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DESIGN APPROACH TO FAULT FINDING IN ORGANIZATIONS USING FMEA (CASE STUDY)

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ABSTRACT

One important factor to improve performance is organizational fault finding in order to identify the issues in organizations and determining the root cause of their occurrence. In general, it can be said that many organizations, prior to accurate investigation, invest on projects for new product that these decisions have high costs and low efficiency. Fault finding pattern is suitable method to identify the strong points, crisis points. Therefore, in this article with introduction of a general pattern of fault finding in new product designing using FMEA approach (error potential effects analysis), we'll survey fault finding of new products in Tehran pegah company and finally, it is suggested feasible solutions.

Keywords: *Fault Finding, Analysis of Error Potential Effects, Designing and Development of New Products*

INTRODUCTION

Fault finding means to understand the fault, finding existence causes of fault. Proper understanding of an organization needs to a conceptual model and framework. In addition, outcome of the review, recognition and fault finding an organization is improvement points determination and definition of effective designs. Products of an organization and its environment have a mutual relationship. Obviously, treatment of a disease in an organization is more successful when its root be recognized. So, to achieve this, fault finding process can be helpful. On the other hand, fault finding plan in an organization and helping them to modify the situation require a suitable pattern and model. (dehghan,2006). In the past, many researchers using approach of error potential effects analysis done fault finding in the productive and service systems. For example, bahram: and et al (2012)(bahrami et al,2012) began to improve implementation and projects management using approach of error potential effects analysis. In this research, the error potential effects analysis team was formed and in first step included collecting information related to implementation process and projects management and their potential risks. Then, deterioration rate, occurrence probability and probability of discover each error and finally, the coefficient of risk priority number(RPN) determined. In next step, to avoid these errors, introduced preventive/ correction proceeding using regular meetings. Azilgen (2010) (Ozilgen, 2010) used approach of error potential effects analysis in the food services systems. In this research, preliminary risk analysis was performed. Receiving raw element of table, intensity analysis and risk priority number were fore casted for each failure. Chi Ozapounzeti (2009) (Chiozza and Ponzetti,2009) designed a model to medical errors decrease using error potential effects analysis method. In this research, designing did in 5 steps:

1. Selecta process to review: in this step, possible harmful events and their effects on patient immunity by joint commission and other regulatory organizations were identified.
2. Employing a multidisciplinary team: in this step, trained operators selected.
3. Collecting and organizing the in formation
4. Risk analysis: this step composes of 4 action:
 - identification of failure states
 - potential effects determireition for each failure state
 - ranking effect intensity for each failure state
 - ranking occurrence probability and identification probability for each failure state
 - identification of critical failure states

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5. Doing necessary actions and outputs measurement sedaghat and e tal(2008)(sedaghat et al,2008) assessed risks of a military,sahar an emergence using potential effects analysis method. First , a sahar emergence took in to consideration.the situation ,strong and weakness pailts were noted. In team works meetings , first , emergence work areas in terms of their mission become distinct. In next steps , have been allocated to causes investigation of error and errors effects on customer , giving deterioration score of error effects , giving event rate in each error and specify current controls.

Boldrine and e tai(2009) (boldrin et al,2009) used error potential effects analysis method to identify the error potential statesin ITERNB injector system. This system had 21 main actions that identified 52potential risk in it and finally, for each error introduced one control system

1. FMEA history:

In the productive and serrice activities areas, competition intensity, increasing customer expectations and technology evolutions lead to increasing manufacturer commitment. Otherwise, market share due to decreasing customer satisfaction will be lost. To achieve this, today organizations use different tools to identify, prioritize, pnalysis and failure and error elements management. One of most important methods is states analysis and error potential effects method that is a systematic method and used for the following reasons:

- a) Identification and prioritize of failure/error potential states in a system, product, process or service
- b) Definition and implementation actions to omit and or occurrence rate reduction of error potential states.
- c) Record the results to provide a perfect reference for future problems solution.

Error states analysis is an analytical technique. This technique depends on increasing safety factor through prevention before failure occurrence. Error states analysis used to fore cast the failures in designing steps or processes improvement in the organization. This analysis has priori approach and it focuses on designing or process and products performance. In addition, analysis of effects. And error states is a tool for changes documentation. About analysis of effects and error states exist different methodologies that following is expressed main sub-processes (Reymond et al, 2008).

