data to information to intelligence.

### 4.2 Data Cleansing Linked to the Pareto Principle

Data cleansing ensured that data undergoes a cleaning process for the data to be eligible for inclusion as information through processing, refinement, and analysis, and transformed into intelligence. Data is standardised as per the standard of inclusion to improve the validity, authenticity, reliability, credibility, and sufficiency of the data. The Pareto principle focuses the attention on what may not seem important in the beginning of the NRT methodology in order to arrive at strategic insights in the end.

### 4.3 Relationship of Data, Information and Intelligence Linked to the Pareto Principle

The NRT must be applied to the cleansed and included data collected from the internal and external business environments to process and refine into information. Afterwards, the data turned information is analysed to produce intelligence. The NRT allows the outcome of the intelligence to be ranked based on importance. The health of the data, information, and intelligence relationship depends on data cleansing, which is a crucial step early in the process of transforming data into information into intelligence.

### 4.4 VARCS Principles

The VARCS principles ensure that data, information, and intelligence are up to standard in terms of validity, accuracy, reliability, credibility, and sufficiency. They also strengthen the standard of inclusion, data cleansing, and the relationship of data, information, and intelligence.

The NRT methodology is illustrated below in Figure 1.

The NRT methodology with the four primary elements were done prior to the execution of the nominal ranking technique (NRT) on the UJ IKM Department SIM BCSs. The NRT is the ranking of the BCSs and the scoring of the keywords. The results of the NRT of the UJ IKM Department SIM BCSs is illustrated in Table 1. The keyword frequency of the BCSs are illustrated in Figure 2.

## 5. NRT Methodology Applied

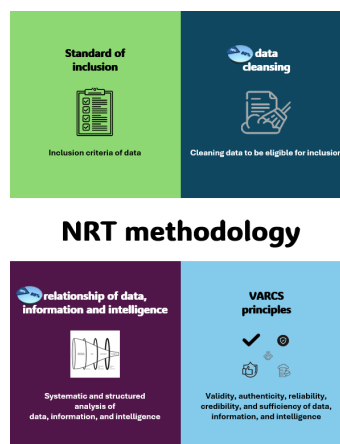


Figure 1: NRT methodology (own source developed for this study, 2025)

The following discusses how the NRT was performed. The sample size of the BCS was  $n = 145$ . The NRT of the 145 BCSs was done in Microsoft Excel. All the BCSs are stored in the UJ IKM Department SIM BCSs database, which is a standard file repository. The pre-determined keywords were searched for in the 145 BCSs. By doing a standard search of a keyword in the file repository, the researcher could determine which keyword exist in a BCS. An example of a keyword search was as such; a keyword was searched for in the file repository with quotation marks placed around the keyword. The keyword “artificial intelligence” was searched for in the 145 BCSs. Placing quotation marks around the keyword ensured that the search was accurate, as the search engine only returned results that had the entire keyword in the BCSs. This search was deemed relevant, as the results presented the keyword accurately.

Based on the number of times a keyword appeared in the total search of the BCSs, the keyword received a score out of 145. The threshold was set at 145, as it is the number of BCSs that exist. The highest-scored keyword received a score of 124 out of 145. In the case of the keyword “artificial intelligence”, the keyword appeared in 22 BCSs, meaning that “artificial intelligence” scored 22. Artificial intelligence ranked 15<sup>th</sup> out of the 29 pre-determined keywords – shown in Figure 2.

