The Effect of Adding New Services to Trainees System: Rayat Portal Case Study

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Abstract: *Requirement engineering is the most effective phase of software development life cycle. It aims to collect good requirements from stakeholders in the right approach. It is important for every organization to develop high quality software products that satisfy user's needs. This paper aims to study the effect of adding new services to trainees' system (Rayat Portal) in facilitating the followed procedures and adding extra value to the business.*
Qualitative and quantitative methodologies have been conducted for data collection to measure stakeholders' satisfaction from many aspects in term of functionality, usability, maintainability, portability, efficiency, develop methodology and requirements election ways. the results of the questionnaire and interviews held showed higher level of satisfaction from stakeholders. The higher level of satisfaction reflects the correctness of the requirements election phase. Moreover, literature reviews have been conducted to show the importance of requirement engineering and how it's so critical having proper requirement engineering to any project.

Keywords: Requirements engineering, E-services, RAYAT Portal, Development, System requirements specification.

I.   INTRODUCTION

Technical and Vocational Training Corporation has been established to prepare manpower in the technical and vocational fields. The Technical and Vocational Training Corporation aims to develop national human resources through training that contributes in meeting labor market needs of qualified manpower. In order to achieve this, designing training programs, implementing training programs, training of technical and vocational trainers, public and private sector participation in training should be conducted to provide specialized technical and professional human resources, establish technical and vocational incubators for training in addition to licensing the private sector for training and supervision of it, and define its technical parameters.

The Technical and Vocational Training Corporation includes technical colleges for both genders, secondary industrial institutes for boys and girls college of excellence in all regions of the Kingdom of Saudi Arabia. It offers various training programs and grants different diplomas to trainees. Also, the English language program offers for graduates with a diploma, in addition the possibility of completing a bachelor's degree in the colleges of boys. The number of trainees for this semester is approximately 139,789 trainees.

In order to provide appropriate services for the trainees and to facilitate their procedures, RAYAT system has been established. The project aims to develop the provided electronic services for the trainees' that currently occupy the colleges and institutes and the most other training units. The desired benefits of Rayat are to implement a global system of best practices in education, to link trainers with trainees using the latest educational techniques, to create a unified database of courses, curricula, plans, trainees and trainers, to complete the entire study process, to calculate the training load, to increase the quality of data and information for the training process, application of smart devices, track the training path electronically and develop the training process. Furthermore, Rayat portal seeks to: enhance quality of provided services, raise satisfaction level of trainees, trainers and employees, attract more trainees and access to global levels of education and training delivery.

The need has increased in the different departments of the institution and its training colleges for a central system to serve all departments in the institution related to the training process and to apply and develop it so that there is a central to collect information and statistics and submit them to departments by specialization the need to improve the training process.

Therefore, there were regular workshops to gather requirements for the establishment of a central system that serves the training colleges including the trainees, trainers and various departments. including: Admissions and Registration Officers at Technical Colleges for Boys and Girls in Riyadh, Team of Trainee Services Department, Of the Intensive English Program and a team from the General Administration of Information Technology in agreement with a foreign execution technology company.

The most important benefit of automation is allowing trainees to do their activities remotely rather than attending to the offices of admission and registration in the colleges. Furthermore, these are the main electronic services offered by Rayat

portal:

- Query for grades.
- Registration of materials in the training course.
- Delete and add curriculum.
- Extract the academic record.
- Inquire about office hours for a particular instructor.
- Change password.
- Request for change of specialization.
- Request to change training branch.

Since, the Rayat portal provides many services to the trainees and the trainers of the training units. This research studies the effect of adding services on Rayat portal to facilitate trainees' procedures, know their satisfaction and how does it reflect on requirements specification from the service side that provided to trainees. Thus, this research describes literature review, methodology used to collect and analyze data. After that, illustrates results of survey and interviews.

II.   LITERATURE REVIEW

There are many systems in educational field which are contribute in enhancement of the educational process. This section reviews a similar system to the Rayat Portal, King Saud University (KSU) attaches great importance to the transformation to electronic transactions. Due to the great development of information technology in the university and the transformation of the traditional procedures into electronic form, the need to limit these services and their definition is clearly accessible by the beneficiaries.