1. Collecting information about under discussion phenomenon: in first step, system, process and or each phenomenon should be identify and activities method and processes should be survey.
2. Potential errors determination: environmental, human risks, materials etc, should be consider, also, states of each risk should be analyze.
3. Effects survey of each error: effects of each risk are possible effects. For example, to study a factory, risk effects can be like fire, power outage, etc.
4. Error causes determination: roots or causes of an error is one of the states analysis steps and error effects.
5. Deterioration rate determination: intensity or risk deterioration about error effects be considered. For this deterioration, there is quantitative indicators risk.
6. Occurrence possible estimation: its occurrence possible shows how a cause or potential mechanism happen. Occurrence possible based on 1 to 10 is measured. Studying past documents are very useful.
7. Probability rate determination of risk discovery: discovery probability is kind of assessment from ability rate that it exists to identify the risk occurrence cause. risk discovery rate is between 1 to 10.
8. Calculation of risk priority rate: risk priority number is multiplication of deterioration (s), occurrence (o) and discovery probability. Risk priority number is between 1 and 1000.
9. Determine the need to corrective proceedings: in this step, risks based on risk priority number are ranked. Corrective proceedings are designed with different goals: remove root causes of the risk, decreasing error effects deterioration, increasing risk discovery probability.
10. Determine the responsibility and duties: organizations should identify liable of each corrective proceedings and record it.
11. Corrective proceedings: proceeding should be effective. After doing corrective proceedings, again, risk priority rate should be calculate.