**Table 1: Results of the NRT**

Results of the NRT					
Ranked – Unsorted			Ranked – Sorted Highest to Lowest		
Number	Business Case Study	Rank	Number	Business Case Study	Rank
1	BCS_1	9	1	BCS_109	17
2	BCS_5	7	2	BCS_169	17
3	BCS_6	14	3	BCS_38	15
4	BCS_8	8	4	BCS_143	15
5	BCS_10	10	5	BCS_6	14
6	BCS_11	11	6	BCS_112	13
7	BCS_12	6	7	BCS_138	13
8	BCS_14	9	8	BCS_45	12
9	BCS_15	11	9	BCS_47	12
10	BCS_16	6	10	BCS_55	12
11	BCS_17	4	11	BCS_72	12
12	BCS_18	9	12	BCS_129	12
13	BCS_20	5	13	BCS_131	12
14	BCS_31	11	14	BCS_132	12
15	BCS_32	5	15	BCS_137	12
16	BCS_38	15	16	BCS_195	12
17	BCS_40	6	17	BCS_203	12
18	BCS_42	11	18	BCS_11	11
19	BCS_43	10	19	BCS_15	11
20	BCS_45	12	20	BCS_31	11
21	BCS_46	9	21	BCS_42	11
22	BCS_47	12	22	BCS_92	11
23	BCS_48	7	23	BCS_99	11
24	BCS_52	0	24	BCS_104	11
25	BCS_55	12	25	BCS_124	11
26	BCS_58	8	26	BCS_135	11
27	BCS_60	10	27	BCS_145	11

Results of the NRT					
Ranked – Unsorted			Ranked – Sorted Highest to Lowest		
Number	Business Case Study	Rank	Number	Business Case Study	Rank
28	BCS_61	8	28	BCS_212	11
29	BCS_63	7	29	BCS_213	11
30	BCS_64	9	30	BCS_10	10
31	BCS_66	1	31	BCS_43	10
32	BCS_67	8	32	BCS_60	10
33	BCS_68	9	33	BCS_70	10
34	BCS_69	3	34	BCS_185	10
35	BCS_70	10	35	BCS_190	10
36	BCS_71	5	36	BCS_194	10
37	BCS_72	12	37	BCS_196	10
38	BCS_74	9	38	BCS_202	10
39	BCS_76	7	39	BCS_220	10
40	BCS_77	6	40	BCS_224	10
41	BCS_78	3	41	BCS_1	9
42	BCS_80	8	42	BCS_14	9
43	BCS_81	7	43	BCS_18	9
44	BCS_82	5	44	BCS_46	9
45	BCS_83	4	45	BCS_64	9
46	BCS_84	5	46	BCS_68	9
47	BCS_85	9	47	BCS_74	9
48	BCS_88	9	48	BCS_85	9
49	BCS_91	8	49	BCS_88	9
50	BCS_92	11	50	BCS_136	9
51	BCS_97	6	51	BCS_157	9
52	BCS_98	2	52	BCS_168	9
53	BCS_99	11	53	BCS_200	9
54	BCS_100	0	54	BCS_211	9
55	BCS_101	6	55	BCS_8	8
56	BCS_102	3	56	BCS_58	8
57	BCS_103	3	57	BCS_61	8
58	BCS_104	11	58	BCS_67	8
59	BCS_105	5	59	BCS_80	8
60	BCS_107	5	60	BCS_91	8
61	BCS_109	17	61	BCS_113	8
62	BCS_110	4	62	BCS_121	8
63	BCS_111	7	63	BCS_122	8
64	BCS_112	13	64	BCS_147	8
65	BCS_113	8	65	BCS_160	8
66	BCS_114	7	66	BCS_179	8
67	BCS_116	6	67	BCS_181	8

Results of the NRT					
Ranked – Unsorted			Ranked – Sorted Highest to Lowest		
Number	Business Case Study	Rank	Number	Business Case Study	Rank
68	BCS_121	8	68	BCS_186	8
69	BCS_122	8	69	BCS_188	8
70	BCS_123	3	70	BCS_5	7
71	BCS_124	11	71	BCS_48	7
72	BCS_125	5	72	BCS_63	7
73	BCS_126	4	73	BCS_76	7
74	BCS_127	5	74	BCS_81	7
75	BCS_128	7	75	BCS_111	7
76	BCS_129	12	76	BCS_114	7
77	BCS_130	5	77	BCS_128	7
78	BCS_131	12	78	BCS_142	7
79	BCS_132	12	79	BCS_149	7
80	BCS_133	5	80	BCS_154	7
81	BCS_134	6	81	BCS_162	7
82	BCS_135	11	82	BCS_164	7
83	BCS_136	9	83	BCS_183	7
84	BCS_137	12	84	BCS_187	7
85	BCS_138	13	85	BCS_189	7
86	BCS_139	6	86	BCS_198	7
87	BCS_140	4	87	BCS_199	7
88	BCS_141	3	88	BCS_201	7
89	BCS_142	7	89	BCS_210	7
90	BCS_143	15	90	BCS_215	7
91	BCS_145	11	91	BCS_217	7
92	BCS_147	8	92	BCS_223	7
93	BCS_149	7	93	BCS_12	6
94	BCS_150	1	94	BCS_16	6
95	BCS_151	4	95	BCS_40	6
96	BCS_152	2	96	BCS_77	6
97	BCS_153	6	97	BCS_97	6
98	BCS_154	7	98	BCS_101	6
99	BCS_155	3	99	BCS_116	6
100	BCS_156	2	100	BCS_134	6
101	BCS_157	9	101	BCS_139	6
102	BCS_160	8	102	BCS_153	6
103	BCS_161	4	103	BCS_166	6
104	BCS_162	7	104	BCS_175	6
105	BCS_164	7	105	BCS_191	6
106	BCS_166	6	106	BCS_20	5
107	BCS_168	9	107	BCS_32	5