KSU Edugate portal provides access to all e-services for faculty members, employees, students and visitors. This portal has many e-services including inquiry services such as salary and vacation inquiries, as well as procedural services such as promotions, attending conferences and applying for allowances.

KSU offers an e-services catalogue that presents detailed information about each e-service.
Examples of E-services that serve the students**:**

- Training courses and workshops.
- E-Application for graduate admission.
- Student cases.
- Approval of research proposals.
- Cancelling registration.
- Training session registration for students.
- Registration and attendance statement letter.
- Withdrawal from the university.
- Updating personal information.
- Major selection.
- Postponing a semester.
- Student complaints.
- Registration application for academically dismissed students.

It is important in these days to produce high quality systems and ensure that the requirements collection is well-defined and document these procedures as a reference for developing and modifying purposes [1].

III.   METHODOLOGY

Qualitative and quantitative methodologies have been used for data collection. The used quantitative methodology is the survey which has been published and distributed electronically using google forms. The survey aims to determine the quality of provided students' services at Rayat Portal to improve the performance and to know about students' feedback and their proposals for development. The distributed survey's questions have been written in both English and Arabic

languages, but the distributed survey was in Arabic to ensure that trainees will understand and respond to it efficiently, surveys have been distributed via WhatsApp messages and emails. The table below represents the content of the distributed survey:

Table 1: Survey contents

			• Decoration and beauty technology
	Factors	**Characteristics**	**Choices**
1	**General Information**	Specialization	• Computer and information technology • Administration management • Fashion design and technology
2		Level of education	• Regular trainee • Graduated
3	**Functionality**	The portal enables the trainee to register training subject	
4		The portal provide the ability to change the specialization	
5		The portal calculates the GPA for each semester	
6	**Usability**	It's easy to reach the provided services	• Strongly agree • Agree • Neutral • Disagree • Strongly disagree
7		The used color are suitable and convenient	
8		The displayed notifications describe issues clearly	
9		The portal has a user manual illustrates how to use the portal	
10	**Maintainability**	Availability of different contact channels (phone- email- technical support system)	
11		All clarifications have been answered clearly	
12		The raised comments and suggestions have been taken care of	
13	**Portability**	The portal is compatible with different browsers	
14		It's easy to use Rayat application in portable and smart devices	
15		All services of Rayat application are working in efficient way on portable and smart devices	
16		The provided services vary between Rayat web portal and mobile application	

17	**Efficiency**	The trainee can access the portal anytime during the training semester	
18		The availability of tracking the tickets raised by the trainee	
19		The portal participates in reducing the need to visit corporation center, by providing integrated online services	

Appendix A show the survey questions. In addition to that, interviews with Rayat system analyst, quality assurance team and one member of operation team in order to make sure the wide coverage of requirements elicitation stage and the possibility of any future enhancements. Appendix B, C and D show the interviews questions and answers.

IV. RESULTS AND DISCUTIONS:

This section describes the finding of the survey and interviews. The survey and interviews aim to measure the level of quality and satisfaction about the provided services to the trainees in the Technical and Vocational Training Corporation (Rayat Portal) and how does it reflect on requirements elicitation.

The survey results were analyzed using SPSS tool in order to get statistical information. The survey contains general and specialist questions. The specialist questions answers using Likert scale as the following:

Table 2: Likert scale used.

The choice	Likert scale
strongly agree	1
Agree	2
Neutral	3
Disagree	4
strongly disagree	5

