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Improving device servicing process via standardized codes

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ABSTRACT

When a device breaks or malfunctions, users typically attempt to get it repaired or replaced by going to a walk-in service shop or shipping it to a servicing facility. Many servicing facilities operate independent of the device manufacturer and employ their own service technicians with varying skill sets. Servicing facilities often employ their own methods and processes to diagnose device problems and subsequently, to repair the device. As a result, the device servicing can vary across facilities or even across technicians within the same facility. This has a negative effect on consistency, quality, and costs of the device servicing experience. This disclosure provides improvements to the device servicing process via the use of standardized codes. The standardized code-based system efficiently maps device symptoms to the repair actions and parts, regardless of the stage during the device servicing pipeline at which these are discovered and reported.

KEYWORDS

- Hardware repair
- Hardware servicing
- Device return
- Repair action
- Repair parts consumption
- Post Repair Testing (PORT)
- Outgoing Quality Control (OQC)
- Out-of-the-Box Audit (OBA)
- Repair technician

BACKGROUND

When an electronic device, e.g., a smartphone, home speaker, wearable device, tablet, computer, or other device, breaks or malfunctions, users typically attempt to get it repaired or replaced by going to a walk-in service shop or shipping the device to a servicing facility. These shops or servicing facilities are authorized partners of the device manufacturer or are operated by the device manufacturer itself.

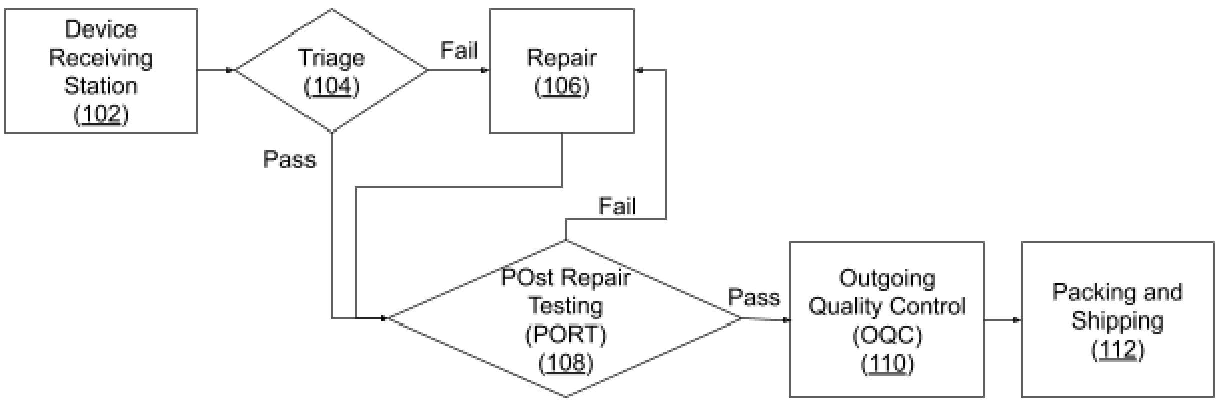

Fig. 1: Typical process flow for device repair at a device servicing facility

Fig. 1 shows the typical flow involved in device repair. As shown in Fig. 1, a received device (102) first goes through triage (104) to identify the specifics of the problem. Triage process can be done manually or automatically, often with the use of testing software or hardware. If the device is found to have a "fail" condition during the triage, it is repaired (106) followed by POst Repair Testing (PORT) (108). Alternatively, if no problem is found during triage ("pass"), the device may directly proceed to the PORT stage. If PORT indicates failure, the device is sent back to the repair stage. Otherwise, the device goes through Outgoing Quality Control (OQC) for cosmetic inspection and functional check (110) before being packaged and shipped back to the customer (112).

Many servicing facilities operate independent of the device manufacturer and employ their own service technicians with varying skill sets. Servicing facilities often employ their own methods and processes to diagnose device problems and subsequently, to repair the device. Moreover, there is often a high turnover of technicians which requires frequent onboarding and training for newly hired technicians. As a result, the device servicing can vary across facilities or even across technicians within the same facility. This has a negative effect on consistency, quality, and costs of the device servicing experience.

