

The Technology Acceptance Model: Understanding the New Landscape in Healthcare

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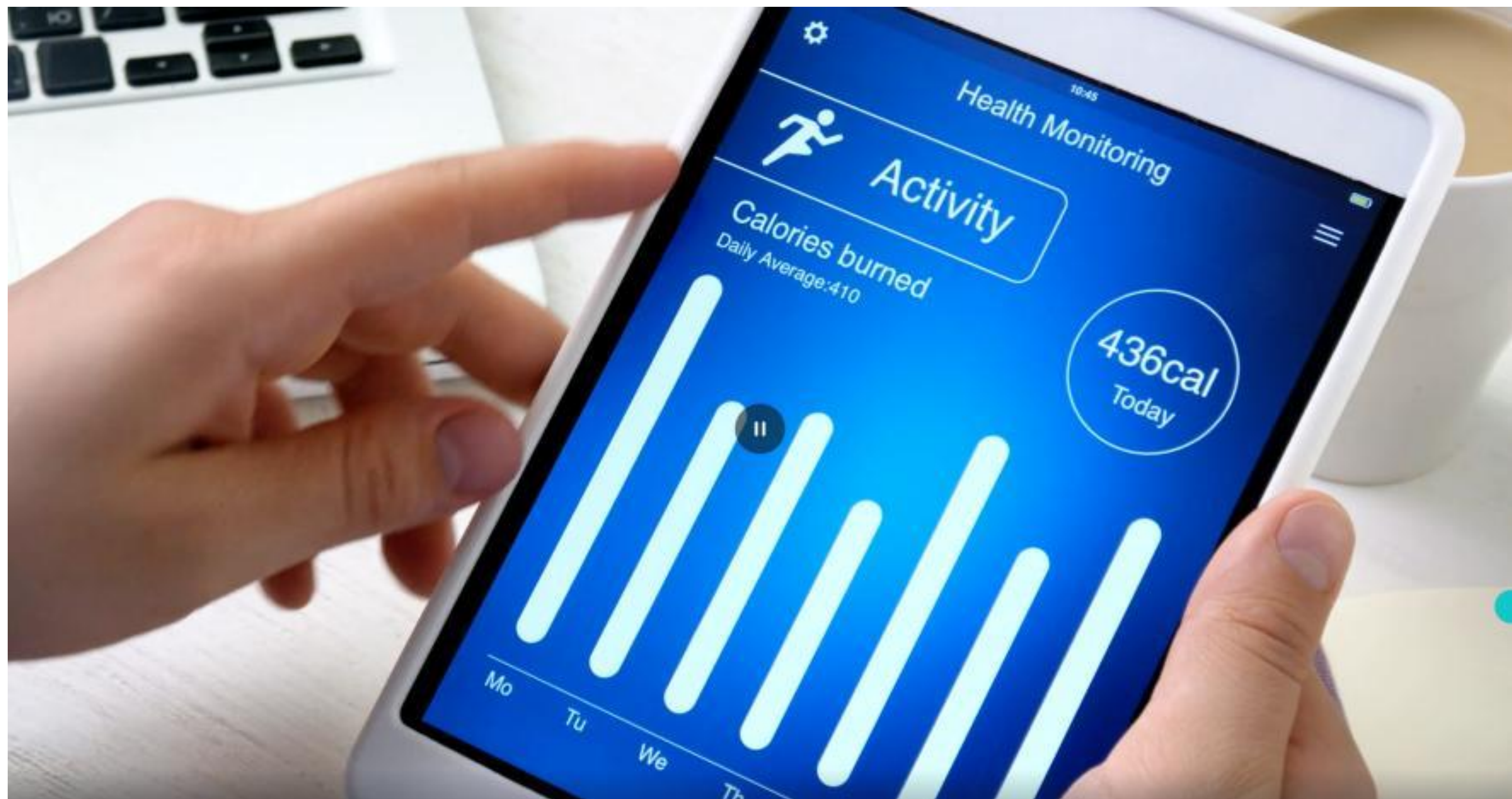








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The *Applicability* of the *Technology Acceptance Model* in the *Acceptance* and *Willingness* of *Hospital Employees* towards using *Digital Health Tools* in *Patient Care*.



What are **DIGITAL HEALTH TOOLS**?

Digital Health incorporates **mobile health (mHealth) apps, electronic health records (EHRs), electronic medical records (EMRs), wearable devices, telehealth and telemedicine**, as well as **personalized medicine**. It is envisioned to improve access to healthcare, reduce inefficiencies in the healthcare system, improve the quality of care, lower the cost of healthcare and provide more personalized health care for patients.