The survey has been distributed electronically by WhatsApp messages and Emails, 61 responses have been collected giving as 90.1% of reliability statistics.
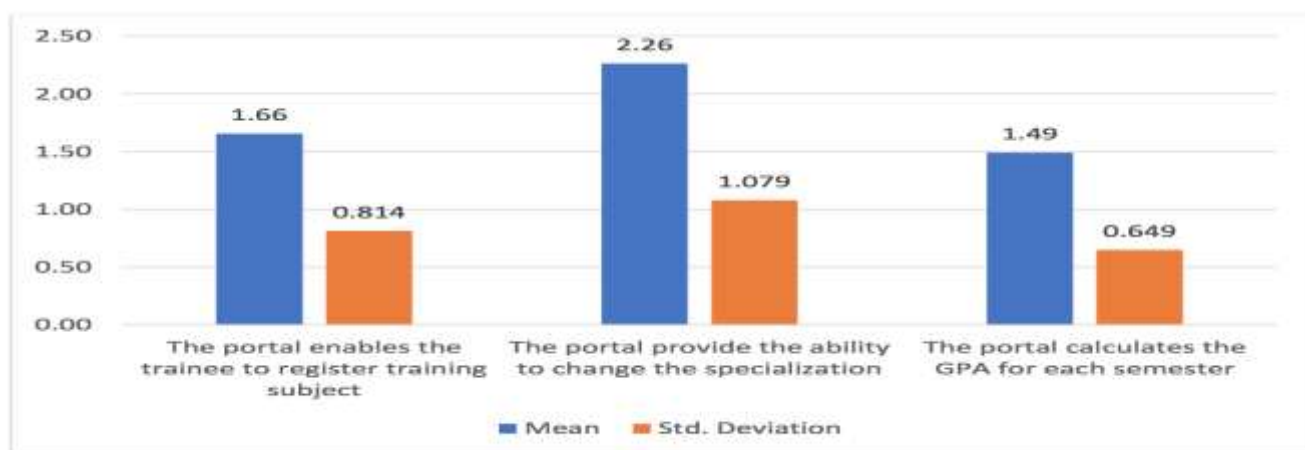

Figure 1: Functionality Factors

Figure 1. shows that the mean of the portal's ability to change the specialization is 2.26, the mean of the portal's ability to register training subject is 1.66 and the mean of the portal's ability to calculates the GPA of each semester is 1.49.
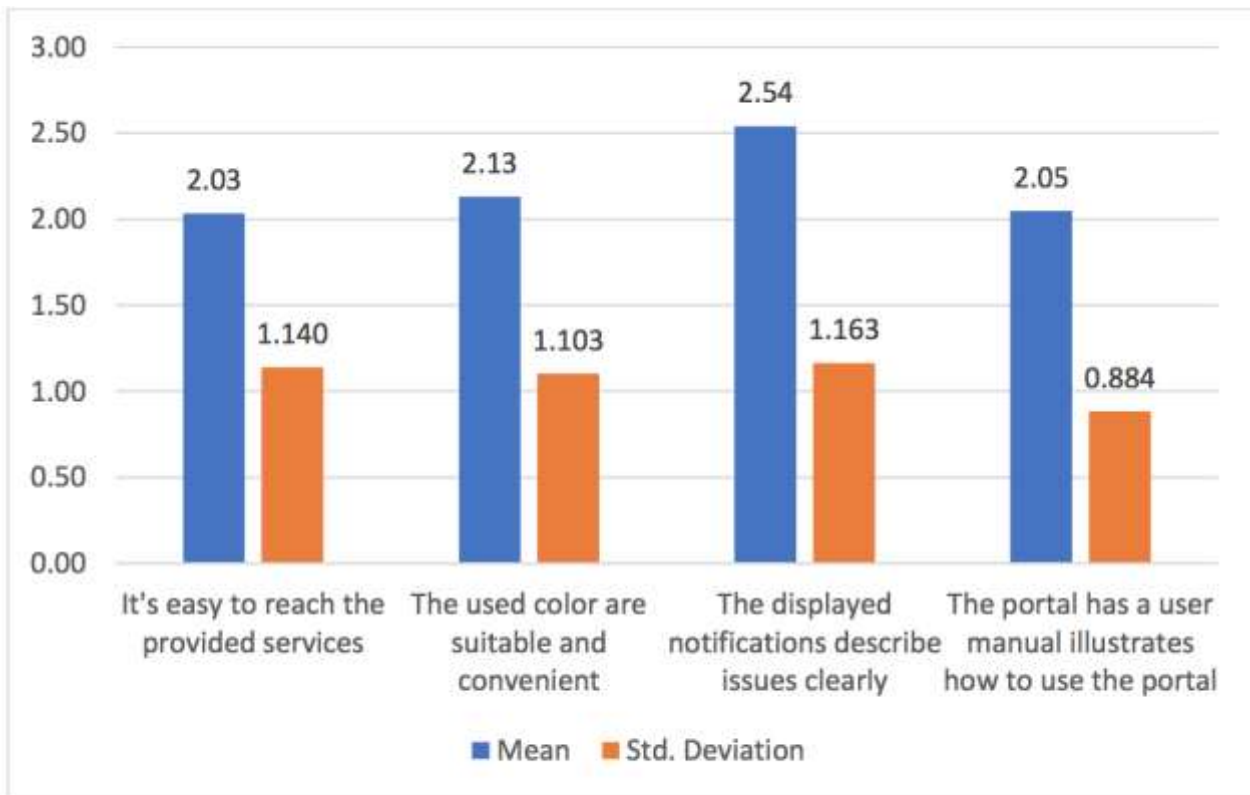
Figure 2: Usability Factors

