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National Policy & Technology catapults Sustainability of MSMEs in Warship Building towards Aatmanirbhar Bharat

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Abstract

Warship building in the country has witnessed a phenomenal change with in house design and construction of stealth ships. Construction of Aircraft carrier INS Vikrant by Cochin Shipyard, a Public sector Undertaking has heralded a new dimension to our indigenous capabilities. Though, considerable headway has been made in the float and move categories in design and development of systems, it is lacking in the vital fight category, with continued dependency on foreign sources.

MSMEs are aptly poised to bridge the gap by inhouse design, development and supply of systems to equip the modern warships. The Government has unleashed a slew of measures to support the MSMEs making provisions in the Defence Procurement Procedures (DPP 2020) for "Make in India" programmes to bolster their involvement in the warship programme. A congenial National policy is of veritable necessity to partake and sustain the MSMES in business with the shipyards. Warships are potent platforms calling for equipment and systems with in date technology. It therefore devolves on MSMEs to be abreast with the technology, providing life cycle support towards operation and maintenance of systems. The domino effect of National policy and Technological prowess will ultimately lead to self-reliant Navy. This paper examines National Policy and Technology perspectives towards ensuring sustainability of MSMES in warship building.

Key words

National Policy, Technology, Sustainability, Aatmanirbhar Bharat, Cronbach alpha, Average Variance Extracted, Factor loadings, Canonical correlation, Wilks Statistic, Hypothesis testing

The third P15B destroyer INS Imphal (D68)

I. Introduction

1.1 Modern India is emerging with economy posted well over 7% GDP growth, being the fifth largest economy in the world, poised towards $5 trillion economy by 2030, as per World Bank and IMF reports. It is a clarion call from the Government of India to attain total self - sufficiency achieving Aatmanirbhar Bharat. Indigenous shipbuilding capabilities including design and construction of Aircraft carriers are witnessed to achieve total maritime domain capability. Though, considerable headway has been made in the float and move categories in design and development of systems, it is lacking in the vital fight category, with continued dependency on foreign sources.

1.2 MSMEs are aptly poised to bridge the gap by inhouse design, development and supply of systems to equip the modern warships. The Government has unleashed a slew of measures to support the MSMEs making provisions in the Defence Procurement Procedures (DPP 2020) for “Make in India” programmes to bolster their involvement in the warship programme. A congenial National policy is of veritable necessity to partake and sustain the MSMES in business with the shipyards. Warships are potent platforms calling for equipment and systems with in date technology. It therefore devolves on MSMEs to be abreast with the technology, providing life cycle support towards operation and maintenance of systems. The domino effect of National policy and Technological prowess will ultimately lead to self-reliant Navy. This paper examines National Policy and Technology perspectives towards ensuring sustainability of MSMES in warship building.

II Research Design

2.1 Research design is centred on establishing the relationship between the National policy, and Technology with Sustainability of MSMEs. Analysis of data is done by calculating Pearson correlation coefficient using the canonical correlation, a multivariate correlation technique. National Policy and Technology are independent variables and Sustainability is a dependent variable.

2.2 Hypothesis

H_0: No correlation exists in Technology and National Policy with Sustainability in warship building (R=0)

H_1: Technology and National Policy has a significant and positive relationship with Sustainability in warship building ($R \neq 0$)

α =.05 is used as significance level for testing the hypothesis.

