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Ranking of Strategic Actions for Indian Automobile Manufacturing Enterprise: An Application of Interpretive Ranking Process (IRP)

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Abstract

Indian automobile industry is one of the fastest growing industries which is showing rapid transformations from the technological perspective. It is having a major impact on the performance of the automobile manufacturing enterprises as well as the industry. There may be lot of strategic actions with respect to performance which can be taken from the enterprises, but it is crucial to do ranking and identify the best strategic actions with reference to some key result areas (KRAs), which can be a major concern for the top management for decision making.

In literature, there are many ranking and decision-making tools available but there is very limited discussion about interpretative ranking process which is intended to overcome by one of the novel tools, i.e. Interpretive Ranking Process (IRP). This study is an attempt to apply IRP for ranking the strategic actions (technological perspective) with reference to expected performance results for one of the Indian automobile manufacturing firms.

The methodology adopted for present study is to analyze the technological strategy perspective for case company with help of SAP-LAP (Situation-Actor-Process Learning-Action-Performance) framework. The actions and performance elements identified from SAP-LAP are used as inputs for developing interpretive ranking model by following IRP methodology. The proposed outcome of this study is to rank the strategic actions (technological perspectives) with respect to the performance and suggest the best strategic actions for the automobile manufacturing enterprise under study, which can be reflected as knowledge base by other enterprises.

Keywords: *Indian automobile manufacturing enterprise, IRP, SAP-LAP, Technology strategy*

Introduction

India is the world's second fastest growing auto market and boasts of the sixth largest automobile industry after China, the US, Germany, Japan and Brazil. Automobile industry is showing a rapid growth in the current scenario. The industry is showing the transformation from the technological perspective and this has a major impact on the performance of the automobile manufacturing enterprises as well as the industry.

The automobile industry in India is now working in terms of the dynamics of an open market.

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Many joint ventures have been set up in India with foreign collaboration, both technical and financial with leading global manufactures. Also a very large number of joint ventures have been set up in the auto-components sector and the pace is expected to pick up even further. The Government of India is keen to provide a suitable economic and business environment conducive to the success of the established and prospective foreign partnership ventures.

This study is an attempt to have a better understanding of technology related strategy issues for an automobile manufacturing enterprise in Indian context. There may be a lot of strategic actions related to technology which are being taken from the enterprises, but it is imperative to explore some of the best strategies. So, the other attempt has been made to rank the strategic actions w.r.t. performance of the automobile company.

The main objectives of the present study are:

- To have an understanding of technology related issues for an automobile manufacturing enterprise in Indian context.
- To rank the strategic actions (technological perspective) w.r.t. performance of an Indian automobile manufacturing enterprise.

The study of this work is limited to Indian Automobile manufacturing enterprise. This study is only concentrating on the technological perspective of an Indian automobile manufacturing enterprise.

The structure of the paper is as follows: After discussing about the introduction of the study, section 2 deals about the methodology used for the study, and the relevance of the methods for present study. Section 3 discusses about the background of the case company. Section 4 performs the SAP-LAP analysis and the elements related to SAP-LAP. Section 5 discusses the methodology for development of IRP model. Section 6 demonstrates the internal validation of IRP model. The last section synthesizes the learning from present study and exhibits the limitations and scope of future work.

Methodology of the Study

For the present study, it is supposed to take the following two methodologies which are SAP-LAP analysis and IRP modelling. The review presented here demonstrates the usefulness of these interpretive methodologies experienced by the researchers in the literature which highlights the application of these methodologies for the present study.

SAP-LAP Analysis

SAP-LAP (situation actor process-learning action performance) framework (Sushil, 1997, 2000, 2001) provides a framework that can be effectively applied to develop either generic or specific models for any case context. Such context will be holistic, synthesizing various competing schools of thought. SAP-LAP models can be developed in various contexts such as strategic management, quality management, technology management, reengineering and restructuring, new product commercialization, financial management, comparative management, and so on.