Figure 2. shows the usability factor, the displayed notifications describe issues clearly is highest mean 2.54 and the lowest it's easy to reach the provided services 2.03.
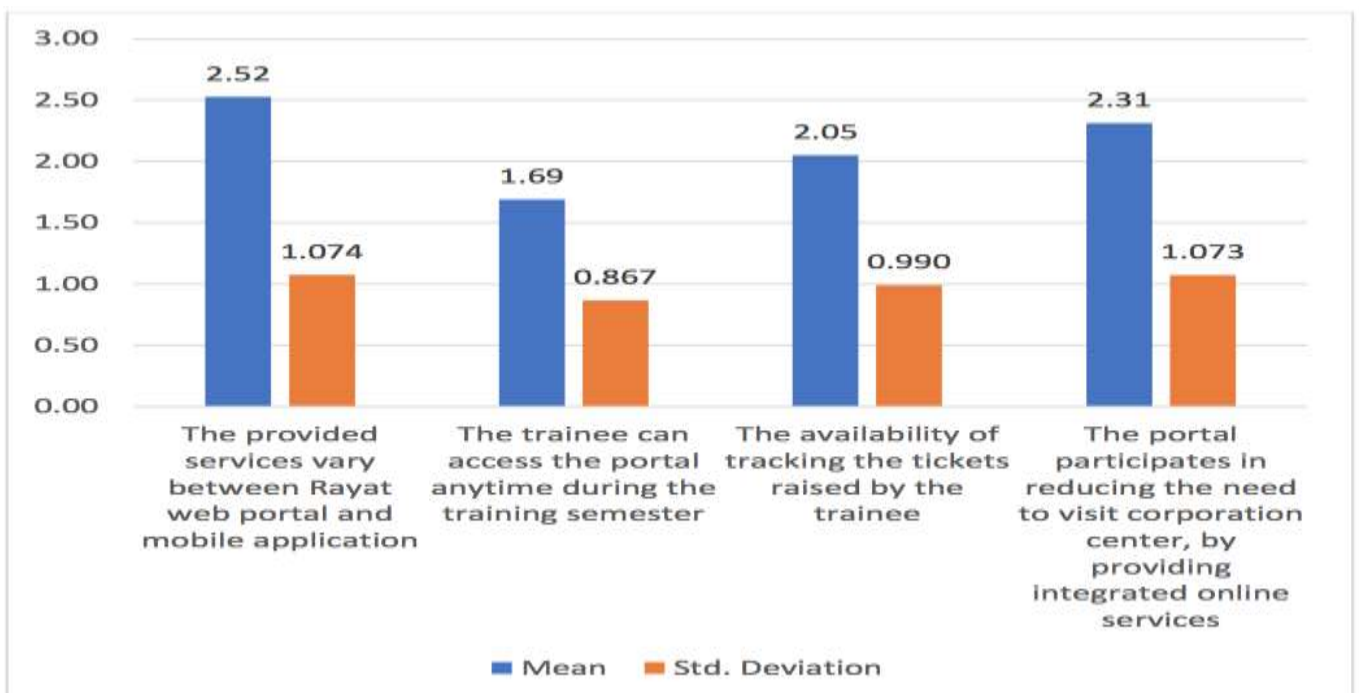