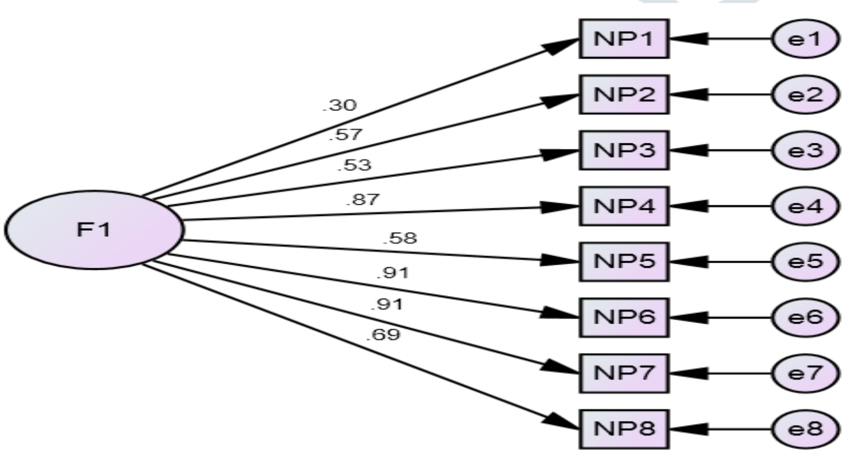
III Data analysis

3.1 Prior to undertaking data analysis, confirmation on the reliability and validity of the measurement indicators for all the constructs will have to be undertaken. A pilot study was therefore undertaken by farming out the questionnaires to 70 MSMEs by stratified sampling involved in float, move and fight categories as well as in Auxiliary services and also dealing with system, sub system, module and ancillary items in the arena of warship building. The questionnaires were sent to Government owned shipyards located across the country and also to a private ship yard owned by Larsen & Toubro Ltd. Reliability test was conducted using Cronbach Alpha and validity of measurement indicators was done by factor loading and Average Variance Extracted (AVE). All constructs reliability found to be above 0.7; the minimum acceptable level for Cronbach Alpha.

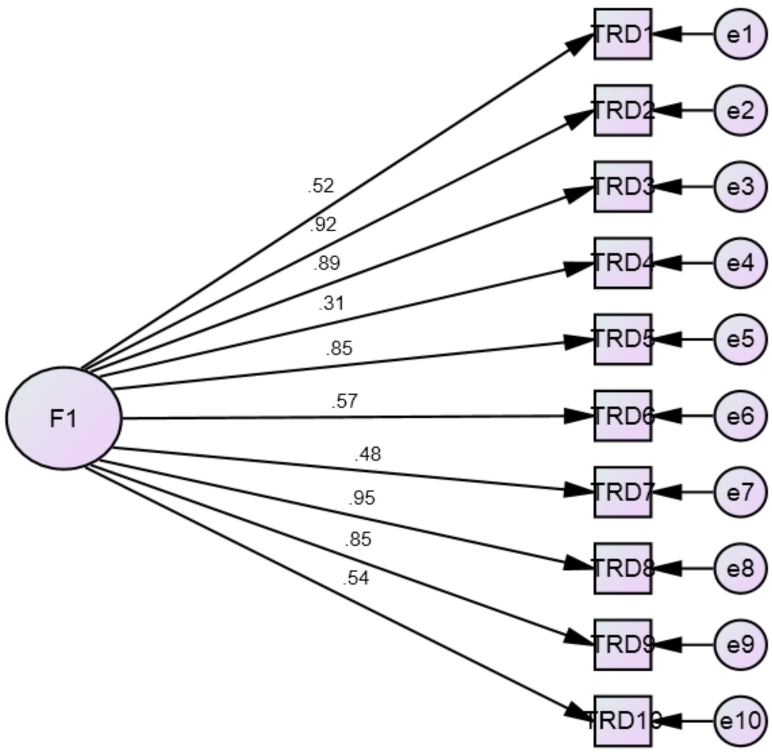
3.2 Validity

Validity is measured by AVE. AVE value should be at least 0.5 so that the majority of the variance is confirmed to occur due to the observed values only. Statistical tests on the validity conducted with 70 samples, as a pilot study, using AMOS software, indicating the factor loadings of each measurement indicator on the respective constructs, are appended.