The SAP-LAP model gives better insights about the problem, expectations from the problem and how to change those expectations into reality than the traditional models of environmental analysis as SWOT, TOWS matrix, and PEST analysis (Arshinder *et al*. 2007). These traditional models are static in nature, which deals only with the internal and external environment of an organization.

This framework is widely used by researchers and practitioners (Suri and Sushil, 2008; Chatterjee

and Chaudhuri, 2010; Ghosh and Sahney, 2010; Pramod and Banwet, 2010) in many contexts and case situations.

IRP Methodology

IRP (Sushil, 2009) is a novel ranking method that emphasis on the knowledge creation and management processes. This also, combines the analytical logic of the rational choice process and decision making with the strengths of the intuitive process at the elemental level. This method has been developed to overcome the shortcomings of the existing ranking methods and tools. The methodology incorporates the strengths of the paired comparison approach (Warfield 1974, Saaty 1977) and it helps to minimise the cognitive overload. It uses interpretative matrix as a basic tool and paired comparison of interpretation in the matrix (Sushil 2009). It is highlighted in the literature that traditional AHP suffers from the drawback that the interpretation of judgements of the experts remains opaque to the implementer, and it is intended to overcome in this method as the experts here are supposed to spell out the interpretive logic for dominance of one element over the other for each paired comparison. It also makes an internal validity check via logic of the dominance relationships in the form of a dominance system graph.

As this is a novel methodology, very limited work has been published using this methodology. So there is a lot of potential for the researchers to apply this methodology in the present context. A recent application of this methodology has been highlighted in the area of world-class manufacturing practices by Haleem *et al*. (2012).

Background of Case Organisation

For the present study, one of the automobile manufacturing enterprises, XYZ Ltd. (fictitious name) has been selected. The company is one of the largest and leading automobile manufacturing in India which has a very large customer base. The company is serving customers in many segments of the cars.

Recently, the Q3 results of company sales showed a drastic decrease. The needs and demands of the customers are changing and now there is more demand in new segments such as small cars and SUVs etc. The hike in fuel and petrol prices have compelled the company to move to other technology and the competitors are also moving towards diesel technology. The company is making some technological agreements with global players to develop diesel engines and now they are looking to develop high technology cars exclusively for their domestic customers.

SAP-LAP Analysis

Sushil (2000) proposed a methodology called SAP-LAP (Situation Actor Process-Learning Action Performance) in order to deal with chaos of the rapid changes in business environment and also helps to understand the technology management functions and their associated attributes of an enterprise. This methodology consists of two steps: first step, SAP deals in a managerial context mainly consist of a “situation” to be managed, “actor” to deals with the situation and a “process” that respond to the situation and next step is LAP which is nothing but the synthesis of SAP. In this, we need to learn about the situation, actor and process and find out the learning. Based on these learning, an actions has to be taken that anticipate the improvement in performance.

SAP-LAP framework is one of the most useful methodologies for analysis and synthesis the process of adopting new and complex technology in an organization. In order to take a strategic action with respect to technological prospective to improve the performance of an enterprise, SAP-LAP is very powerful framework.

In this section, SAP-LAP analysis has been carried out for XYZ Ltd using just to have a better understanding about the technology trends and technology related decisions and strategies, the changes in the environment and it will lead to identify the elements related to suggested actions and expected performance.

Situation

XYZ Ltd. has experienced a decline in sales, the reasons identified by the company are that competitors are adopting new technologies as well as they are moving towards diesel engines. The prices of petrol are going high which leads to increase the demand of diesel cars in the market. The other changing scenario identified by the company is that now the customers are more interested in small segment car as well as SUV's (Sports Utility Vehicles), which leads to develop high demand in the market. The other companies are investing a lot of money in R&D to develop new and better technologies for satisfying the demands of customers. XYZ Ltd. has decided to go for diesel segment car as well as the company budgets are looking for a more pie for internal R&D investments.