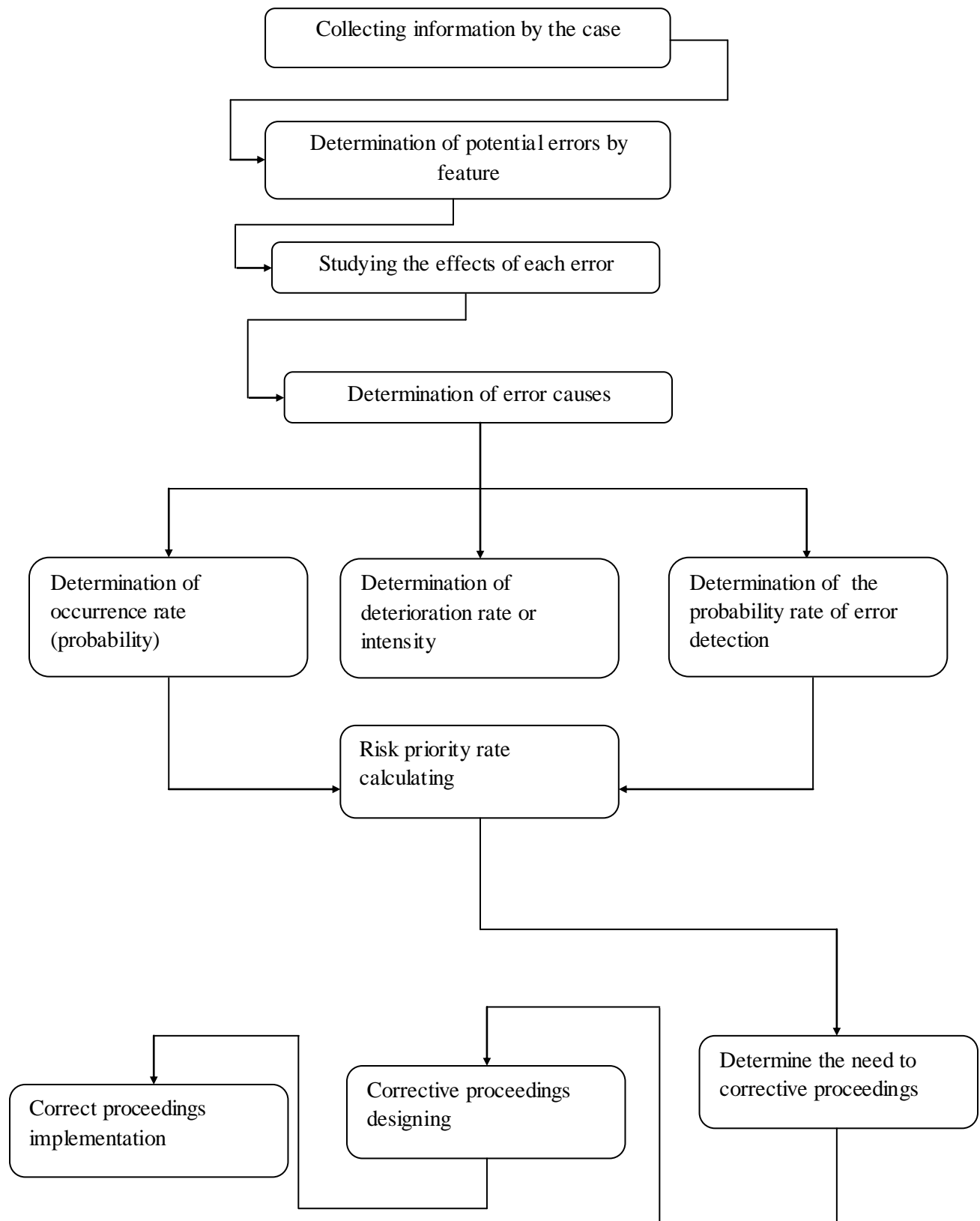


Figure 1: Analysis of states and error effects (Reymond et al, 2008)

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Table 1: A simple example of state analysis ad error effects table.

worksheet of states analysis and error effects							
date:	expletive:	controller:			System name:		
corrective proceedings	Risk priority number (RPN)	discovery probability	occurrence probability	deterioration rate	error causes	error effects	potential error
9	8	7	6	5	4	3	2

2. Introducing general pattern of fault finding to design and develop the new products using FMEA approach based on present studies, a certain patter for fault finding in designing process and development of new products by error potential effects analysis approach is not recommended.

First phase: recognition phase

It is the first phase in fault finding process the aim is to examine the organization that fault finding process is supposed to run it.

Steps:

1. Determining the relevant units with designing process of new products and explaining their duties
2. Determining the inputs and out puts in each unit
3. Examining how the de sing process of new products and record it in the from of exeutive method and diagram designing DFD.

Tool:

1. duties form
2. From-to table
3. Data flow diagram

Source: documents within the organization

Second phase:

Fault finding and fault measurement.

In this phase, the aim is to design and development of new products in organization and grouping them and de terming their priorities.

Steps:

1. Determining present and possible faults in design and development of new products in organization using first phase information and record them for each unit.
2. Determining potential causes of each fault using brain storm and or using why-why diagram and prioritizing the faults using FMEA tables.

Tool:

1. Brain storm
2. Why-why diagram
3. FMEA tables

Source:

Documents within the organization

Third phase: determining the improvement solutions in this phase, the aim is provid solution to improve in organization and omitting the error and present and possible faults in design and development process of new products.

Steps:

1. Determining improvement solutions using brain storm and determining the kind of improvement (continual improvement, corrective proceedings)
2. Determining the best improvement solutions

Tool:

1. Brain storm

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Source:

Source within the organization

Fourth phase: improvement solution execution

The aim is planning to execute improvement in organization.

Steps:

1. Determining the improvement activities in third phase and record them in the form of faults.
2. Determining the necessary sources to perform improvement project and record it in the sources registration form (financial and human)
3. Determining the improvement costs
4. Determining the benefits of improvement
5. Performing the improvement activity.

Tool:

Documents within the organization

Fifth phase: improvement process control

In this phase, the aim is controlling the improvement process and measuring the improvement from improvement activity performance.

1. Weekly monthly meetings and receiving the reports from liable persons
2. Reviewing the reports and analyze them
3. Performing necessary proceedings

Tools:

Weekly and monthly meetings

Sources:

Documents within the organization

4. Fault finding in design and development process of new products in Tehran pegah company based on 3 section pattern

In this section, we study fault finding in the design and development process of new products based on proposed.

Pattern

1-4: recognition phase

1 and 2 phase simultaneously: determining the relevant unites with designing and development process of new products and explain their duties and determining the out puts and inputs in each unit using from –to table the units related to designing and development process of new products include: 1. Production planning unit, 2. Commercial unit, 3. Marketing and selling unit, 4. Advertisements unit, 5. Quality unit, 6. Development and research unit, 7. Suggestions unit

Now, we explain these units and determine their out puts and inputs

1. Production planning unit:

Table 2: From– to table for production planning unit

document code:	from – to table		
unit in charge	Unit name: production planning		
output to	unit out put	input from	input unit
marking and selling unit	completed feasibility study form of production	research and development unit	feasibility study form of production
production line	final production planning	marking and selling unit	Lable
production line	final production planning	commercial unit	Ingredients
production line	final production planning	quality unit	building license

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As in production and selling planning to the organization, new Product is approved, the following units will take action: planning and designing unit, research and development units, quality control, marketing and selling, operation assistance. In this committee, production planning unit has the responsibility of processes timing. After goods arrival to market, designing and planning unit in regard to monthly controlling acts. For products that their selling process were low, designing and planning unit provide a justification planning a bout out of production,

2. Commercial unit

The aim of this unit is supplying all figures and services in different unit of the organization and in the designing and development process is responsible to supply required ingredients.