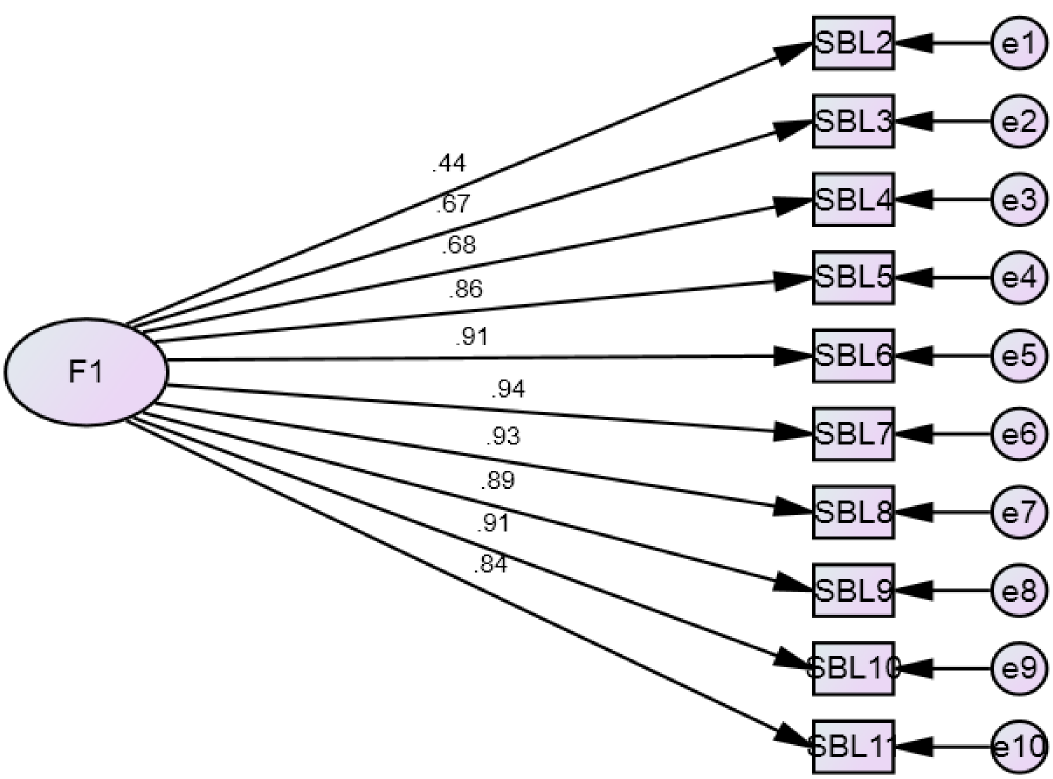
Factor Loading – National Policy



Factor Loading – Technology



Factor Loading – Sustainability



"Factor loading signifies the extent to which the variable is related to an underlying factor and how well it represents that factor. Factor loading ranges from -1 to 1; closer to 0 shows that the factor exerts a low influence on the variable. Factor loading of each and every indicator should be at least 0.5; otherwise, it is considered as a weak indicator and not included in the model. For all the constructs Average Variance Extracted should be above the threshold value of 0.5" (Balachandran and Aanand, 2023). AVE is 0.55 for national Policy, 0.57 for Technology and 0.68 for Sustainability, supporting validity. On successful completion of pilot study, canonical correlation was undertaken by collecting 160 responses from MSMEs"

3.4 Canonical Correlations

National Policy and Technology with Sustainability

Settings

Variables in set 1 - Measurement indicators of National Policy and Technology

Variables in set 2 - Measurement indicators of sustainability

correlations used - 9

Canonical Correlations

	Correlation	Eigenvalue	Wilks Statistic	F	Num D.F	Denom D.F.	Sig.
1	.662	.782	.172	1.420	162.000	948.622	.001
2	.532	.394	.307	1.111	136.000	858.776	.198
3	.475	.292	.428	.960	112.000	766.092	.597
4	.435	.234	.552	.829	90.000	670.199	.867
5	.358	.147	.681	.684	70.000	570.641	.975
6	.296	.096	.782	.590	52.000	466.869	.990
7	.273	.081	.857	.535	36.000	358.236	.988
8	.247	.065	.926	.436	22.000	244.000	.988
9	.119	.014	.986	.176	10.000	123.000	.998

H0 for Wilks test is that the correlations in the current and following rows are zero