Actors

The top management of XYZ Ltd. has a very crucial role in development of strategies related to technology and new product development. The new segments developed by the company are on the basis of the needs of the potential customers. The company wants to attract more and more new customers, so they are developing new technologies. The strategies of the competitors are also influencing the revenues of XYZ Ltd., and it impales the company to look more seriously for new technology development. The R&D scientists also have a key role as they are the one who have to develop new technologies to lead in the highly competitive market.

Process

For surviving and leading in highly competitive and technology sensitive market, the company looks to align the business strategies with their technology strategies. For leading in technology, the company is looking for a technical agreements with global companies in terms of strategic alliances, joint ventures and technological agreements. They are moving towards new product development for the changing the customer needs. The very important process for the company is to assess the customer's needs. For satisfying the customer's needs, the company has recently developed a product exclusively for their domestic market. The company is also looking to adopt the new technologies for their global as well as domestic customers.

Learning

The analysis carried out in the above factors lead to synthesis some learning for the case company. As the market is highly competitive, the company needs to learn to fulfil as well as assess the needs of the potential customers. For leading in technology, the company should look forward to develop strategic alliances with global partners to give better products to their global as well as domestic customers. The company lacks behind the global standards, so an important learning is to practice towards global technological standards. It is very important to be technological sound, so the company needs to learn more technological developments.

Actions

On the basis of the analysis discussed above, some suggested strategic actions for XYZ Ltd. has been presented here. The company should look forward to develop the core competencies in the area of technology. There are new customer segments evolving in the market, so the company needs to develop the new technological segments for fulfilling the demands of potential

customers. The long term solution for technological development lies in the investment of in-house R&D. They need to recruit more and more competent scientists who have the global technological exposures which help the company to develop the products, which can lead to practice global technological standards.

Performance

If the company realises the strategic action suggested above, the expected performance are growth in sales, better revenues and better financial results. The company will be able to get a new customer base and it will lead to develop the financial profitability for the company. The better technological products and services will lead to develop the high customer satisfaction level.

Elements of SAP-LAP Analysis: The analysis discussed in the above section has been refined in the form of elements related to SAP-LAP which are presented in Table 1.

Table 1: SAP-LAP Elements

SAP	LAP
Situation: • Declining Sales • Competition • Increasing Demand for Small Segment Car and SUVs • R&D Investments / Technological Updation • Rising Fuel Prices	***Learning***: • Strategic Alliances • Fulfilling Better Needs of Potential Customers • Technology Development • Targeting to Reach Global Technological Standards
Actor: • Top Management • Potential Customers (future prospective) • Competitors • Scientist (R&D)	***Actions***: • Core Competence Development • New Technology Segment Development • Investment In-house R&D • Practicising Global Technological Standards
Process: • Technology and Business Strategy Alignment • Technological Agreements • New Product Development • Customers Needs Assessment	***Performance***: • Growth in Sales • New Customer Base • Financial Profitability • Customer Satisfaction

Development of IRP Model

Sushil (2009) evolved a novel ranking method i.e. Interpretive Ranking Process (IRP) by using the strength of both the intuitive process and the rational choice process of decision making and eliminated the limitation of each one. This methodology builds on the strength of the paired comparison approach which minimises the cognitive overload (Warfield 1974, Satty 1977).

The steps of IRP (Sushil 2009) are as follows:

Step 1. Identify two sets of variables – one to be ranked with reference to the other, e.g. actions and performance, actors and processes, etc.

Step 2. Develop a cross-interaction matrix between the two sets of variables.

Step 3. Convert the cross-interaction matrix into an interpretive matrix (Sushil 2005).

Step 4. Convert the interpretive matrix into an interpretive logic of pair-wise comparisons and dominating interactions matrix by interpreting the dominance of one interaction over the other.

Step 5. Develop ranking and interpret the ranks in terms of dominance of number of interactions.

Step 6. Validate the ranks thus derived.