Digital tools give healthcare providers **an extensive view of patient health** by significantly **increasing access to health data** and giving **patients greater control over their health**. The result is increased efficiency and improved medical outcomes.





Source: IQVIA Institute, Sep 2017

Report: The Growing Value of Digital Health. IQVIA Institute for Human Data Science, Nov 2017

Why did I take up this topic?

Information and communication technologies have the potential to serve as enablers to achieving all 17 Sustainable Development Goals, there is a global push for an in-depth discussion on how ICTs will contribute toward improved health and wellbeing well into the future.

WHO's Thirteenth General Programme of Work (2019-2023) has officially acknowledged these new developments by including associated triple billion targets for making sure 1 billion people benefit from universal health coverage, 1 billion are protected in case of a health emergency, and 1 billion have better overall wellbeing experiences.

The Global digital health market will see a compound annual growth rate (CAGR) of 27.9% from 2020 to 2027, whereas in India Revenue is expected to show an annual growth rate (CAGR 2022-2026) of 24.60%, resulting in a projected market volume of US\$21.38bn by 2026. The average revenue per user (ARPU) is expected to amount to US\$25.55.



TECHNOLOGY ACCEPTANCE MODEL

The Technology Acceptance Model is an information systems theory that models how users come to accept and use a technology. The actual system use is the end-point where people use the technology. Behavioral Intention is a factor that leads people to use the technology.