Table 3.from- to table for commercial unit

document code:		from – to table	
unit in charge		Unit name: commercial	
output to	unit out put	input from	input unit
production planning unit	buy material	R&D unit	final confirmation to start the process

3. Marketing and selling unit

This unit is responsible for marketing and selling the new products.

Table 4 from-to table for marketing and selling unit

document code:		from – to table	
unit in charge		Unit name: marking and selling	
out put to	unit out put	input from	input unit
R&D unit	completed feasibility study form of production	production planning unit	Feasibility study form of production
	marketing test results	new product committee	market test request
Production planning unit	lable designing	New products committee	final confirmation to start the process

New products committe

4. Advertisements unit

After and before producing a production, this unit introduces the productions to sellers and customers. Before new product arrival to market (after final confirmation of production), inside the organization, advertising is done by sms, bannere, etc. after production arrival to market, advertising is done by salamat radio, exhibition, visiting the schools and universities, catalog and CD,

Table 5: From-to table for advertisements unit

document code:		from – to table	
unit in charge		Unit name: advertisements	
output to	unit out put	input from	input unit
employers and user	advertisements	designing and new products improvement committee	starting advertisements

5. Quality unit

The aim in this unit is that compare formulation with present standards. If producing a new product was not possible, a form filled by this unit.

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Table6: From-to table for quality unit

document code: from – to table			
unit in charge			Unit name: quality
out put to	unit out put	input from	input unit
Production planning unit	taking building license	new products committee	final confirmation to start the process

6. Research and development unit
 This unit is charged with formulation designing of new products.

Table 7: From-to table for research and development unit

document code: from – to table			
unit in charge			Unit name: research and development
output to	unit out put	input from	input unit
Production planning unit	Feasibility study form of production	suggestions unit	idea
new products committee	feed back about new products	marketing and selling unit	Completed Feasibility study form of production
new products committee	formulation designing and sample production	new products committee	Instruction of new products formula designing

7. Suggestions unit
 This unit is charged with filtration and choosing ideas for new products

Table 8: from-to table for suggestions unit

document code: from – to table			
unit in charge			Unit name: suggestions unit
out put to	unit out put	input from	input unit
R&D unit	ideas filtration and choosing the best idea	Employers – complaints and people comments	ideas

Step3. Examine howdo the designing and development process of new products and record them in the executive form and DFD diagram designing.

Formsofworkorganization

Document cod	Performance mettd
1.aim Development and designing the new products in organization	
2.responsibilities Marketing and selling manager, research and development unit manager, commercial unit shopping manager, quality unit manager, public relations manager, designing and plan assistance, production manager	
3.definitions Feasibility study form: this from has three sheets that given to different units.	
4.required filed to perform. Documents within the organization	
5.Explain performance steps	

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After choosing the ideas by suggestions unit, feasibility study form fills by research and development unit. Production unit examines whether there is necessary facilities to producing that production or not. Then, mentioned form is given to marketing and selling unit and this gives a primary idea based on experience and then research and improvement unit express the view points and plan goes to new products committee. The committee members include: marketing and selling units, plan assistance, research and development, public relations, quality, product and commercial. If committee was agree with new products, research and development unit designs formulation. Marketing and selling department tests the market and the results given to research and development department. If there was not a problem, the units be required to start your own business

2-4. fault finding and fault measurement

Step 1: determining present and possible faults in designing and development process of new products in organization using the information from first phase and record them for each phase.