Step 7. Represent the obtained ranking diagrammatically in the form of an interpretive ranking model.

Step 8. Interpret the ranking order and use it as the base for recommending action.

Interpretive Ranking Process (IRP) uses two sets of variables i.e one set of variables that are to be ranked and the other set of reference variables that provide the basis for ranking e.g. Actions vs Performance, Actors vs Process and so on. In this project, based on secondary data analysis and opinion of experts from industry and academia, some critical factors i.e. four such strategic actions with respect to technological prospective and four corresponding performance were identified.

Elements of Suggested Actions and Expected Performance

Based on the SAP-LAP analysis which was carried out in the last chapter, four refined elements of suggested actions and expected performance are identified and listed in Table 2.

Table 2: Actions and Performance Variables used for IRP

Suggested Action	**A1 -**	Core Competence Development
	A2 -	New Technology Segment Development
	A3 -	Investment In-house R&D
	A4 -	Practicising Global Technological Standards
Expected Performance	**P1 -**	Growth in Sales
	P2 -	New Customer Base
	P3 -	Financial Profitability
	P4 -	Customer Satisfaction

Development of Cross-Interaction Matrix

A cross-interaction matrix represents the relationship/deployment between each action and performance in this matrix, '1' representing a presence of relationship between the pair of variables and '0' representing its absence. Based on refined elements mentioned above, a cross-interaction matrix in a form of binary matrix has been developed and presented in Table 3.

To avoid the subjective bias, a questionnaire has been developed to get the responses from the experts related to interaction of suggested actions and expected performance. Total 19 respondents filled the questionnaire, out of which 14 have been selected for the final analysis. Eight and more than 8 (60%) responses has been considered as the positive responses for this study.

Table 3: Cross-interaction Matrix

Action	P1	P2	P3	P4
A1	0	0	1	0
A2	1	1	0	1
A3	0	1	1	0
A4	0	0	1	1

Performance

Interpretation of Interactions

The above cross-interaction – binary matrix is converted into a cross-interpretive matrix (Sushil, 2005) by interpreting all the interactions with entry '1' in terms of contextual relationship. For example, (Action A2, Performance P2) is interpreted as 'More customers will attract towards new technology driven car. A complete cross-interpretive matrix is presented in Table 4.

Table 4: Interpretive Matrix

Action	P1	P2	P3	P4
A1	-	-	CC helps to develop ability for more profits in future	-
A2	More customers will attract towards new technology driven car	Technological innovation will lead to develop new customer base	-	Better technologies will make happy the customer
A3	-	More in house R&D helps to new technology development and new customer base	More in house development will develop ability for more profits	-
A4	-	-	Attract more global customers leading to more profits	Global technology practices will lead customers satisfied

Performance

Pair-Wise Comparisons

The above interpretive matrix will be used as a base to develop paired wise comparison of ranking variables i.e Actions w.r.t. the reference variables(s) i.e. Performance, one by one. For example, the action A1 is compared with action A2 w.r.t various performances P1, P2, P3 and P4 respectively and the interpretive logic of dominating interaction between A1 and A2 w.r.t various performance is recorded in the knowledge base and a complete interpretive logic-knowledge base has been presented in Table 5.

To decide the dominance of the strategic actions w.r.t. performance, the expert's opinion had been collected with the help of a questionnaire. The objective of the questionnaire was to seek the opinion of experts related to dominance of a pair of strategic actions w.r.t. performance. Total 10 respondents filled the questionnaire and six and more than 6 (60%) responses has been considered as the positive responses for this study.

In the above paired comparison, the ranking variables has not been compared directly, while their interaction w.r.t the respective reference variables(s) has been compared. For example, in this study, the strategic action A1 and A2 w.r.t. various performances have been compared rather than direct comparison of A1 and A2. A summarized dominating interaction has been presented in Table 6. Here, the action A1 is dominating action A2, A3, A4 in performance P3 whereas it is being dominated by action A2 in performance P1, P3 and P4.

