

Virtual Reality and employee training in the Healthcare Industry

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Abstract

Continuous changes in the healthcare industry are having a significant change in training structure of the healthcare professionals. Making the right investment in the employee training leads to the success of the organization as a whole. With the emerging technological advances, the healthcare practitioners needs to be adaptive with the ad hoc changes. Virtual Reality generate real-life situation by simulating more realistic scenarios. The aim of this paper is to understand the benefits of the use of Virtual Reality as a technology to train the employees of healthcare industry, and will provide an insight of the current training practices followed in healthcare industry and whether introducing Virtual Reality in the training method will add any value or not in terms of effective training and employee engagement.

The paper is backed by a survey conducted on medical practitioners to understand the current training methods in healthcare industry, and how introducing Virtual Reality as a method can ease the training process. The findings of the paper proposes to aid the healthcare industry to understand the need to adopt Virtual Reality in their training methods and revise the existing methods which is being followed currently. The paper is based on both primary and secondary research on introducing Virtual Reality as a technology in the 'employees' training in the healthcare industry and will be helpful for the industry to adopt to the growing technological change.

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I. INTRODUCTION

Training and learning are very important when it comes to improving the skills of the employees in the organization. Every organization works for achieving a particular goal, and it is very important to train the employees of the organization to understand the same so that they can contribute to the growth by aligning their personal growth with the growth of the organization. There are various training methods followed by various organizations such as eLearning, Role playing, Case Studies, Hands-on training, Coaching or mentoring etc. These methods have been followed by organizations for quite a long time to train the employees. Training practice in healthcare is very crucial as it has an effect on the employee performance and

engagement which directly impacts the well-being of the patients. Investing in good training methodology as it is very critical to meet the patient's expectation. Proper training not only engages the employees but also decrease the employee turnover and helps in retention thus reducing the cost of hiring medical practitioners by the healthcare industry. The current training method in healthcare involves the medical practitioners to work directly with the equipment which increases the chance of failure in operating the machine in the first attempt, thus impacting the confidence level of the practitioners. With the growing challenges and complexity in the industry specifications, it has become to move on to a new and advanced method of training which can meet the growing needs.

Talking of Healthcare industry, the last decade has witnessed a remarkable growth and advancement of modern technology and with new medical equipment introduced in the healthcare sector, it has become a challenge to train the medical practitioners to use the equipment which also includes the process of assembly and maintenance of the machines. The challenge is also to comfort the patients during their treatment. This requires shorter training time, optimization of cost and better understanding of equipment which can ease the purpose. Based on the growing demands in healthcare and advance of medical technology, there is a need to find an alternate training method which can help the medical practitioners understand the working of equipment better and also retain the knowledge during training for a prolonged time, thus producing an effective and high skill performance of the practitioners. The drive to amalgamate technology and training is growing up at a rapid pace.

II. LITERATURE REVIEW

Virtual Reality (VR) is a technology that makes a person feel like they are part of some other place. It makes use of special glasses and software to develop various images, sounds and other sensations to create a different place, so that a user feels like he or she is really part of this other place (Sisto, Forrest & Glendinning, 2002c). VR environment offers an interactive human-computer interface which can be used as an effective tool to learn and understand the assembly and maintenance of medical equipment. This can be used as an effective tool to understand the functioning of the virtual medical equipment in real time simulation in the virtual environment. This will help them to understand the usage of equipment better and help them perform operations multiple time before they gain an expertise on the usage. Virtual Reality systems can be used for planning, training and adopting new techniques. They can also be used for analyzing and interpreting complex data. Using Virtual Reality system can also be used to provide relief to patients by distracting, motivating

and supporting them during their treatment/operation (Hoffman, 2004).

When talking of surgery, there is a long learning curve as the process is very complex and it requires special training and proficiency by the practitioners before they start working on them directly during operations. Therefore, making it very important for the practitioners to learn and acquire the skills properly before doing hands on. In the present scenario, the medical practitioners are supposed to acquire practical knowledge after gaining theoretical knowledge. The current training methods involves the medical trainees to observe and assist the senior doctors during operations. They are supposed to assist the doctors by incorporating certain tasks, which is performed under strict supervision. During training, the practitioners learn through basic training equipment but the major chunk of knowledge still comes through books and different multimedia materials which is not sufficient enough to provide theoretical and practical knowledge to perform the operations safely. However, there are lot of disadvantages to this method of training. Firstly the learning is only by observing, this doesn't help the practitioners to retain the knowledge for longer period of time. Secondly, there might be biasness in the training methods adopted by the doctors. This method of training also limits the knowledge transfer from an experienced doctor to trainees, as only a limited number of trainees can be trained under a specific doctor. Also there is a limit on number of working hours that the medical experts can give for the trainees per week (Liu, Renwick, Cleary & Kauffmann, 2003).

