Techno Harmony (Development Support System)

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Introduction

Due to widespread use of smartphones, tablet PCs and other portable communication terminals, business related to the Vehicle-ICT, which will realize a new car lifestyle by connecting those communication terminals with cars, has been rapidly expanding.

We established the "Techno Harmony" system for the purpose of contributing to the efforts made by FUJITSU TEN Group to shorten development periods of new functions and products and to evolve into a company that will satisfy the market needs first in the vehicle-mounted business.

The Techno Harmony is a system that can improve design productivity in three areas, product development, development of design engineers' skills and accumulation of know-how, by managing and storing evidence acquired from each step of the product development on one platform.

Outline of Problem Solving Process by Techno 2 Harmony

In order to solve problems found in each step of the engineering design (hereinafter simply "design"), this system provides guidance in the steps from problem detection to completion of problem solving measures. By storing the results of the measures taken in those steps, they are accumulated as know-how in a database. At the same time, the system shows regular processes of solving problems and provides know-how of design and verification, on the real time basis so as to enhance efficiency in product development and engineer training.

Moreover, the system is configured to support product development management by identifying development groups that need assistance through visualization of problem-solving progress for each product.

The guidance is given in the following three main steps of solving a problem (**Fig. 1**).

[STEP 1] Decision-making on policy for solving problem

Action items are entered onto the Techno Harmony in the five categories below to clarify when and who will verify what product to solve what problem.

- Specification change (customer)
- Specification change (FIJITSU TEN)
- Defects
- Upgrade
- Cost reduction

A policy for solving the problem is determined after its analysis and the evidence used for determining the pol-

icy is recorded.

[STEP 2] Design and management

After the problem-solving policy has been determined, in the case where a circuit of which know-how exists in the database, it is designed based on the know-how. In the case where there is no know-how, new design is engineered for the circuit and it is designed based on it.

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The results of its design verification are recorded and stored after being associated with the evidence and the DR minutes of it.

[STEP 3] Standardization

For standardization, the items below are reviewed and entered onto the Techno Harmony, being associated with the design change history.

New design

· Points to be improved from existing know-how



Fig.1 Image of Problem Management Process

3 Development Support System and Its Function

The Techno harmony includes four development support functions which are designed to solve problems and to provide training to engineers. Details of those functions are described below one by one.

①Function of providing design know-how

(For efficient design process and learning the design know-how)

②Function of providing verification know-how

(For efficient verification process and learning the verification know-how)

③FMEA preparation support function

(For efficient FMEA preparation process and learning the preparation know-how)

4Problem solving progress check function

(Management support by visualizing the problem solving progress)

For the functional layout of the system, see Fig. 2.



Fig.2 Block Diagram of Techno Harmony

3.1 ①Function of Providing Design Know-how

The function of providing the design know-how is designed for effective use and learning of the know-how needed for designing.

Table 1 Image of Engineering Design Requirement Sheet



Table 2 IIIage Of Lingineering Design Checkins	Table 2	Image	of	Engineering	Design	Checklist
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Function	Design requirement	Result of design	Link to evidence	Judgment
Basic function	Design requirements for the basic function	Result of measures for design requirements	Link to evidence	Pass or fail
Additional function	Design requirements for the additional function	ditto	ditto	ditto
Main unit function	Design requirements for the main unit function	ditto	ditto	ditto
Protection function against harmful effect	Design requirements for the protection function against harmful effect	ditto	ditto	ditto
Self- defense function	Design requirements for the self-defense function	ditto	ditto	ditto

Using this function, the engineers can call, from the database of the design requirement sheet^{*(1)} (**Table 1**), the design know-how (data) necessary to a circuit block to be designed. The called data serves as an entry point to the know-how of the circuit. The engineers can jump with only one click from the data to detailed description of the circuit design so that they can learn the working principles and the requirements of the circuit, effectively. Moreover, the requirement sheet can be converted into a form of a design checklist (**Table 2**) so that design quality can be improved by designing and verifying the circuit based on the checklist.

3.2 2 Function of Providing Verification Know-how

The function of providing the verification know-how is designed for effective use and learning of the know-how necessary for planning and conducting design verification.

When the circuit block to be verified is called from the verification item list database, this function shows the required verification items, the verification procedure and normal man-hour information (**Table 3**) in the form of the verification item list. The shown list includes links to verification procedure manuals of all the verification items in the list so that each of the verification procedures is only one-click away. Therefore, the engineers can effectively learn the necessary know-how of the circuit verification plan including all necessary items.

$\boldsymbol{*}\left(1\right)$ [What is the design requirement sheet?]

The form of the design requirement sheets was created based on the FMEA requirements. The sheets define functions needed for circuit blocks (Table 1 (A)) and design requirements to materialize the functions (Table 1 (B)). Moreover, each of them is an entry point of the design know-how including: reasons why the defined design requirements are required; names of documents describing the working principles of the circuit; and the link leading to the location where the document is stored (Table 1 (C)). Table 3 Image of Verification Know-how Database

Verified circuit block	Verification item	Normal man- hour (h)	Verification procedure link		[verification procedure manual]
DCDC converter	Regulation	A	Link to procedure manual		 Points to be observed
	Phase margin	В	ditto		 Verification conditions
	Short circuit	C	ditto	ľ	• Verification
	Durability against load	D	ditto		procedure • Circuit connection

3.3 ③ FMEA Preparation Support Function

This function is for more accurate identification of possible problems and higher design quality by familiarizing the engineers with the FMEA preparation process and enhancing efficiency in the preparation.

Fig. 3 illustrates an image of the preparation support function. The items below are materialized by this system supporting the FMEA preparation.

(1)When creating function list:

Familiarized to use of know-how (quality improvement) and effective search of existing know-how

2When transcribing data to another sheet:

Improvement in work efficiency by automatic transcription of data to another sheet



Fig.3 Image of FMEA Preparation Support Function

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3.4 ④ Problem Solving Progress Check Function

This function is designed for managers to provide early support to their development teams that are behind the schedule or that are facing high rate of defects by visualizing the process of solving the problems and the occurrence rate of problems for each category.

The figure below (**Fig. 4**) illustrates an image showing progress of a problem-solving process.



Fig.4 Image of Problem Solving Progress Check

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Conclusion

By introducing the Techno Harmony, the evidence acquired from each step of product development can be managed and stored on one platform, and the design productivity has been improved in the three areas of the product development, the development of design engineers' skills and the accumulation of know-how.

This system is helpful training means especially for young engineers and functions as an effective tool that provides many opportunities of awareness and learning.

There are still issues to be improved for designing new items. However, since it is possible for engineers to get accustomed to using and accumulating know-how, the system is useful in terms of design management.

In the future, hearing opinions and requests from user engineers, we will make efforts in upgrading the system so as to provide the better design environment to them.

FUJITSU TEN TECH. J. NO.41(2015)