Figure 3: Reliability Factors

Figure 3. shows reliability measures in figure 3. So, the provided services vary between Rayat web portal and mobile application means 2.52.
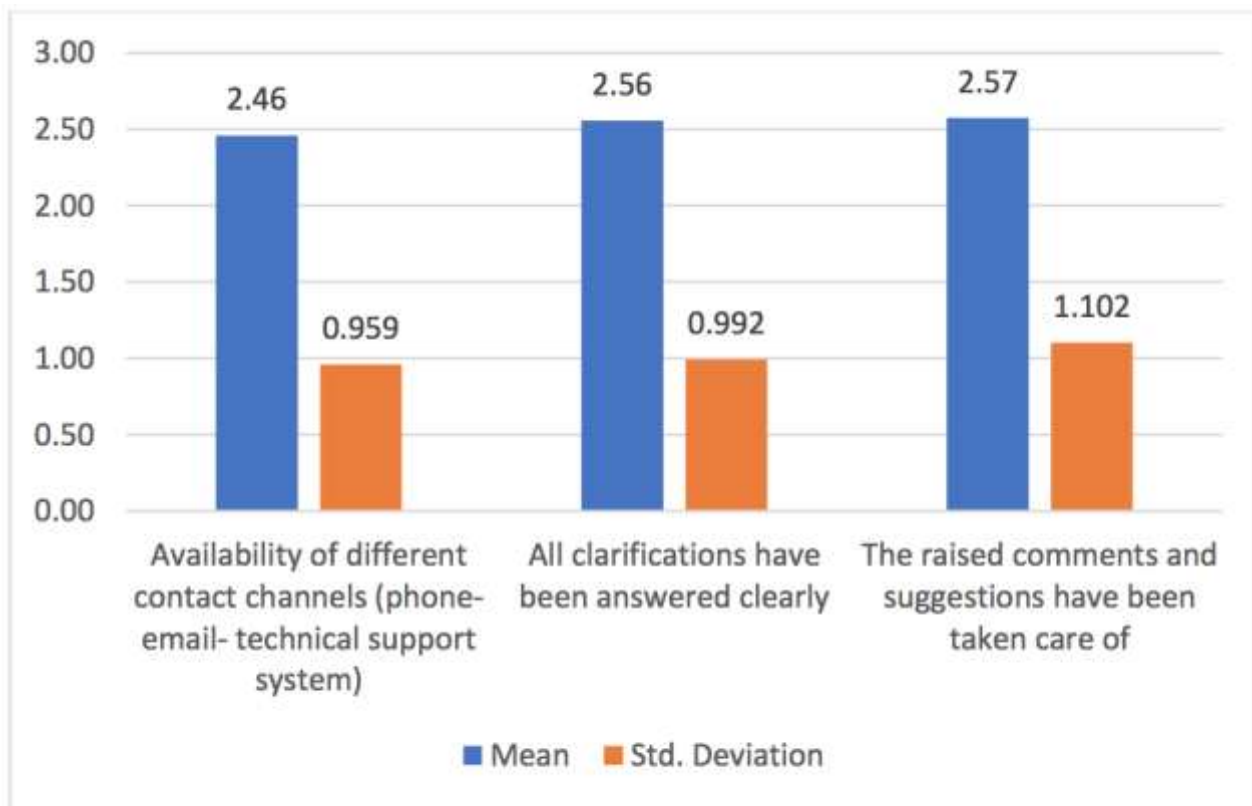
Figure 4: Efficiency Factors

Figure 4. Shows that the mean of raised comments and suggestions that have been taken care of is the highest 2.57.
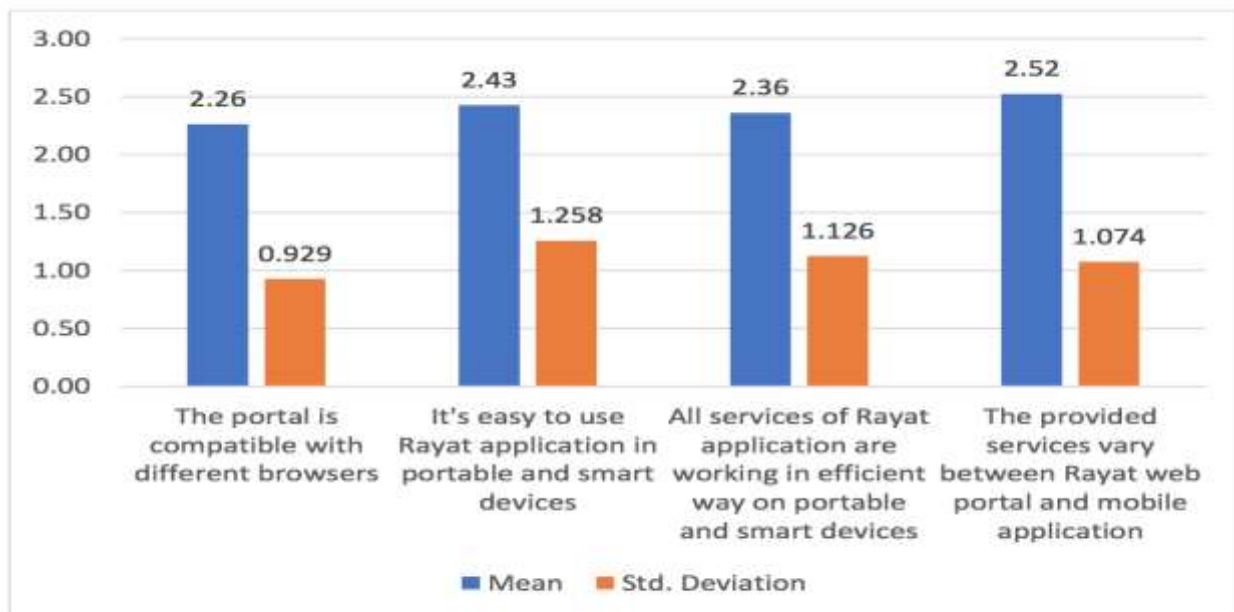