Set 1 Standardized Canonical Correlation Coefficients

Variable	1	2	3	4	5	6	7	8	9
NP1	-.066	-.303	.130	-.229	-.113	.150	-.324	.001	.435
NP2	-.712	-.155	-.227	.375	.121	-.231	.109	-.913	.696
NP3	.372	.272	-.407	-.738	.488	.540	.644	.958	-.183
NP4	.330	-.314	-.486	.835	-.353	.002	.164	-.082	.457
NP5	-.890	.271	.479	-.230	-.742	-.091	-.359	.422	-.428
NP6	.770	.038	.937	.291	.595	.433	-.774	-.041	.227
NP7	-.256	-.549	-.301	.005	.557	-.122	.588	.176	-.228
NP8	.061	.700	-.196	.259	-.407	-.314	-.193	-.266	-.550
TRD1	.083	-.091	.113	-.377	-.423	-.117	.294	-.283	-.259
TRD2	-.795	.317	.331	-.106	.520	-1.327	.138	1.225	-.629
TRD3	1.007	-.255	.331	.093	-.329	.849	.011	-1.396	.345
TRD4	-.241	-.174	.556	.144	-.160	-.081	.271	-.410	.204
TRD5	.482	-.223	-.184	-.175	.203	-.462	.076	.261	.845

TRD6	-.152	.113	.105	.687	.028	.788	.393	.435	-.456
TRD7	.237	.816	-.417	-.103	-.235	-.195	-.172	-.154	.015
TRD8	-.624	-.250	.677	-.315	-.423	.416	.161	.168	.842
TRD9	.597	-.014	-.538	.088	.072	.166	-.036	-.257	-.289
TRD10	-.480	.649	-.580	-.390	.532	.060	-.249	.366	-.568

Set 2 Standardized Canonical Correlation Coefficients

Variable	1	2	3	4	5	6	7	8	9
SBL2	-.458	.181	.182	-.401	-.885	-.149	-.125	-.098	-.354
SBL4	.599	-.308	.272	.557	-.297	-.274	1.099	.076	-.155
SBL5	.066	-.231	.569	-1.264	.639	-1.088	-.332	.176	.747
SBL6	.534	-.803	.337	.485	-1.100	1.120	-.119	.461	1.262
SBL7	-.156	1.128	-1.208	1.299	-.076	-1.494	-.606	-.430	-.206
SBL8	.912	.928	1.516	-.407	.547	.708	-.697	.541	-.865
SBL9	-1.744	-.179	-.001	.733	.645	.280	.344	.435	.382
SBL10	.115	.178	-1.537	-1.254	.020	.270	.985	.225	-.086
SBL11	-.026	-.163	.260	.094	.014	.627	.021	-1.682	-.291

Set 1 Unstandardized Canonical Correlation Coefficients

Variable	1	2	3	4	5	6	7	8	9
NP1	-.078	-.357	.152	-.270	-.132	.177	-.382	.002	.512
NP2	-.873	-.190	-.278	.460	.149	-.283	.133	-1.118	.852
NP3	.398	.291	-.436	-.790	.522	.579	.690	1.026	-.195
NP4	.375	-.357	-.552	.949	-.401	.002	.186	-.093	.519
NP5	-.844	.257	.454	-.217	-.703	-.086	-.340	.400	-.406
NP6	.735	.036	.894	.278	.568	.413	-.739	-.039	.217
NP7	-.237	-.507	-.278	.004	.514	-.112	.543	.163	-.210
NP8	.052	.594	-.167	.220	-.345	-.266	-.164	-.226	-.467
TRD1	.081	-.089	.111	-.370	-.415	-.115	.289	-.278	-.255
TRD2	-.727	.290	.302	-.097	.475	-1.214	.126	1.121	-.575
TRD3	.892	-.226	.293	.082	-.291	.752	.010	-1.236	.305
TRD4	-.170	-.122	.391	.102	-.112	-.057	.191	-.289	.143
TRD5	.473	-.218	-.181	-.171	.199	-.454	.074	.256	.829
TRD6	-.169	.126	.117	.766	.031	.879	.438	.485	-.508
TRD7	.231	.796	-.407	-.101	-.230	-.190	-.168	-.150	.015
TRD8	-.545	-.219	.591	-.275	-.369	.363	.141	.146	.735
TRD9	.577	-.013	-.521	.085	.070	.160	-.035	-.248	-.279
TRD10	-.366	.496	-.443	-.297	.406	.046	-.190	.279	-.434