DESCRIPTION

This disclosure proposes improvements to the device servicing process via the use of standardized codes for devices from an individual manufacturer. The codes are shared with multiple service partners, e.g., all service partners that provide authorized service for devices from the manufacturer. Separate standardized codes are provided for each stage within the device servicing process. Specifically, the following standardized codes are implemented:

1. **G-code:** Each specific issue reported by the customer is assigned a G-code.
2. **T-code:** Each problem identified during the triage process is assigned a T-code.
3. **X-code:** Each problem identified during the POst Repair Testing (PORT) process is assigned an X-code.
4. **Q-code:** Each problem identified during the post-repair steps of Outgoing Quality Control (OQC) or Out-of-the-Box Audit (OBA) is assigned a Q-code.
5. **R-code:** Each specific action taken for repairing the device is assigned an R-code.
6. **Other**: Failure or problems detected via any other means or sources are assigned other codes.

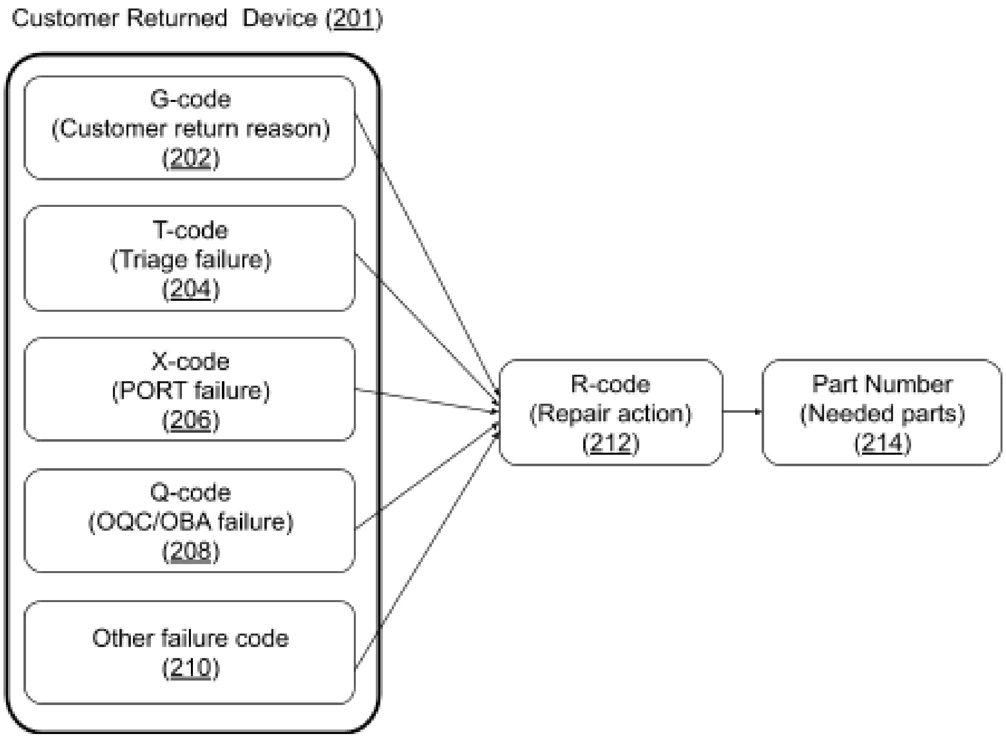

Fig. 2: Mapping failure symptoms to repair actions via standardized codes

As illustrated in Fig. 2, the codes are designed such that each G-code (202), T-code (204), X-code (206), and Q-code (210) is connected to an R-code (212) that designates the corresponding repair action to be taken to address the issue identified by the code. Similarly, other failure codes (210) can also be connected to specific R-codes. In turn, each R-code is mapped to device part numbers indicating the parts required (214), if any, to perform the repair action connected to the R-code.

Although failure symptoms for a specific device problem, such as issues with a front camera of a smartphone, may differ across the device servicing stages, the issues are addressed by the same repair action and parts, such as replacing the front camera of the device. It is essential that the R-codes be selected such that they correspond to a repair action that involves repairing or replacing a key component or module of a device, e.g., a smartphone, and not to all parts of the device including small parts such as screws or adhesives. The standardized code-based system described herein efficiently maps the symptoms to the repair actions and parts, regardless of the stage during the device servicing pipeline at which they are discovered and reported. Moreover, the proposed system overcomes the limitations of the current reporting of failure symptoms that uses non-standardized and text-based formats which require further manual processing and interpretation in order to determine the appropriate repair action.