Not all practitioners can be benefitted from the current training methods. All these factors act as a bottle neck in the training methods of medical practitioners. The training also involves experimenting and operating on animals which involves many legal and ethical problems too. Adding to the list is the anatomical difference between human and animals. Moreover the cost and handling the corpse is making the training method more imprudent (Kauffmann, 2000). Also the

teaching skills has a major role to play. This clearly shows that there is a gap in the medical training among the practitioners which needs to be curbed.

Working on the equipment involves risk of failure. Hence it is very important to get trained properly before doing a hands on with the devices. In such cases, which involves high risk and cost, simulators can act as better option so that the employees are well acquainted with the functionality before performing the real operations. Medical practitioners must receive proper training before they start performing their tasks. Better is the training of healthcare professionals, better and safer will be the healthcare procedures (Bayona, 2006). Virtual Reality can provide new techniques and better learning solution which can help the medical practitioners and will also improve the patient safety. It also allows the practitioners to practice and train the skills as many times as they want before mastering it. Cates (2007) proposed that healthcare industry should adopt Virtual Reality as a method to train the medical practitioners. This will help them learn meaningful skills without hampering the safety of the patients.

Virtual Reality system provides a realistic environment where the medical practical practitioner can learn and practice as much as they want. Two important features of Virtual Reality can be stated as (1) the users can control the viewpoint as per their comfort, (2) the users can interact with the objects within the virtual environment (Wilson, 1997). This also reduces the stress during training as they can repeat the usage as many times as they want without any fear of failure. The experience gained during training by using virtual reality system as be transferred to real operating room.

III. RESEARCH OBJECTIVE

The objective of this research is to determine if there exists any gap in the current training methods for medical practitioners in the healthcare industry and how Virtual Reality as a technology can help bridge the existing gap and improve the training process.

IV. DATA AND RESEARCH METHODOLOGY

The research paper is written and is based on primary data by collecting responses from medical practitioners working in different medical fields, which includes dentist, orthopedist, surgeon, physician etc. using Survey/ Questionnaire. The questions is based on dichotomous scale format. The questionnaire is floated on a sample size of 80 medical practitioners out of which 69 responses are recorded for the research purpose. The responses are acted upon and analyzed using SPSS 20 software. Chi Square test is done on the received responses and various relevant factors have been analyzed for the purpose. Chi Square test has been done to determine if there exists any substantial gap in the employee training in healthcare.

The research process that has been adopted in the current study consists of following stages:

1. Defining the research objective.
2. Developing the plan for research
3. Formulating Questionnaire and collecting data based on that.
4. Analyzing the obtained data
5. Report on the research finding

Population/Sample size:

For this research, a questionnaire was floated among 80 medical practitioners out of which 69 responded and their responses have been considered for analysis.

Data Collection:

Primary Data: The primary data for the research has been collected by floating a survey form among the medical practitioners and their responses has being worked on.

Secondary Data: The secondary data for the research has been collected by reading various research papers and articles related to the study.

Questionnaire design:

The questionnaire has been designed well and consists of closed ended questions. There are 20 questions which has been designed to cover all the aspects of effectiveness of Virtual Reality as a method of training in healthcare industry.

Hypothesis:

Null Hypothesis:

H0: There is no significant gap in the training methods of medical practitioners in healthcare industry.

H1: There is no relation between the introduction of Virtual Reality as training method and ease of adopting better skills.

H2: There is no relation between introduction of Virtual Reality as training method and improvement of training methods.

Alternative Hypothesis:

H0: There is significant gap in the training methods of medical practitioners in healthcare industry.

H1: There is relation between the introduction of Virtual Reality as training method and ease of adopting better skills.

H2: There is relation between introduction of Virtual Reality as training method and improvement of training methods.

Tools and methods adopted for analysis of obtained data:

Tools: SPSS 20

Method: Chi square test and Clustered Bar Chart

V. RESULTS AND DISCUSSION

A. Data Analysis and Interpretation: Chi Square test

Table 1: Preference method of Training and help before the training

| | | Helpbeforetraining | | | Total |
|---|----------------|--------------------|-----|------|-------|
| | | No | Yes | | |
| Preferencemethod | Count | 4 | 0 | 0 | 4 |
| | Expected Count | .2 | .3 | 3.4 | 4.0 |
| Hands on experience | Count | 0 | 5 | 15 | 20 |
| | Expected Count | 1.1 | 1.7 | 17.1 | 20.0 |
| Virtual experience before Hands-on experience to reduce risk of failure | Count | 0 | 1 | 45 | 46 |
| | Expected Count | 2.6 | 3.9 | 39.4 | 46.0 |
| Total | Count | 4 | 6 | 60 | 70 |
| | Expected Count | 4.0 | 6.0 | 60.0 | 70.0 |

Table 2: Chi Square test

| Chi-Square Tests | | | |
|--------------------|---------------------|----|-----------------------------------|
| | Value | df | Asymptotic Significance (2-sided) |
| Pearson Chi-Square | 79.321 ^a | 4 | .000 |
| Likelihood Ratio | 38.748 | 4 | .000 |
| N of Valid Cases | 70 | | |

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .23.

