ARTICLE

TOWARDS UTILIZATION OF A LEAN CANVAS IN THE BIOMETRIC SOFTWARE TESTING

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ABSTRACT

The growth of technology kept a unique value in the market for the biometrics products and its solutions. Biometrics solutions normally collect the human characteristics related different metrics and main utilization of biometric software solutions is in security. Biometrics solutions are mainly cauterized in two types physiological & behavioral characteristics. Growing digital data and human dependency on software embedded devices created questions on the security of the system and its collected data safety. Another side day to day growing digital security threats and personal data protection forced the human to think and adopt the biometrics solutions for better data security and protection. Some of the research suggests in the year 2015 overall biometric solutions market expected to be worth $13.8 billion and this information boosted the development of the number of the unique biometric solution with introducing the cutting-edge technologies. Development of biometric software solutions is turned into the new age with the usage of the number tools and technologies for the biometric data collection store and retrieve information for the valid human authentication. In recent years' biometric authentication possible with many types of devices including mobiles. In this case, it is becoming very important test the biometric software performance in more precisely on a number of supporting mobile devices before giving software to end customer. Overall biometric performance testing is key for the biometric software solution make successful with end customers. From many years, the traditionally lean canvas is used for business planning's and strategy building, but considering the lean principles we can generate the more suitable lean canvas for the biometric software test planning and in test strategy building.

INTRODUCTION

In daily life, digital personal identification, frauds preventing and personal data security becomes more important for securing the user tractions. Biometric is more advantages comparing any other, it uses such technology that checks many human body characteristics such as Deoxyribonucleic acid, iris recognition, eye retina, fingerprint, palm veins, palm, voice, typing rhythm, and gait. These all characteristics are unique with each human being and difficult to create a clone of them. The biometric solutions secured human life with personal identification via token-based technology for the passports, driver license, passwords, etc. In this path, biometric identification software and hardware are playing a key role in securing the data in the more advanced way. Biometric identification now used daily routine life, such as in banks, web login, offices, government office, personal mobile login as well as in the surveillance. The biometric solution created an advanced layer of protection to user data that's not very easy to break for the malicious attackers.

Biometric software success depends on its performance results. It is very important biometric application need to be well tested to get best results. Robust error free software plays a key role in succeeding the biometric software solutions to intended end users. From many years' lean canvas is used only in the business validation, but adoption of the lean principal in the lean canvas development for the biometric software verification, validation process can impact directly on software quality. Lean canvas simplifies the test planning and reduces the cost of software testing itself.

The problem statement

In biometric software testing process, quality assurance team faces many challenges while creating the test plan and test strategy.

The most common biometric software testing challenges are:
- The performance [1] of the system is key for succeeding biometric software characteristics such as accuracy, speed.etc
- The number of performance objects increases the test complexity (e.g. number of images, multiple fingers).
- Need more effort to collect correct sample test data for the test system.
- Feature extraction capabilities & complexity of merging data from self-developed vs third part algorithms.
- Biometric capture time of human characteristics with the help of hardware [2, 3] (e.g. scanners, mobile, embedded devices).
- Complexity in testing if biometric using multiple human body characteristics performance objects for identification.
- Lack of combination of sample tests data for testing objects.

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- Combination of performance metrics for biometric systems such as FAR = False Accept Rate, FRR = False Reject Rate, ROC = Receiver operating characteristic, EER = Equal error rate, FTE = Failure to enroll rate, FTC = Failure to capture rate, TC = Template capacity.
- Captures image quality factor, improved data quality and dealing with poor quality input data for biometric system affect the performance.
- Single algorithms or combination of algorithms to get more desired results increase the complexity of the system.

Scientific novelty of paper

From many years, lean canvas is used only for the creating and evaluation of business models. The lean canvas is a white board consists of the several segments on it and it shows the overview of the business. It is drawn on a single page which helps to plan the business ideas, prototype, segment the business and validation with help of several segmented blocks. This board can help you to make strategy, planning, decision-making and help the team to build better businesses.