Table 5: Interpretive Logic-Knowledge Base

Paired Comparison	Interaction with Performance	Interpretive Logic
A1 Dominating A2	P3	A2 not having any direct influence
A1 Dominating A3	P3	Core competency has more influence than technology developments
A1 Dominating A4	P3	Core competency has more influence than global technological standards
A2 Dominating A1	P1	A1 not having any direct influence
	P2	A1 not having any direct influence
	P4	A1 not having any direct influence
A2 Dominating A3	P1	A3 not having any direct influence
	P2	Getting more customers through new technologies has more influence than in-house R&D
	P4	A3 not having any direct influence
A2 Dominating A4	P1	A4 not having any direct influence
	P2	A4 not having any direct influence
	P4	The existing technology making customers more happy than going for global technological standards
A3 Dominating A1	P2	A1 not having any direct influence
A3 Dominating A2	P3	A2 not having any direct influence
A3 Dominating A4	P2	A4 not having any direct influence
	P3	In-house development gives more profitability than global customers
A4 Dominating A1	P4	A1 not having any direct influence
A4 Dominating A2	P3	A2 not having any direct influence
A4 Dominating A3	P4	A3 not having any direct influence

Table 6: Dominating Interaction Matrix

Dominating →

Being Dominated ↓	A1	A2	A3	A4
A1	-	P3	P3	P3
A2	P1, P2, P4	-	P1, P2, P4	P1, P2, P4
A3	P2	P3	-	P2, P3
A4	P4	P3	P4	-

Development of Dominance Matrix

The numbers of the above dominating interactions has been summarized in the form of a matrix and called it dominance matrix, which gives the number of cases in which one ranking variables dominates or being dominated by other ranking variable.

The net dominance for a ranking variable i.e. action has been computed as (D – B), where D represents the total no. of cases where these ranking variable(s) dominate all other ranking variables and B represents the total number of cases in which a particular ranking variable has

Table 7: Dominance Matrix

	A1	A2	A3	A4	No. Dominating (D)	Net Dominance (D – B)	Rank Dominating
A1	-	1	1	1	3	-2	**III**
A2	3	-	3	3	9	6	**I**
A3	1	1	-	2	4	-1	**II**
A4	1	1	1	-	3	-3	**IV**
No. being Dominated (B)	5	3	5	6	19 (Total Interactions)		

been dominated by all other ranking variables. The highest net positive dominance of a ranking variable has been ranked '1' and followed by next lower and so on. The variable(s) with highest negative net dominance will be ranked lower because these are being dominated more by other variable(s). A summarized dominance matrix clearly indicating the ranking of all factors has been shown in Table 7.