Depending on the issue, each G-code, T-code, Q-code, or other code can be associated with multiple R-codes if addressing the issue requires multiple repair actions. In some cases, the multiple repair actions may need to be performed in a specific sequence. In addition, in some cases, each subsequent recommended repair action may be necessary only if the preceding repair action fails to resolve the issue. Fig. 3 shows an example depicting a device (302) that does not power on. The T-code assigned to the issue (304) indicates three R-codes for three repair actions (306) with corresponding part numbers (308) required to perform each action. In this case, if Repair Action 1 does not solve the problem, the technician can move on to Repair Action 2 and so on.

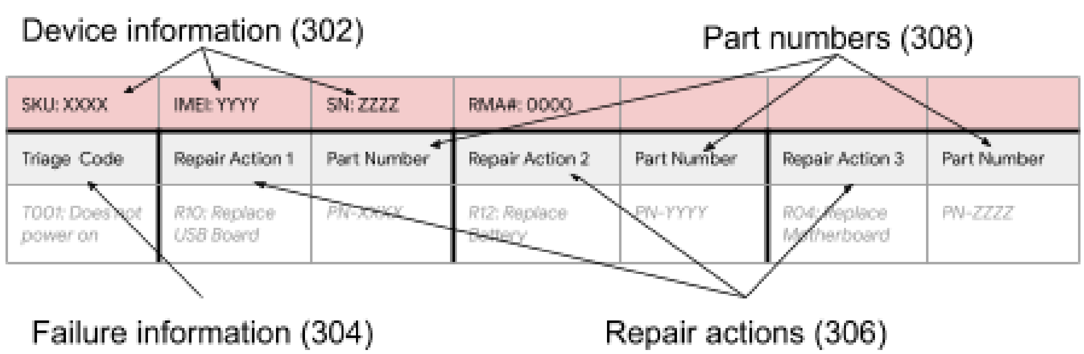

Fig. 3: Multiple repair actions mapped to address a device failure

The mappings are designed to be integrated with software used by the service facility to manage its operations. With such integration, scanning the device information, such as SKU, IMEI, Serial Number, or RMA Number, etc. can provide code information akin to the example shown in Fig. 3. Based on the information presented, the repair technician can determine the next course of action. Such operational integration of the proposed codes and mapping can minimize variations and inconsistencies in service actions across service centers as well as across technicians within the same service center. In addition, it enables quick on-boarding of new repair technicians with minimal training and reduces dependency on hiring technicians with more years of experience.

Further, the standardization allows capturing relevant data about device servicing operations on a global scale for a particular manufacturer, thus enabling application of data analytics for various purposes, such as inventory tracking and routing of device parts. Analysis of data collected during the repair process via the standardized codes can be further applied to make improvements to the repair process itself. For example, if it is found that the second repair action fixes the issue connected to a given T-code in 90% of the cases, that action can be promoted to be the first in the recommended sequence. Moreover, the data can reveal failure trends and interactions which can be addressed to decrease inefficiencies, delays, and costs.

Parts consumption is one of the biggest cost drivers in the hardware service industry. With the techniques described herein, service centers can have clear visibility of the service stage where the parts are being consumed. For example, an increase in motherboard consumption can be traced to its part number and corresponding R-code (e.g., “Replace Motherboard”). From the shop floor data, one can trace the corresponding T, X, Q or other codes that are calling for the repair action of “Replace Motherboard.” Thus, abnormal trends in parts consumption can be easily traced to a root cause, thereby addressing the issue quickly and reducing the consumption of costly parts.

CONCLUSION

This disclosure provides improvements to the device servicing process via the use of standardized codes. The standardized code-based system efficiently maps device symptoms to the repair actions and parts, regardless of the stage during the device servicing pipeline at which these are discovered and reported. The system overcomes the limitations of the current reporting of failure symptoms that uses non-standardized and text-based formats that require further manual processing and interpretation in order to determine the appropriate repair action. These mappings are integrated with the software used by the service facility. Such operational integration of the proposed codes and mapping can minimize the variations and inconsistencies in service actions across service centers as well as across technicians. In addition, it enables quick on-boarding of new repair technicians with minimal training. Further, the standardization allows capturing relevant data about device servicing operations on a global scale and enables data analytics for various purposes.