Now considering lean canvas design as a base for biometric solution system software testing to find the optimal test metrics for the test planning and test strategy.
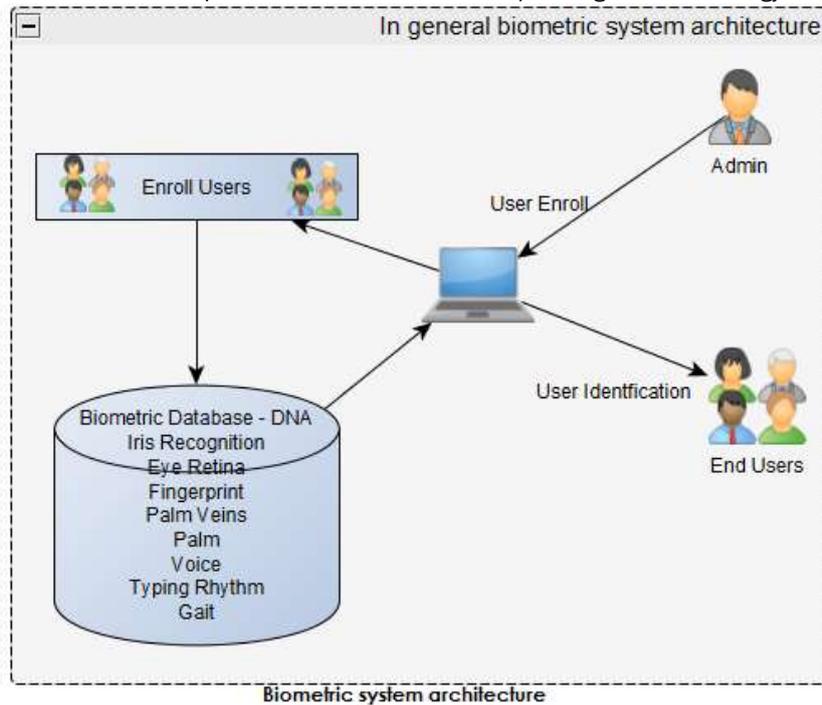

Fig. 1: In general biometric system architecture.

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Specifically

- Investigating and building the more sophisticated lean canvas prototype in biometric software testing.
- Developing the biometric test strategy and planning using lean canvas.
- Analyze and simplifying the test planning for the biometric solutions.
- Taking care of lean principles, need to design the biometric testing compatible lean canvas.
- Identifying the most appropriate lean canvas metrics from biometric such as FAR, FRR, ROC etc. those fit in test planning.
- Identifying the biometric system subcomponent, software features to do integration and end to end testing.

Related research

Alex Osterwalder with his co-authors in the year 2000 introduced first-time business model canvas for the business planning and strategic management. The business model canvas acts as a one-page light weight document where the user can visualize possible activities of the business. In the year 2006 business model canvas is named as a lean canvas [4].

The business model canvas life cycle phase start with an idea, build, product, measure, data and learn.
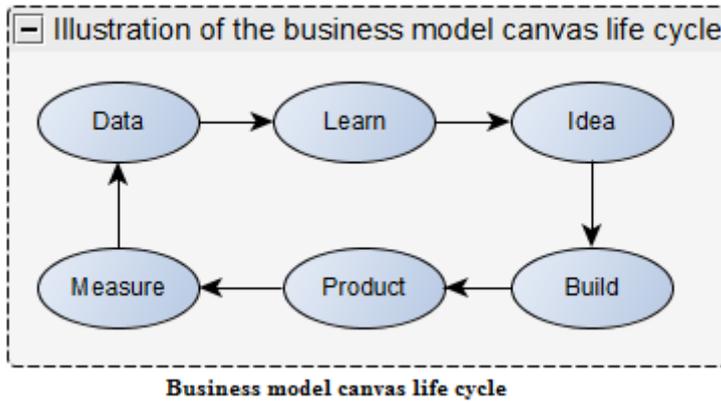
Fig. 2: Illustration of the business model canvas life cycle.
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Business model canvas fundamentals help to identify the object of the business.

- Start with an idea and loop with learning.
- Remove the unwanted things from the process in life cycle by analyzing.
- Constant feedback in the life cycle.

Biometric testing and Lean canvas life cycle

From [Fig. 1], In general, biometric system architecture demonstrate the system overview now considering the business model canvas life cycle, we able to identify the similar terms for biometric testing [7].

- Ideas = Biometric solution using DNA, iris recognition, eye retina, fingerprint, palm veins, palm, voice, typing rhythm, and gait or the combination of any of them.
- Build = Biometric capturing hardware and software.
- Product = Biometric as a solution.
- Measure = FAR, FRR, ROC, EER, FTE, FTC, TC
- Data = Stored templates in the database.
- Learn = Performance and logs.