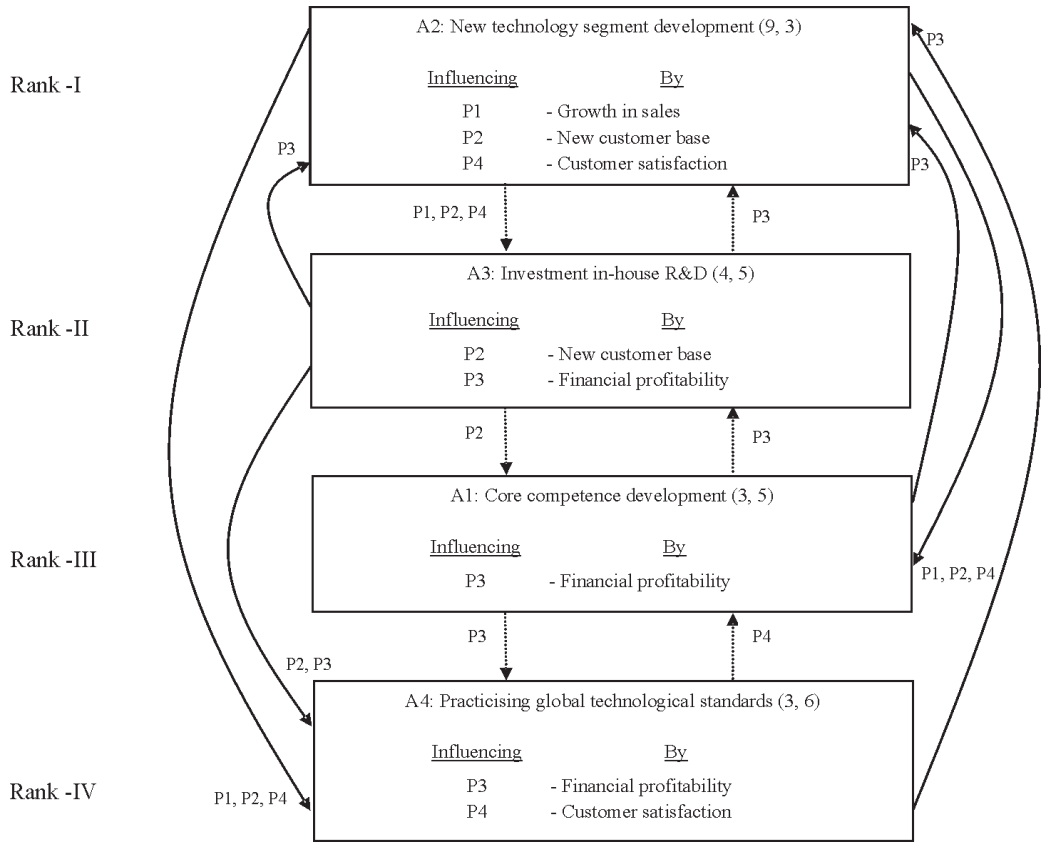

Figure 1: Interpretive Ranking Model

Interpretive Ranking Model

This is nothing but a diagrammatically representation of the final ranks of the ranking variables. The final ranks of various actions w.r.t their roles in achieving various performances are shown in Figure 1. The arrows in this figure represent the reference variable(s) in which cases a particular ranking variable is dominating the other ranking variables. Also, the numbers dominating and number being dominated are displayed in brackets for all actions. This figure also helps to interpret how each action is influencing various performances.

The IRP model shown in Figure 1 suggested that strategic action A2, i.e. new technology segment development has got rank one; strategic action A3, i.e. Investment in in-house R&D has got 2nd rank; strategic action A1, i.e. core competence development has got 3rd rank and finally strategic action A4, i.e. practicing global technology standards has got 4th rank. Here, arrow from A2 to A3 demonstrates that A2 is dominating A3 for performance P1, P2 and P4. Likewise, arrow from A3 to A2 demonstrates that A2 is dominated by A3 for performance P3. For all the actions, the numbers dominating and numbers being dominated are summarized within brackets. Here, for action A2, the numbers dominating and dominated are (9, 3).

This model demonstrates that the companies and experts realise that as the competition is increasing and customer demands are changing, it is important to give priority to develop new technology segment which lead to develop new customer base as well as satisfy the existing customers. Here, it is displayed that the companies are also realising the importance of investment more in-house R&D.