Figure 5: Portability Factors

The mean of the provided services vary between Rayat web portal and mobile application is 2.52 as shown in figure 5. Through the survey, it shows the extent to which the requirements of the system accurately determine the quality of the service and the possibility of developing it. The survey and the obtained answers are shown in the table 3, and figure 6.

Table 3:System requirements specification

No	Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	The portal enables the trainee to register training subject	30	25	4	4	1
2	The portal provide the ability to change the specialization	18	18	18	5	2
3	The portal calculates the GPA for each semester	35	23	2	1	0
4	It's easy to reach the provided services	24	21	10	2	4
5	The used color are suitable and convenient	19	27	8	3	4
6	The displayed notifications describe issues clearly	13	18	18	8	4
7	The portal has a user manual illustrates how to use the portal	16	31	10	3	1
8	Availability of different contact channels (phone- email- technical support system)	10	23	18	10	10
9	All clarifications have been answered clearly	10	17	26	6	2
10	The raised comments and suggestions have been taken care of	10	21	19	7	4
11	The portal is compatible with different browsers	11	31	12	6	1
12	It's easy to use Rayat application in portable and smart devices	14	26	9	5	7
13	All services of Rayat application are working in efficient way on portable and smart devices	14	24	14	5	4
14	The provided services vary between Rayat web portal and mobile application	12	19	17	12	1
15	The trainee can access the portal anytime during the training semester	31	21	7	1	1
16	The availability of tracking the tickets raised by the trainee	19	27	10	3	2
17	The portal participates in reducing the need to visit corporation center, by providing integrated online services	15	22	17	4	3