Biometric system testing process and possible waste identification test metrics using lean principles

In the general test plan for the biometric system solutions need to rethink because of many reasons, but among important is test engineers are using collected data from various human characteristics and sometimes reusing sample data of different n numbers of users is not show the [4]. Moreover, sample data generated from software not give hundred percent guarantees about data that is matched with real user human characteristics.
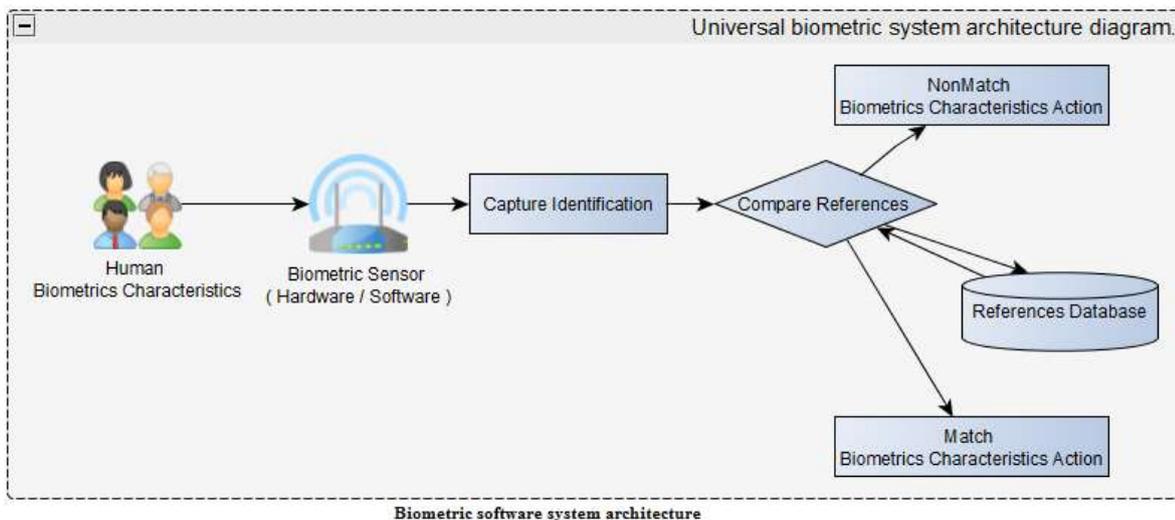

Fig. 3: Universal biometrics system architecture diagram.
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In biometric software development, it is needed to understand the importance of possible waste producing that can directly impact on the software development and testing cost, time as well as on software quality.

In such situation using lean seven principles [5], we can get different test metrics [8] and these can be used for the biometric testing process.

Transport – Sample test data generated from software not guaranteed results with comparing real user data.
Inventory – Without having good compatible hardware and software under investigation not able to test.
Motion – Testing the users in a test environment as well as a real environment bring different results.
Waiting – Identification processing time.
Overproduction – Testing the solution in such environment itself, where it not able to adopt it.
Over processing – Not having the appropriate user database for testing, resulting performance go down.
Defects – Fail to detect early stage bugs due to lack of real environment setup.

Lean canvas board test metrics for biometric products testing

Now with the help of seven lean principles, we can recognize new possible biometric test metrics. Collected all various metrics can be used to visualize the lean canvas on the white board. Collect test metrics titles may vary and improve the overtime on lean canvas board.

Lean principles and design lean canvas board

From above chapter, we get to know that there are possibilities we can generate the different basic biometric software test metrics those can be used further for the drawing the lean canvas board. Once we identified the test metrics, then we can create the number of blocks and names on the white board.

CONCLUSION

The study about biometric test process and test strategy improvement with utilization of lean canvas shows the new possibilities for visualizing the process on the single page. This one-page light weight document can direct impact on the software verification and validation process as well as save money that spent in testing. In next level to create and visualize lean canvas for the biometric testing need to continue the following research activities.

- Identification of lean canvas test metrics needs to be done with real product development environment.
- Need to carry out an experiment that segment testing process into sub-components.
- Lean metrics identification and brief description need to set for them
- Need to develop a prototype that shows the biometric lean canvas visualization.
- Need to develop algorithms that identify and optimize the lean metrics.
- Need to develop software that generates a prototype for biometric software test planning.

Author wish is to ideas discussed in the above research article generate new ideas and new research topics. Also, about how biometric software testing can be improved with the adoption of lean canvas on it.

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