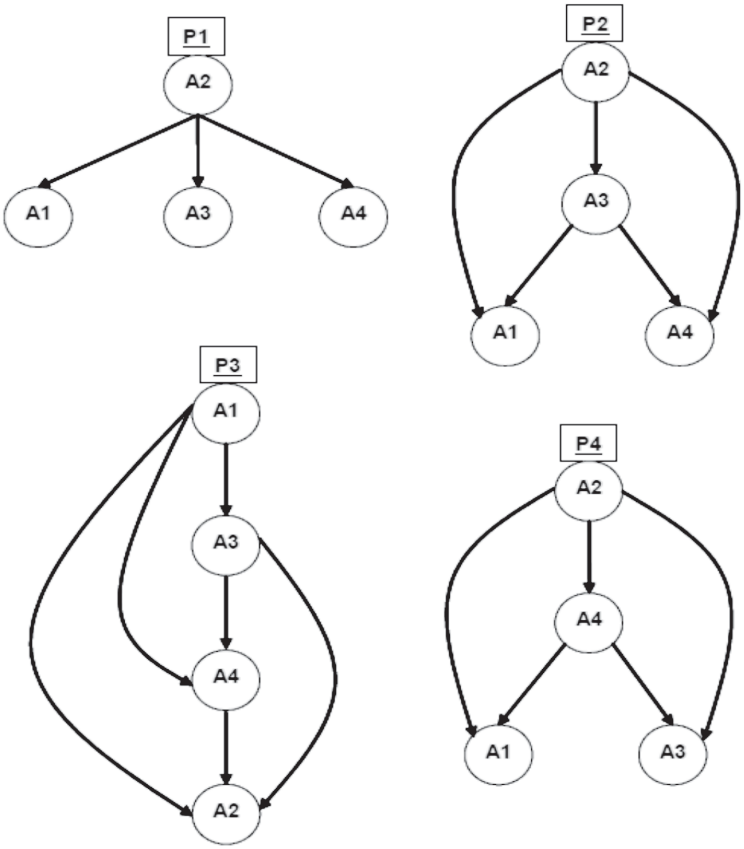

Figure 2: Internal Validity of Pair-wise Comparison

Validation

The proposed ranking model is based on interpretive logic, so to generate the confidence in this model it is necessary to validate this model and here, some of them are highlighted.

Validating Model Structure

This IRP model can be validate in terms of variables and their interactions. For this first, we will check weather all the relevant ranking and reference variables have been included or not and this can be done through a structured walkthrough for the cross-interaction matrix. Then, examine the correctness of the interpretation by a structured walkthrough made through the cross-interaction interpretive matrix. Finally, will check the dominance relationship from 'dominating interaction matrix' through system graphs for all the reference variables i.e. expected performance. The flow of this system graph should be in one direction and there should not be any feedback loop. The dominating interactions of various actions for different performance as given in Table 6 are shown in Figure 2. Here, the dominance relationships in all the system graphs are unidirectional with transitive relationship, thereby internally validating the assessment of paired comparisons.

Discussions and Conclusion

The results of the present study are as follows:

- The study deals about the current context of automobile industry related to rapid technological transformations.
- The SAP-LAP analysis presented in the study deals about having a better understanding related to technological perspectives of an automobile manufacturing enterprise.
- The study demonstrates the application of a novel methodology of ranking a variable w.r.t. other variable; here the suggested strategic actions have been ranked w.r.t. the expected performance.
- The integration of two interpretive methodologies can be helpful for any researcher to get a better interpretive understanding related to any context as well as identifying the most effectiveness of the elements.
- The results of the study can be helpful for the practitioners to realize about the most effective strategic actions which have been suggested in the study, can help to achieve better performance results.

Implications

The practitioners can incorporate the suggested actions, which can help them to leverage better performance results for their enterprises. This study can be the best illustration for the researchers dealing in qualitative and interpretative methodologies to get a detailed description and application of a novel methodology like IRP. The inclusion of IRP as a research tool can help to get more methodological rigor.

Limitations and Future Work

The study is an attempt to apply the novel ranking methodology for a case context related to automobile manufacturing industry. As, there is very limited work presented using this novel ranking methodology, so this piece of work gives more understanding about this methodology of ranking, but there are some limitations for the present study.

Although, the study has attempted to incorporate the opinion of the experts at the time of development the interpretation matrix as well as the dominance of the actions, the number of

the experts were not very much, which can be expanded to get more deep insights from the experts.

Here, the ranking is done for the suggested actions and expected performance, but same methodology can be used to rank the current actions taken by top management.

Future scope related to this work is that this methodology can be incorporated with more interpretive and qualitative research tools/methodologies, so more methodological rigor can help to get better and rich insights related to area of inquiry.

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