Variable	1	2	3	4	5	6	7	9
SBL2	-.290	.115	.115	-.254	-.560	-.094	-.079	-.224
SBL4	.495	-.254	.225	.460	-.246	-.226	.908	-.128
SBL5	.045	-.157	.387	-.860	.435	-.741	-.226	.509
SBL6	.388	-.583	.245	.352	-.799	.814	-.087	.917

SBL7	-.107	.769	-.823	.885	-.052	-1.018	-.413	-.140
SBL8	.603	.614	1.003	-.269	.362	.469	-.461	-.573
SBL9	-1.195	-.123	.000	.502	.442	.192	.236	.261
SBL10	.078	.121	-1.043	-.852	.013	.183	.669	-.059
SBL11	-.015	-.096	.153	.055	.008	.367	.012	-.171

Set 1 Canonical Loadings

Variable	1	2	3	4	5	6	7	8	9
NP1	.046	.205	-.251	-.051	-.005	.327	-.157	-.010	.190
NP2	-.271	.339	-.080	.372	.372	.139	.230	-.139	.287
NP3	.112	.196	-.125	.059	.287	.402	.227	.283	.231
NP4	.018	.148	-.127	.479	-.037	.158	.142	.318	.340
NP5	-.189	.210	.040	.167	-.206	.320	-.036	.290	.128
NP6	.095	.379	.298	.348	.387	.245	-.106	.147	.248
NP7	-.011	.158	-.057	.163	.284	.309	.186	.009	.100
NP8	.274	.446	-.009	.276	.177	.096	.029	-.010	.112
TRD1	.075	.336	.245	-.063	-.227	-.162	.602	-.084	-.052
TRD2	.076	.455	.372	.103	.242	-.228	.503	.037	-.040
TRD3	.203	.402	.320	-.064	.155	.123	.463	-.213	-.013
TRD4	-.220	.275	.187	-.165	.011	.013	.373	-.267	.257
TRD5	.213	.436	.121	-.078	-.108	-.273	.425	.115	.445
TRD6	-.027	.471	.163	.320	-.168	.151	.531	.032	-.063
TRD7	.001	.804	-.064	.020	-.230	.069	.181	-.081	.268
TRD8	-.107	.415	.318	-.136	.028	.165	.341	.032	.325
TRD9	-.018	.371	-.003	-.054	.059	.154	.383	-.100	-.008
TRD10	-.284	.530	.027	-.267	.268	.106	.189	-.152	.149

Set 2 Canonical Loadings

Variable	1	2	3	4	5	6	7	8	9
SBL2	-.390	.441	.305	-.249	-.670	-.116	.183	-.053	.016
SBL4	.117	.394	.366	.135	-.120	-.200	.753	-.081	.226
SBL5	-.025	.494	.310	-.237	.042	-.220	.260	-.207	.665
SBL6	.068	.563	.132	.031	-.245	.207	.166	-.082	.723
SBL7	.024	.800	.039	.123	-.094	-.078	.179	-.182	.512
SBL8	.055	.833	.309	-.041	.029	.195	.251	-.016	.322
SBL9	-.383	.614	.247	.065	.082	.136	.411	-.036	.465
Variable	1	2	3	4	5	6	7	8	9
SBL10	.008	.708	-.097	-.233	-.033	.198	.444	-.093	.434
SBL11	-.043	.515	.208	-.055	.021	.176	.297	-.620	.428