10 sample of most genuine faults in new products designing are earmarked:

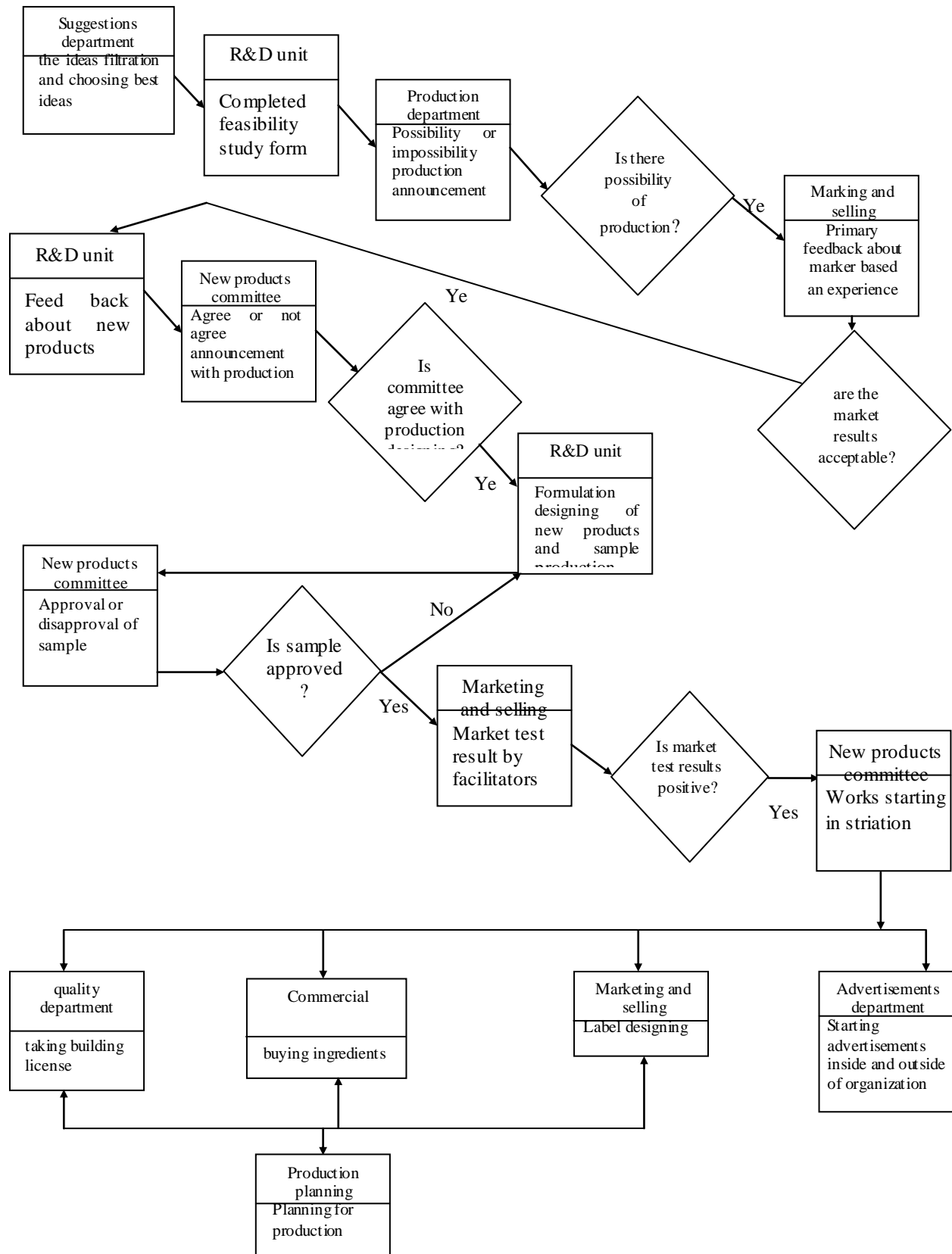
1. Lack of attention to market and customer need in new products designing by research and development department
2. Lack of precision in product formulation designing by research and development department
3. Lack of using the provider ideas to make a combination with similar quality and low cost
4. Lack of attention in choosing ideas suggestions department
5. No business review before new product improvement by marketing and selling department
6. The lack of short term study of subsets by marketing and selling department
7. There is not CFT team in organization

Step2. Determining the potential causes in each fault using FMEA tables through brain storm and prioritizing the faults using FMEA tables.