Results of the NRT					
Ranked – Unsorted			Ranked – Sorted Highest to Lowest		
Number	Business Case Study	Rank	Number	Business Case Study	Rank
108	BCS_169	17	108	BCS_71	5
109	BCS_170	3	109	BCS_82	5
110	BCS_173	3	110	BCS_84	5
111	BCS_175	6	111	BCS_105	5
112	BCS_178	4	112	BCS_107	5
113	BCS_179	8	113	BCS_125	5
114	BCS_180	2	114	BCS_127	5
115	BCS_181	8	115	BCS_130	5
116	BCS_183	7	116	BCS_133	5
117	BCS_184	2	117	BCS_208	5
118	BCS_185	10	118	BCS_17	4
119	BCS_186	8	119	BCS_83	4
120	BCS_187	7	120	BCS_110	4
121	BCS_188	8	121	BCS_126	4
122	BCS_189	7	122	BCS_140	4
123	BCS_190	10	123	BCS_151	4
124	BCS_191	6	124	BCS_161	4
125	BCS_193	1	125	BCS_178	4
126	BCS_194	10	126	BCS_69	3
127	BCS_195	12	127	BCS_78	3
128	BCS_196	10	128	BCS_102	3
129	BCS_197	3	129	BCS_103	3
130	BCS_198	7	130	BCS_123	3
131	BCS_199	7	131	BCS_141	3
132	BCS_200	9	132	BCS_155	3
133	BCS_201	7	133	BCS_170	3
134	BCS_202	10	134	BCS_173	3
135	BCS_203	12	135	BCS_197	3
136	BCS_208	5	136	BCS_98	2
137	BCS_210	7	137	BCS_152	2
138	BCS_211	9	138	BCS_156	2
139	BCS_212	11	139	BCS_180	2
140	BCS_213	11	140	BCS_184	2
141	BCS_215	7	141	BCS_66	1
142	BCS_217	7	142	BCS_150	1
143	BCS_220	10	143	BCS_193	1
144	BCS_223	7	144	BCS_52	0
145	BCS_224	10	145	BCS_100	0