Set 1 Cross Loadings

Variable	1	2	3	4	5	6	7	8	9
NP1	.031	.109	-.119	-.022	-.002	.097	-.043	-.002	.023
NP2	-.179	.180	-.038	.162	.133	.041	.063	-.034	.034
NP3	.074	.104	-.060	.026	.103	.119	.062	.070	.027
NP4	.012	.079	-.060	.208	-.013	.047	.039	.078	.040
NP5	-.125	.112	.019	.073	-.074	.095	-.010	.072	.015
NP6	.063	.201	.142	.151	.138	.072	-.029	.036	.029
NP7	-.007	.084	-.027	.071	.102	.091	.051	.002	.012
NP8	.182	.237	-.004	.120	.063	.028	.008	-.003	.013
TRD1	.049	.179	.117	-.027	-.081	-.048	.165	-.021	-.006
TRD2	.050	.242	.177	.045	.087	-.067	.138	.009	-.005
TRD3	.135	.214	.152	-.028	.055	.036	.126	-.052	-.002
TRD4	-.146	.146	.089	-.072	.004	.004	.102	-.066	.031
TRD5	.141	.232	.058	-.034	-.039	-.081	.116	.028	.053
TRD6	-.018	.251	.078	.139	-.060	.045	.145	.008	-.007
TRD7	.001	.428	-.031	.009	-.082	.020	.049	-.020	.032
TRD8	-.071	.221	.151	-.059	.010	.049	.093	.008	.039
TRD9	-.012	.197	-.002	-.023	.021	.046	.105	-.025	-.001
TRD10	-.188	.282	.013	-.116	.096	.031	.052	-.038	.018

Set 2 Cross Loadings

Variable	1	2	3	4	5	6	7	8	9
SBL2	-.258	.235	.145	-.108	-.240	-.034	.050	-.013	.002
SBL4	.077	.210	.174	.059	-.043	-.059	.206	-.020	.027
SBL5	-.017	.263	.147	-.103	.015	-.065	.071	-.051	.079
SBL6	.045	.299	.063	.013	-.088	.061	.045	-.020	.086
SBL7	.016	.425	.018	.054	-.033	-.023	.049	-.045	.061
SBL8	.036	.443	.147	-.018	.010	.058	.069	-.004	.038
SBL9	-.254	.326	.117	.028	.029	.040	.112	-.009	.055
SBL10	.005	.376	-.046	-.101	-.012	.059	.121	-.023	.052
SBL11	-.028	.274	.099	-.024	.007	.052	.081	-.153	.051

Proportion of Variance Explained

Canonical Variable	Set 1 by Self	Set 1 by Set 2	Set 2 by Self	Set 2 by Set 1
1	.025	.011	.036	.016
2	.158	.044	.377	.106
3	.038	.009	.061	.014
4	.049	.009	.024	.005
5	.046	.006	.060	.008
6	.047	.004	.031	.003
7	.109	.008	.138	.010
8	.027	.002	.054	.003
9	.048	.001	.219	.003

3.5 Hypothesis Testing

H_0: No correlation exists in Technology and National Policy with Sustainability in warship building (R=0)

H_1: Technology and National Policy has a significant and positive relationship with Sustainability in warship building ($R \neq 0$)

α =.05 is used as significance level for testing the hypothesis.

Canonical correlation test results show that R = 0.662, p = .001. "The Pearson correlation coefficient value ranges between 0.6 - 0.79; indicating a strong relationship exists between National Policy, Technology and Sustainability " (Evans,1996). P value being .001, shows that the relationship is significant. It is inferred that there is a strong and significant relationship exists between National Policy, Technology and Sustainability.

IV. Inference

4. The following inferences are drawn:-

(a) National Policy and Technology exhibits a strong and significant relationship with Sustainability (r =0.662, p = .001).

(b) Due to the significant and positive relationship, conducive national policies and technological trajectory will ensure sustainability of MSMEs in warship building, moving towards Aatmanirbhar Bharat.

(c) The Wilks statistics indicates that the unexplained variation is around 17 %, which implies that there is much more explained variance compared to unexplained variance.

V. Conclusion

5..Conducive national policies and adherence to technological standards and advancements will propel the MSMEs for a larger partake in warship building. The transfer of technology from the Government research centres should flow to the MSMEs to develop critical systems for warships. Large scale industries also need to collaborate with the MSMES to provide the necessary thrust and impetus in developing critical technologies by the MSMEs. This would certainly obviate in the long run from dependency on foreign sources. The maritime domain and strategy demands ships being built indigenously and equipping with indigenous combat systems with the ulterior objective of achieving Aatmanirbhar Bharat.

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