Table 9: FMEA table for R&D department

row	potential error	error effect	deterioration degree	error probability	discovery probability	RP N
1	lack of attention to market and customer need	lack of product development fitness with customer need	7	8	weakness department of R&D	720
		production selling decrease	8			
2	lack of intention to product formulation designing	product development with unfit taste difference between real taste and defined product concept	5	4		200
3	lack of using the provider ideas to make a combination with similar quality and low cost	producing with unsuitable cost and price	8	6	lack of suitable link with providers	384

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DFD organization, for designing and development of new products

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Table10: FMEA table for suggestions department

row	potential error	error effect	deterioration degree	error probability		discovery probability	RPN
1	lack of attention to choosing and fattening the ideas	Choosing unsuitable ideas	8	6	lack of attention to public complaints and employees view points	6	288

Table11. FMEA table for marketing and selling department

row	potential error	error effect	deterioration degree	error probability		discovery probability	RPN
1	no business review before new product development	lack of achievement to benefit and selling goals	10	10	lack of enough knowledge	8	800
2	the lack of short term study of subsets	unsuitable performance of subsets in marketing and selling	7	10	Weakness management	10	700
3	long fitness with business plan	slow arrival of new product to market	7	5	Weakness management	7	245

Table12. FMEA table for product planning department

row	potential error	error effect	deterioration degree	error probability		discovery probability	RPN
1	Lack of serious control NPD	slow process of designing and development	8	10	Weakness management	10	800

Table13: FMEA table for senior management

row	potential error	error effect	deterioration degree	error probability		discovery probability	RPN
1	There is not CFT team	Lack of problems identification before occurrence	8	10	Weakness management	10	800
2	Lack of enough budget for advertisements	lack of enough advertisements	7	6	Weakness management	5	210

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Table14. Prioritizing the present faults table in designing and product development

RPN	Faults
800	Lack of commercial review before new product development by marketing and selling department
800	Lack of serious controlling of NPD team planning product department
800	There is not CFT team
720	Lack of attention to market and customer need in new products designing by R&D department
700	Lack of short term study of subsets by marketing and selling department
384	Lack of using the provider ideas to make a combination with similar quality and cost
288	Lack of precision to ideas identification by suggestions department
245	long fitness with business plan
210	Lack of enough budget for advertisements
200	Lack of attention to product formulation designing by R&D department

3-4. third phase: determining the improvement solutions

Step 1: determining improvement solutions using brain storm and determining kind of improvement

Table 15: Providing solution table for product development designing faults.

The solutions for RPN improvement	RPN	fault
- Business review be done like selling and cost and benefit anticipation and determine whether the organization achieves to its goals?, if the answer was positive, it will arrive to product development level.	800	1.Lack of commercial review before new product development by marketing and selling department
1. There should be an incentive system in NPD team according to departments 2. NPD isolation from planning department and making independent called new products development and designing organization.(trot,2005	800	2.Lack of serious controlling of NPD team planning product department
- To fault identification, a CFT team should be in organization	800	3.There is not CFT team
- 1. Identify the goods that are produced by product competitors and have lot of customers 2. examing the customers sellers complaints 3. using AFD	720	4.Lack of attention to market and customer need in new products designing by R&D department

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- 1. Weekly and monthly meetings with subsets and request their performance report 2. an incentive system designing for subsets 3. using trained selling representative and expert employees in marketing and selling department	700	5.Lack of short term study of subsets by marketing and selling department
- provider participation in weekly meeting of NpD committee and using their view points to a combination with best quality and lowest cost (trot,2005)	384	6.Lack of using the provider ideas tomake a combination with similar quality and cost
-1.allowing to other people in organization to express their own ideas 2.communication with universities and inventions identification and using their ideas for new product 3.obligating the employees of selling section to examine competitors and identify possible opportunities for new product development 4. meeting with R&D department managers to choose the best ideas	288	7.Lack of precision to ideas identification by suggestions department
- employees efforts of marketing and selling section to coordinate with business plan	245	8.long fitness with business plan
- budget allocation for advertisements to use advertising method like advertising in radio and TV	210	9.Lack of enough budget for adertisements
-1. Using expert specialists in R&D department 2. using trained people to give opinion about product tast	200	10.Lack of attention to product formulation designing by R&D department

CONCLUSION

In this research due to importance of new products development process, new products development and designing process is checked by approach error potential effects analysis and according to fault finding pattern, general method was that first fault finding importance and making a general pattern for fault finding was introduced and then a general pattern about fault finding in and development process provided by using approach of error potential effects analysis and finally based on suggestion pattern and using brain storm meetings and interview with experts, a list from present faults in development and designing process is identified and using FMEA table and numbering to relevant standards, risk numbers will acquire. With respect to present researches and standards toward designing and new products development, the solutions are introduced for mentioned faults improvement

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