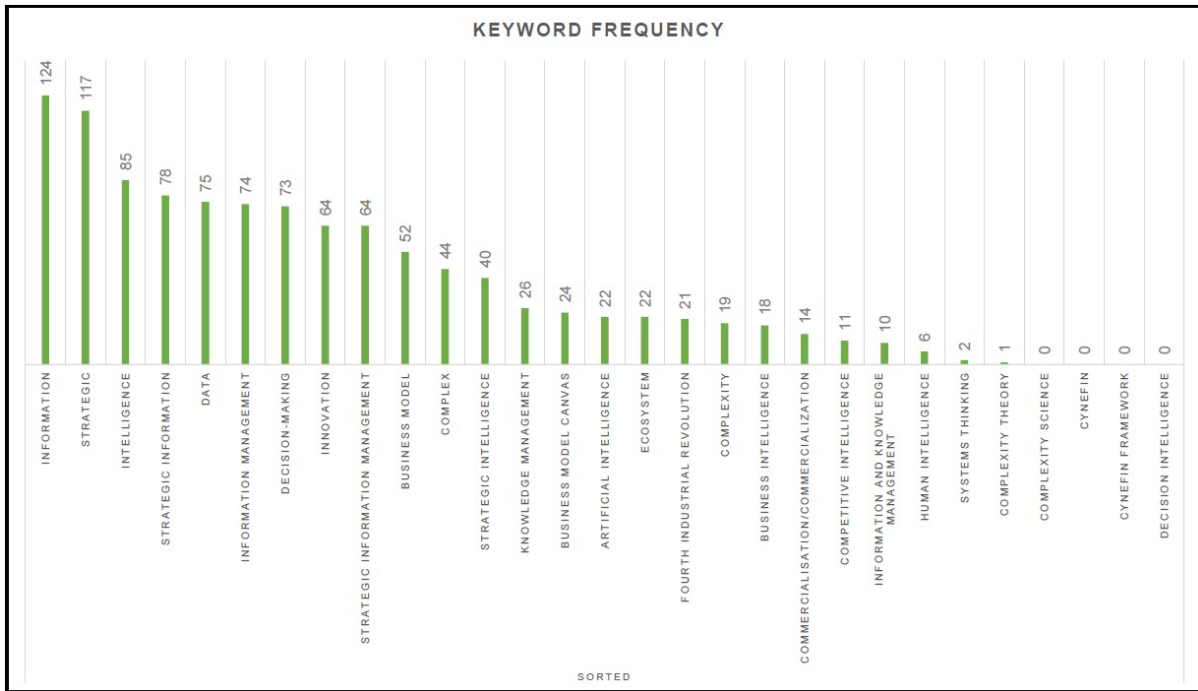


Figure 2: Keyword frequency (own source developed for this study, 2025)

From the NRT conducted on the UJ IKM Department SIM BCSs, the ranking of BCSs illustrated in Table 1 conveys the results of how many keywords were present in a BCS, and how many times a keyword was present in each BCS. Table 1 further illustrates the ranking of BCSs in an unsorted and sorted manner.

Figure 2 illustrates the frequency of the keywords present in the BCSs. The top five keywords that ranked the highest were: 1) information, 2) strategic, 3) intelligence, 4) strategic information, and 5) data. Furthermore, the NRT shows that the interrelated concepts of **data**, **information**, and **intelligence**, which emerged as key aspects in the NRT, are crucial for AI-driven business models. The ranking of **data**, **information**, and **intelligence** reflects that the relationship of data, information, and intelligence – as given in the NRT methodology are central to the management of big data. The presence of the keywords **strategic** and **strategic information** further narrates the level of importance in business. Strategic directly links to executives in the business, relaying that the accurate management of data into information into intelligence is of strategic value to executives for informed decision-making and strategy development. The findings are relevant within the growing data-information-intelligence economy, especially in the context of AI-driven business models. AI-driven business models depend greatly on the ability to process big data, extract into relevant information, and report into actionable intelligence. This in turn informs the strategic direction executives will take. In this context, the strategic deployment of intelligence becomes not only a competitive advantage for a business, but a defining characteristic of businesses in the data-information-intelligence economy.

## 6. Conclusion

In conclusion, this paper has introduced and illustrated the structured and systematic approach of the NRT methodology for managing big data, demonstrating its potential adaptability within AI-driven business models, that can operate in the data-information-intelligence economy. The necessity for AI-driven business models to effectively manage data for sustainability and competitiveness highlights the importance of a methodology such as the NRT methodology. By emphasizing the structured and systematic approach to the management of data through analysis into information, and subsequently into strategic intelligence, the NRT methodology provides a crucial compass for navigating the complexities of big data management. The principle that unanalysed data and information remain inactive, highlights the value proposition of the NRT methodology, in providing a structured and systematic pathway to generate the intelligence required for sound decision-making. Ultimately, the adoption of such systematic approaches is paramount for AI-driven businesses seeking to thrive in the data-information-intelligence economy, where valid, authentic, reliable, credible, and sufficient data, information, and intelligence are necessitated.

## Ethics Declaration

Ethical clearance was obtained from the University of Johannesburg's, College of Business and Economics (CBE) Research Ethics Committee. Ethics clearance for this research was approved on 31 October 2022. Reference number: 2020SCii558.

## AI Declaration

The authors did not make use of any AI tool in producing this research paper.

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