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FMEA – Mobile Phone

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This report has the goal of describing an example of FMEA method on a mobile phone. It will be made a description of the essential steps of a FMEA method applied to this case. But what is FMEA? FMEA is a technique used by engineers or teams as a way to ensure, as much as possible, of all the potential failure modes and their causes or mechanisms associated. In the case of the mobile phone, we have a system that would be analyzed along with its components and their potential failure modes. FMEA is a very important tool for this because it can help to avoid that problems from the pass could happen again, and looking for an upgrade improvement of the product.

There are several types of previous diagrams and analysis that we could use in a previous phase. For this case it was made a Bottom-Up analysis, which means that it begins with the failure mode on the component until the effects on the system are considered. Also for this mobile phone case, it was more appropriated to be a single individual, instead of a team, to do the analysis because the mobile phone is a small object and it would be better analyzed by only one person.

After all the previous phases completed, it’s time for the failure mode analysis according to the FMEA form like the one it’s possible to see below:

Product or Process					FMEA Type						FMEA Date					
FMEA Team Members											**Rev / Rev Date:**					
Process/Product Description or Purpose	Potential Failure Modes	Potential Effect(s) of Failure	SEV	CLASS	Potential Causes / Mechanisms of Failures	OCC	Current Design / Process Control Prevention Detection	DET	RPN	Recommended Actions	Who When	Actions Taken	SEV	OCC	DET	RPN

To measure the severity, occurrence, and detection values the following tables were used:

Severity		
Index	**Severity**	**Criteria**
1	Minimum	The client barely knows that a failure occurred.
2 3	Low	Slightly decreasing on performance and light dissatisfaction by the client.
4 5 6	Moderated	Significative decreasing on performance and dissatisfaction by the client.
7 8	High	System stops working, big dissatisfaction by the client.
9 10	Very high	Same as previous but with security concerns.

Occurrence		
Index	**Occurrence**	**Proportion**
1	Minimum	1:1000000
2	Low	1:20000
3		1:4000
4	Moderated	1:1000
5		1:400
6		1:80
7	High	1:40
8		1:20
9	Very high	1:8
10		1:2

Detection		
Index	**Detection**	**Criteria**
1	Very high	It will be detected.
2		
3	High	Big possibility of being detected.
4		
5	Moderated	It will probably be detected.
6		
7	Low	Probability it won't be detected.
8		
9	Very low	It won't be detected.
10		

For a better understanding of all the FMEA analysis the descriptions are posted bellow and not on the FMEA form. Besides that, for this case, the topics of the last column were not described because its details are difficult to know or predict in this situation and they were not took as the main issue.

System: Mobile Phone

Component: Keyboard

Function: Allows the user to perform / execute operations on the mobile phone

Potential Failure Mode: doesn’t respond to actions; broken

Effects: incapability to execute actions

Severity: 7

Potential Causes: falls; water infiltration; wrong utilization by user; manufacture errors

Occurrence: 6

Current Design / Process Control: tests; inspection

Detection: 4

RPN (Risk Priority Numbers): 168

Recommended Actions: change keyboard material to a stronger and reliable one; more supervision

Component: Battery

Function: Provides energy and sustainability to the mobile phone

Potential Failure Mode: not functional; incapability of charging; low durability; overheating

Effects: dissatisfaction by the costumer; durability of the battery too insufficient for a correct utilization of mobile phone; constant shut down; risk of explosion

Severity: 9

Potential Causes: inappropriate type of batteries; negligent utilization by costumer

Occurrence: 7

Current Design / Process Control: tests; inspection

Detection: 3

RPN (Risk Priority Numbers): 189

Recommended Actions: utilization of appropriate batteries (lithium); more supervision

Component: mobile phone shell

Function: protection of internal components; mobile phone shell

Potential Failure Mode: broken; incorrect size; low resistance, external scratches

Effects: unappealing esthetics; uncomfortable utilization by users; low resistance to physical contact (light or strong)

Severity: 4

Potential Causes: manufacturing errors

Occurrence: 6

Current Design / Process Control: tests; inspection

Detection: 8

RPN (Risk Priority Numbers): 192

Recommended Actions: selection of appropriate material for the shell (resistant and adequate size); more supervision

Component: mobile phone screen/display

Function: interaction with the user; mobile phone operations/software; protection of internal display

Potential Failure Mode: black screen; colors change; no image on screen; screen with interferences; inappropriate resolution; dead pixels; broken screen; external scratches, broken display

Effects: incapability of interacting with mobile phone operations; mobile phone not functional

Severity: 8

Potential Causes: manufacture errors; wrong utilization by user; inappropriate technology

Occurrence: 6

Current Design / Process Control: tests; inspection

Detection: 2

RPN (Risk Priority Numbers): 96

Recommended Actions: selection of appropriate display technology and external screen material; more supervision

Component: mobile phone software

Function: controlling mobile phone hardware / functionalities

Potential Failure Mode: crashing; slow operability

Effects: user is incapable of operating with the mobile phone; data loss

Severity: 8

Potential Causes: incorrect software; programming failures

Occurrence: 9

Current Design / Process Control: tests; inspection

Detection: 2

RPN (Risk Priority Numbers): 144

Recommended Actions: selection of appropriate and reliable software; more supervision

Component: mobile phone hardware

Function: psychical components; interpretation of software instructions

Potential Failure Mode: physical damage, manufacture errors

Effects: inoperability of mobile phone; high dysfunctionality; short circuit

Severity: 9

Potential Causes: falls; water infiltration; manufacture errors

Occurrence: 7

Current Design / Process Control: tests; inspection

Detection: 2

RPN (Risk Priority Numbers): 126

Recommended Actions: careful manufacturing; stronger and more resistant materials; more supervision

Component: mobile phone DC input

Function: power supply input

Potential Failure Mode: internal connector

Effects: incapability of supplying electric energy to the mobile phone; short circuit

Severity: 7

Potential Causes: manufacture errors

Occurrence: 5

Current Design / Process Control: tests; inspection

Detection: 5

RPN (Risk Priority Numbers): 175

Recommended Actions: more reliable materials; careful manufacturing; more supervision

Component: mobile phone antenna

Function: antenna signal receptor

Potential Failure Mode: malfunction

Effects: signal reception dysfunctionality

Severity: 4

Potential Causes: manufacture errors; falls

Occurrence: 2

Current Design / Process Control: tests; inspection

Detection: 8

RPN (Risk Priority Numbers): 64

Recommended Actions: more reliable materials; more supervision

According to the details and results from the elaboration of all the FMEA method, the team analyzes the RPN's and get their conclusions. After looking at the results, we could say that looking at the RPN's would tell us that, for example, a failure on the phone shell would be the one with high priority because of the RPN's result (192). However, it's possibly to see that the severity of the failure is low, so there's no high risk that would turn the phone shell failure in a priority. On the other hand, there are components which RPN isn't the higher and that should be with high priority because their severity and occurrence are high, like the phone hardware or the phone software.

This results and all the analysis process show us that the team's work isn't always as simple as it could be after FMEA. They still

have to understand and decide which failures are really more important than others and “change” the priority ranking, taking all the necessary measures to eliminate the failures. In the case of the mobile phone it would be considered that battery, software and hardware are the components whose failures would have high priority towards a resolution.