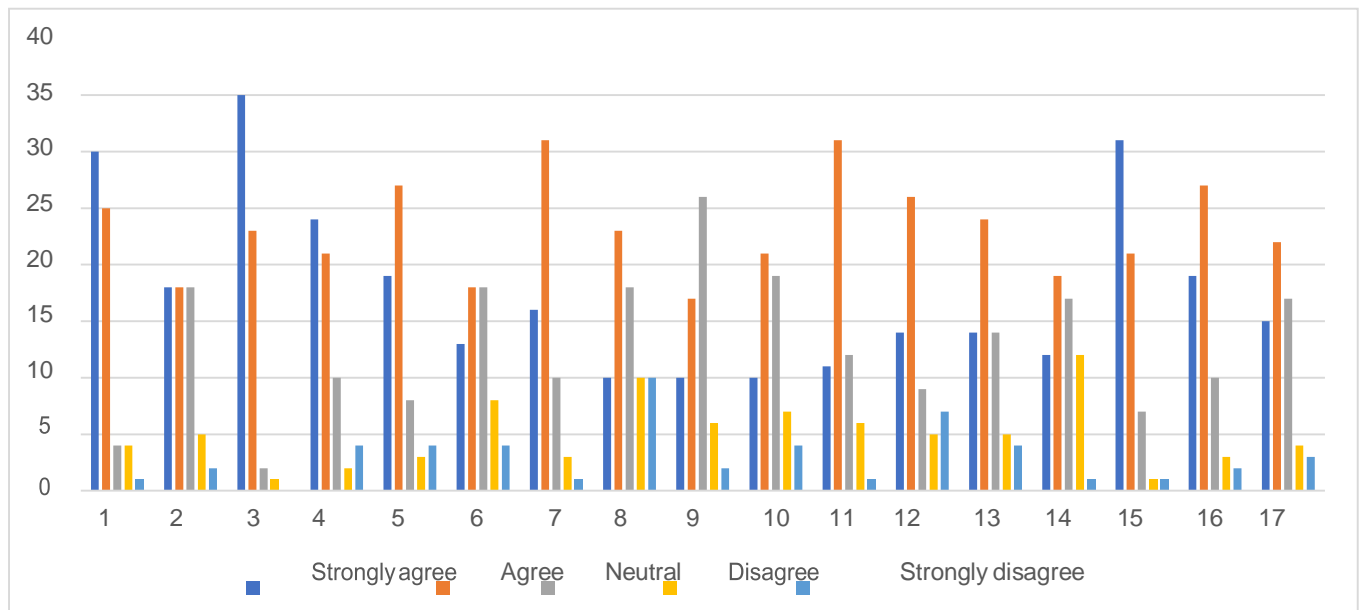The results of Table 3 are shown again in Figure 6.

Figure 6: System requirements specification

Interviews results:

The interviews have been done with Rayat system analyst, system operator and quality assurance. These interviews prove the importance of system analysis stage besides requirements elicitation and user's involvement from the beginning of project life cycle, writing clear and specified objectives and choosing the best development methodology. All of these factors contribute in success of the project, reduce the amount of errors which may occurs, facilitate the portal usage, delivers user's needs in order to simplify their operations and support the continuous and the future development of Rayat portal.

V. CONCLUSIONS

This paper has been explained using Rayat Portal as a case study, that critical part of any software development project is the requirements gathering. Communication, cooperation and time, this was the way to accomplish the high and good requirements document, and enhancing the clarity of requirements can significantly improve the outcome of software projects.

Stakeholders should be involved throughout the project but stakeholders cannot do the job by themselves. Customer input can help bridge the gap between what is expected and what's delivered. Developer input can help reduce development time and project cost by adding valuable insight about technical aspects of the requirements reducing the amount of rework, which the project will need.
When everyone works together to develop high quality requirements document you end up with a much better result.
So, some of the benefits from good requirements gathering can be: fewer defects in the delivered product, less development rework, faster delivery of the finished product, less unused features, lower cost of development, higher levels of satisfaction from stakeholders, higher levels of satisfaction from developers, higher levels of satisfaction from consumers and users.
The results of the questionnaire and interviews showed higher level of satisfaction from stakeholders. The higher level of satisfaction reflects the correctness of the requirements election phase.

REFERENCES

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Appendix A

Rayat Portal Services Evaluation

The aim of this survey is to measure the level of quality and satisfaction about the provided services to trainees in the Technical and Vocational Training Corporation (Rayat Portal).
Note that this survey will be used only for scientific research purposes, your participation is much appreciated.

Specialization *
- Computer and information technology
- Administration management
- Fashion design technology
- Decoration and beauty technology

Level of education *
- Regular trainee
- Graduated

The portal enables the trainee to register training subject *
- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The portal provides the ability to change the specialization *
- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The portal calculates the GPA for each semester *
- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

It's easy to reach the provided services *
- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The used colors are suitable and convenient *
- Strongly agree
- Agree
- Neutral

- Disagree
- Strongly disagree

The displayed notifications describe issues clearly *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The portal has a user manual illustrates how to use the portal *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Availability of different contact channels (phone- email- technical support system) *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

All clarifications have been answered clearly *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The raised comments and suggestions have been taken care of*

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The portal is compatible with different browsers *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

It's easy to use Rayat application in portable and smart devices *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

All services of Rayat application are working in efficient way on portable and smart devices *

- Strongly agree

- Agree
- Neutral
- Disagree
- Strongly Disagree

The provided services vary between Rayat web portal and mobile application *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The trainee can access the portal anytime during the training semester *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The availability of tracking the tickets raised by the trainee *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

The portal participates in reducing the need to visit corporation center, by providing integrated online services *

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

For any more suggestions please mention them:

Appendix B

System analyst interview			
Interview data			
Date	01/04/2019	**Duration**	30 min
Interviewee data			
Name	-------	**Title**	System analyst

- **What is the methodology type which has been used in the development of Rayat portal?** It was agile methodology, which provides flexibility and deliver services incrementally based on the priority.