From Table 1, it can be observed that value of Pearson Chi square statistic is 79.321, and $p < 0.001$, the p-value is 0.000, which means that the relationship between Preference method and help before training is significant: i.e., the null hypothesis can be rejected, since $p < 0.05$.

Table 3: Preference method of Training and Improvement in training method

| | | Improvethemethod | | | Total |
|---|----------------|------------------|-----|------|-------|
| | | No | Yes | | |
| Preferencemethod | Count | 4 | 0 | 0 | 4 |
| | Expected Count | .2 | .1 | 3.7 | 4.0 |
| Hands on experience | Count | 0 | 0 | 20 | 20 |
| | Expected Count | 1.1 | .3 | 18.6 | 20.0 |
| Virtual experience before Hands-on experience to reduce risk of failure | Count | 0 | 1 | 45 | 46 |
| | Expected Count | 2.6 | .7 | 42.7 | 46.0 |
| Total | Count | 4 | 1 | 65 | 70 |
| | Expected Count | 4.0 | 1.0 | 65.0 | 70.0 |

Table 4: Chi Square test

| Chi-Square Tests | | | |
|--------------------|---------------------|----|-----------------------------------|
| | Value | df | Asymptotic Significance (2-sided) |
| Pearson Chi-Square | 70.468 ^a | 4 | .000 |
| Likelihood Ratio | 31.393 | 4 | .000 |
| N of Valid Cases | 70 | | |

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .06.

From Table 2, it can be observed that value of Pearson Chi square statistic is 70.468, and $p < 0.001$, the p-value is 0.000, which means that the relationship between Preference method and Improvement in training method is significant: i.e., the null hypothesis can be rejected, since $p < 0.05$.

Table 5: Preference method of training and Improvement of skills

Crosstab

| | | Improvesskills | | | Total |
|---|----------------|----------------|-----|------|-------|
| | | No | Yes | | |
| Preferencemethod | Count | 4 | 0 | 0 | 4 |
| | Expected Count | .2 | .3 | 3.4 | 4.0 |
| Hands on experience | Count | 0 | 6 | 14 | 20 |
| | Expected Count | 1.1 | 1.7 | 17.1 | 20.0 |
| Virtual experience before Hands-on experience to reduce risk of failure | Count | 0 | 0 | 46 | 46 |
| | Expected Count | 2.6 | 3.9 | 39.4 | 46.0 |
| Total | Count | 4 | 6 | 60 | 70 |
| | Expected Count | 4.0 | 6.0 | 60.0 | 70.0 |

Table 6: Chi Square test
Chi-Square Tests

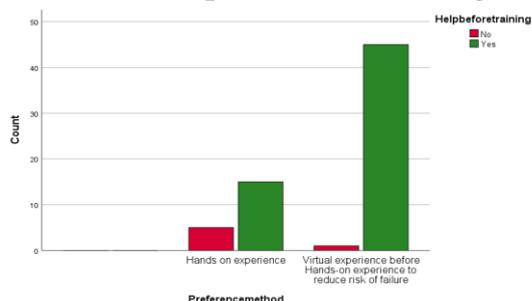
| | Value | df | Asymptotic Significance (2-sided) |
|--------------------|---------------------|----|-----------------------------------|
| Pearson Chi-Square | 86.100 ^a | 4 | .000 |
| Likelihood Ratio | 46.442 | 4 | .000 |
| N of Valid Cases | 70 | | |

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .23.

From Table 3, it can be observed that value of Pearson Chi square statistic is 86.100, and $p < 0.001$, the p-value is 0.000, which means that the relationship between Preference method and Improvement in skills is significant: i.e., the null hypothesis can be rejected, since $p < 0.05$.