- **Was the user involved during the project life cycle?**

  Yes, from early stage till the end of the project. For instance, Technical and Vocational Training Corporation have formed a committee consists of members from admission and registration, studies programs management and trainee's affaires. To take their experiences.

- **What was the fact finding that was used by the system analyst in Rayat portal?**

  System analyst has used interviews, follows the committee's works and forms used in the corporation and realize the old version of the system and its supportive documents.

- **What was the most important elements mentioned in Software Requirement Specification (SRS) for the wanted services?**

  Functional requirements, business process, screens visualization and the customer agreement about the service.

- **Was the delivery time being realistic and how it can be adjusted?**

  Yes, it is determined from the experience of previous systems and from the available resources. Furthermore, the completion of services is depending on their priority.

- **Was there any continues changes on the agreed requirements and specifications and what is the impact of their occurrence?**

  Usually, changes depend on business needs and on adding further services or features. The SRS which is written by analyst contains low level details which is used to mitigate future changes.

- **What were the main drawbacks and how they have been avoided?**

  The used methodology in development of the portal is Agile which has flexibility in errors correction then, the test plan and test case to be used, in some cases faults occur in while test case execution and it can be reduced by reviewing the test case. The testing stage starts after the analysis stage to fined system's bugs in order to send it to developers to be fixed, then the quality check is applied to ensure bugs have been rectified.

- **Was there any ambiguity in requirement and how it can be treated?**

  Ambiguity is occurring in some cases and it should be handled by the system analyst to modify and clarify the SRS document.

- **Is there any future development plan? And how?**

  Yes, sure, there are continuous needs for development and enhancement. The Technical and Vocational Training Corporation always look for future to supports educational operations by adding new features.

Appendix C

interview			
Interview data			
Date	02/04/2019	**Duration**	**20 min**
Interviewee data			
Name	-------	**Title**	**Operation**

- **What was the used approach to rectify any occurred incidents?**
  by requests system which contains user's incident details then the incidents will be categorized as bugs, to be solved by the system developers.

- **What is the level of availability of Rayat portal?**
  Rayat portal has high availability based on the agreed Service Level Agreement (SLA) with the operational company.
  There were many types of tests applied on the system to ensure its availability such as: load balancer to test portal performance and web inspect to test security aspects.

- **What is the followed support levels and the role of each level?**
  There are three support level as following:
  Rayat 1: this level receives issue request from support portal.
  Rayat 2: this level solves incident of unresponsive operations if it doesn't resolve by Rayat 1 Rayat 3: the problems of servers and links will be solved in this level.

- **What is the maxim period of time to treat the request?**
  It depending on the complexity of the issues but it should not exceed two days.

- **Does Rayat portal contribute in reducing the trainees attending by provide services through it?**
  Sure, knowing that the work is in progress to automate the remaining non-automated services which is require the presence of the trainees in their college such as: if trainees change their mobile numbers they can't sign in to the portal and they should visit their colleges to reset mobile number field.

- **Does the portal allow trainees to track their request?**
  Yes, the trainees can keep track of their request's status by logging into the portal.

- **Was there any variation between the provided services via the Rayat web page and application?**
  There was some simple variation between them but the rest of the services will be added on demands to reduce the variation.

Appendix D

interview			
Interview data			
Date	**04/04/2019**	**Duration**	**15 min**
Interviewee data			
Name	-------	**Title**	Quality Assurance

- **Are requirements matching the system at the time of the testing?**
  Yes, are closely related because the requirements are written accurately and clearly which enable to the developer apply them. Furthermore, the quality assurance team audit the requirements before develop.

- **What is your roles in the system development?**
  Quality assurance team cares about reducing the amount of bugs before the production phase.

- **Is the quality team involved form the beginning of the system life cycle? And if any what is the used mechanism?**
  Yes, the quality team is involved form the beginning in many ways such as: interviews, meetings and document auditing.