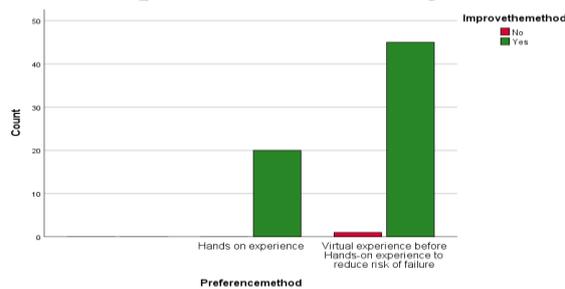
B. Data Analysis and interpretation: Clustered Bar Chart

Figure 1: Preference method of Training and help before the training



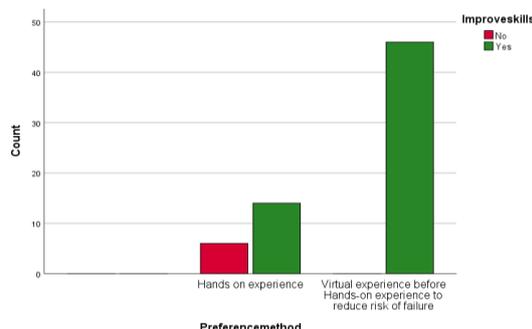
Major chunk of medical practitioner support that Virtual experience can help and ease the practitioners before performing the hands-on job.

Figure 2: Preference method of Training and Improvement in training method



Major chunk of medical practitioner support that Virtual experience can improve the current training methods in healthcare industry.

Figure 3: Preference method of training and Improvement of skills



Major chunk of medical practitioner support that Virtual experience can improve the skills of the practitioners.

DISCUSSION

A survey was conducted on 80 medical practitioners out of which 69 responds have been taken for analysis. By analyzing the data, it has been observed that 79.7% of medical practitioners believe that there is a substantial gap in the hands-on experience during employee training. Some of the reasons that are quoted for this gap being, Lack of coordination between theory and practical knowledge, lack of proper infrastructure, teacher to student ratio, lack of proper equipment, not adequate technology, ignorance of teaching professionals, lack of enough funding in medical field, extensive theoretical knowledge compared to practical knowledge, human factors, biasness, lack of engagement among senior doctors to share their knowledge. Stagnation in teaching methods is also considered as a major

reason for the growing gap in the training of medical practitioners.

82.6% medical practitioners believe that virtual reality as a method of training can be adopted if it offers significant savings in terms of cost and time. 89.9% of the response shows that VR can help perform the job better. 59.4% feel that VR has the ability to take over the existing methods of training in healthcare. 92.8% responses shows that Virtual Reality can be used a technique to comfort and ease the patients before/during treatment. Some of the major reasons which promotes adopting VR in healthcare industry according to the practitioners are Provide safe site-specific environment, reflecting real world conditions, thereby helping people learn relevant skills.

3D animation help learners know more, such as seeing the installation and maintenance of machines so as to understand the process better.

Improves the participation of employees due to highly engaging learning method.

This overall analysis of the data obtained shows that Virtual reality can be adopted as a training method in healthcare industry and it has the ability to supplement the current training method and if properly practiced can take over the existing methods in the future.

FUTURE SCOPE OF RESEARCH

After analyzing the data, it has been observed that the major factors due to which Virtual Reality has not been implemented properly in the training of medical practitioners are: lack of Infrastructure, cost to maintain VR devices, people are skeptical to adopt new technology, absence of know-how, ignorance towards new technology, no prior understanding of VR devices and rigid standardized curriculum. The research paper demonstrates how Virtual Reality as a technology be used in training to bridge the current gap and how it can be used to facilitate the training process of practitioners and how it can be used to provide comfort to the patients. However, there is a further scope to research on how to implement this method in the

training process of healthcare industry by mending all the barriers that exists currently. Research work can be done to ensure how the current restrictions related to Virtual Reality can be worked on so that it can be implemented in the training process on a wider scale.

CONCLUSION

The study shows that adopting Virtual Reality in the training of healthcare professionals can help and improve the process in many ways which includes proper acquiring of skills to operate the equipment, better experience in handling complex situation during real operations, employee engagement thus improving the overall scenario of healthcare industry. It has been analyzed from the primary data that VR can also help in reducing the subjective bias during training as compared to training provided by the senior doctors. One can practice on the medical equipment as many times as they want without having the stress of failure and not jeopardizing the safety of the patients at the first go.

The conclusion also covers two issues which is related to both technical and non-technical matter related to VR. The first one to be considered is the fact that the medical professionals have to work together to improve the system from different point of views. Different medical practices have different purpose and way to use the machine, therefore there is a need to collaborate among the medical professionals, because there is a sharp contrast with respect to each other.

Considering the technical aspects, it is very important to design advanced hardware and develop efficient software that can serve the purpose. From a medical professional's point of view, it is very important to design the device that comes with proper graphics and better control so as to achieve a realistic simulation of the equipment and operating room thus giving the practitioners a better way of training and learning.

To conclude, even though Virtual Reality systems are getting accepted in healthcare these days, it should be considered that VR are used to complement the training purpose in healthcare, but

there is a long way to go before it takes over the current method. But the present usage of VR shows that there will be growing demand of adopting it as a leading training method in healthcare industry.

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