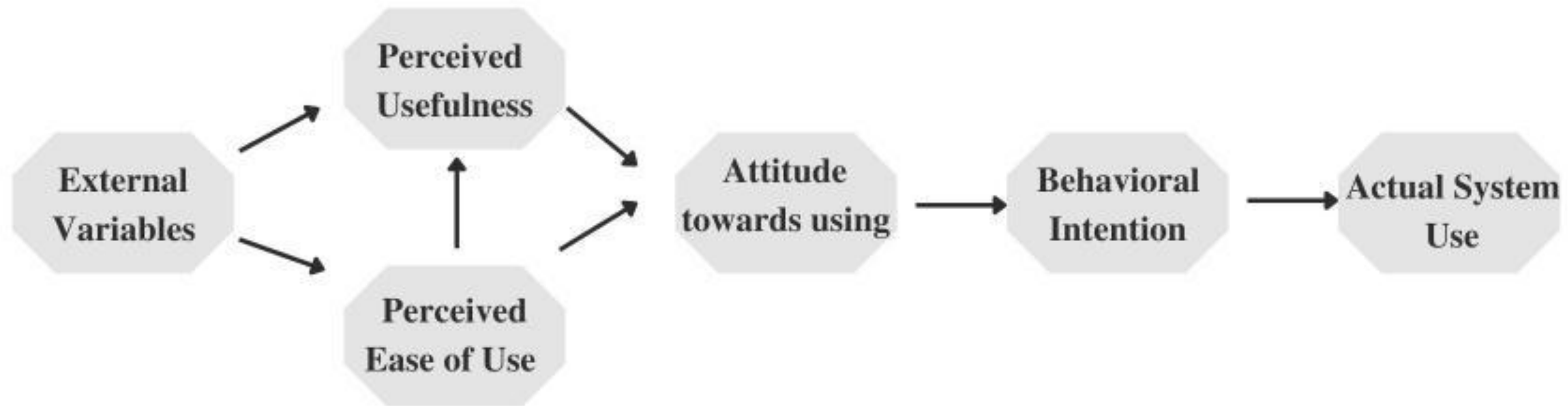


Fig 1: Technology Acceptance Model

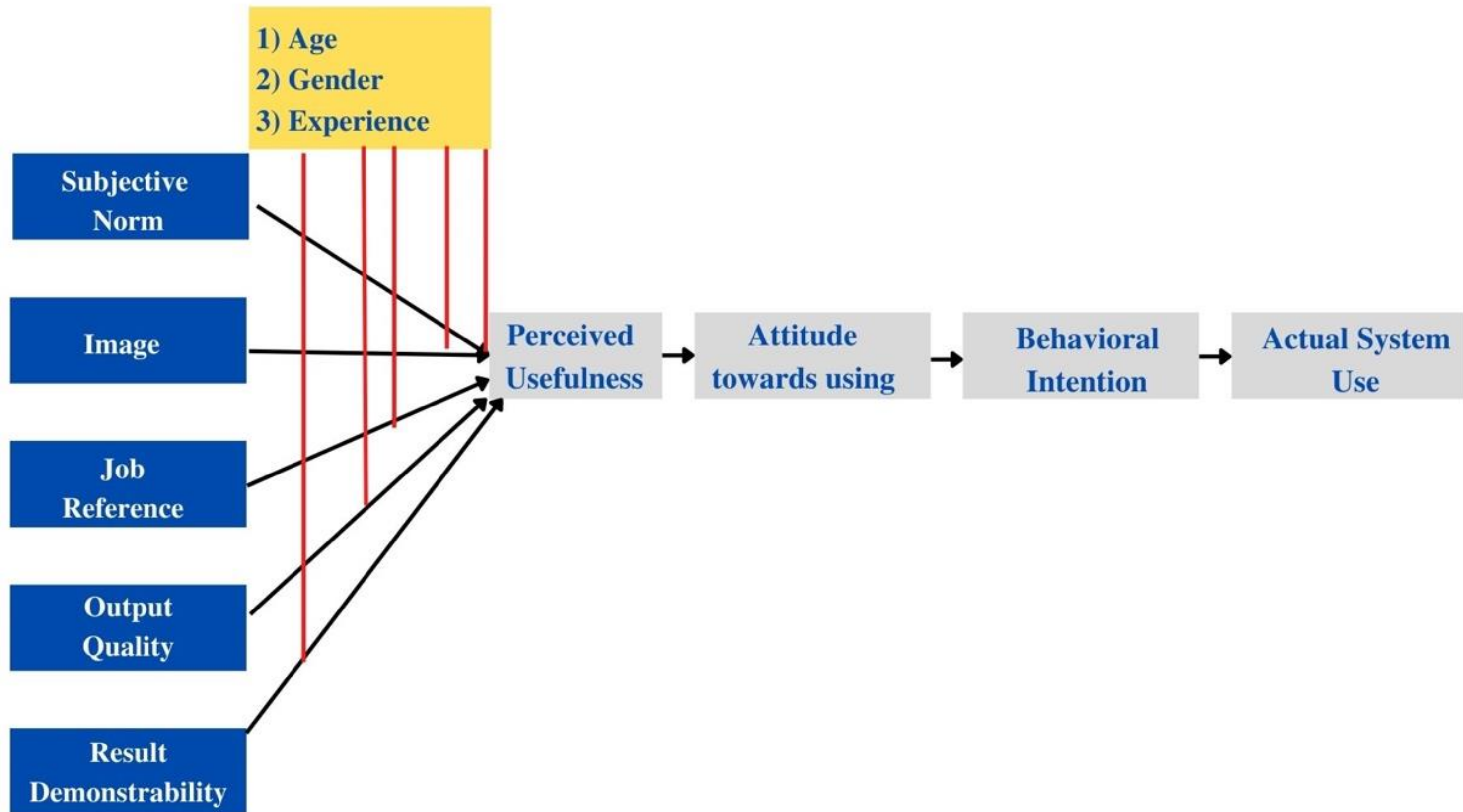


Fig 2 : Determinants of Perceived Usefulness

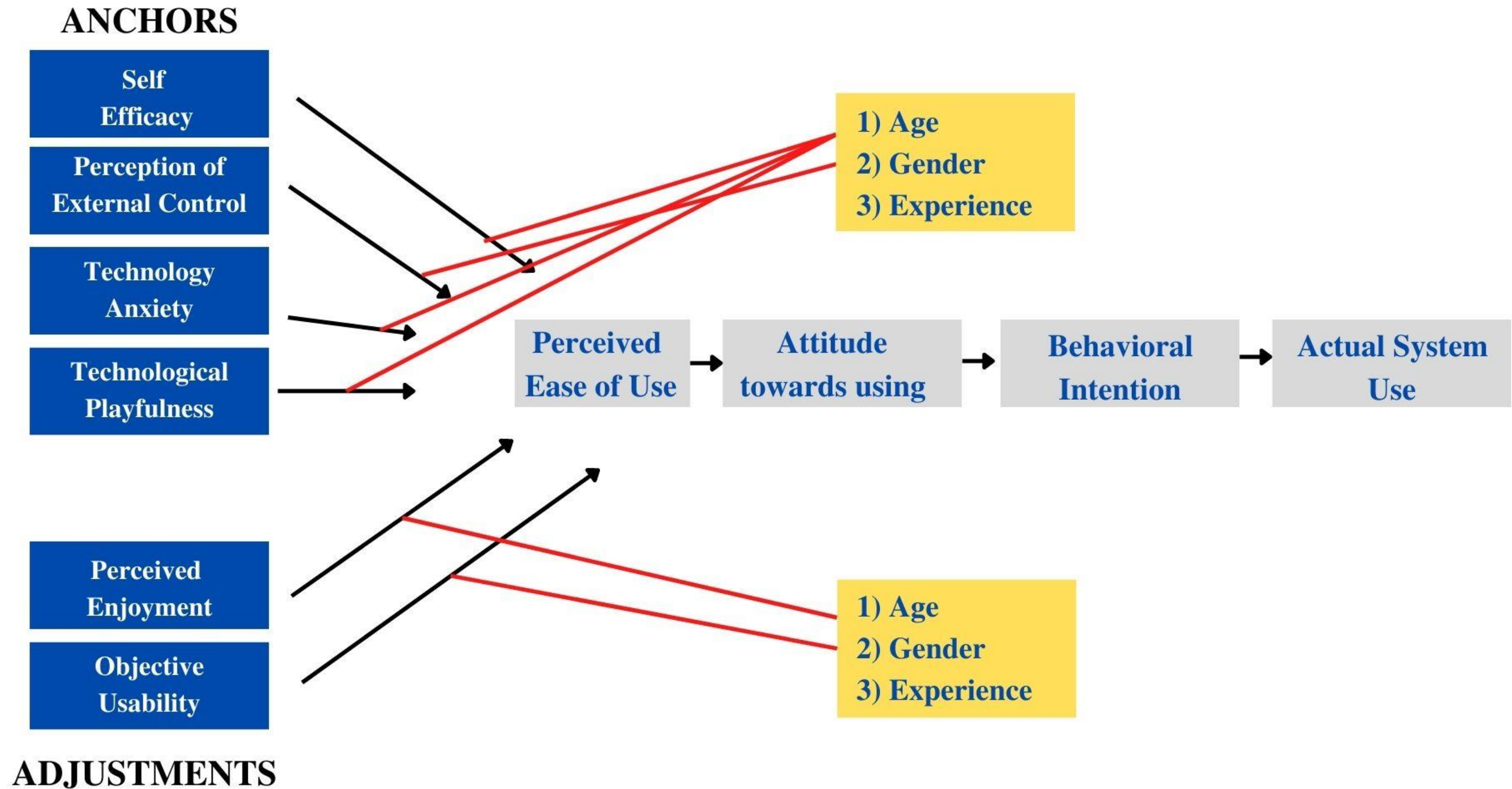


Fig 3 : Determinants of Perceived Ease of Use



RESEARCH **METHODOLOGY**

Research Question



What significance does the Technology Acceptance Model have for how willing and accepting hospital staff members are to employ digital health tools in patient care?

Research Objectives



- To determine the factors that could contribute to the technology acceptance of digital health tools in hospitals by staff.
- To understand the behavioral intentions in willingness to use the digital health tools in patient care.

Research Design



A Quantitative Cross-Sectional survey study of descriptive nature

Study Setting



Saket Hospital, Jaipur. The entire hospital was divided into Clinical and Non- Clinical departments.

Sampling Technique



Nonprobability Convenience Sampling

Sample size

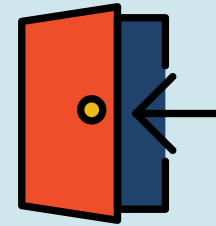


Participants were divided into two categories i.e., clinical, and non-clinical staff and a total of 116 responses were recorded.

STUDY POPULATION

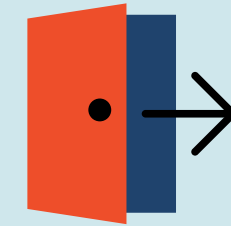
The entire hospital was divided into clinical and non- clinical departments. Based on what and how these departments directly affect patient care by using Digital Health Tools, this was taken into consideration while determining the Inclusion and Exclusion criteria.

Included Departments



1. Emergency Department
2. Outpatient Department
3. Inpatient Department
4. ICU
5. Operation Theatre
6. CSSD
7. Dietary Department
8. Pharmacy Department
9. Laboratory Department
10. Radiology Department
11. Nursing Department
12. IT Department
13. Administrative Department
14. Consultants/Doctors
15. MRD
16. Front desk/Reception

Excluded Departments



1. Linen and Laundry Department
2. Housekeeping Department
3. BWM Department
4. Engineering Department
5. Hospital Security
6. Central Stores
7. Canteen



STUDY TOOL AND DATA ANALYSIS

Name :
Age :
0–14 years
15–47 years
48–63 years
≥ 64 years
Gender:
Female
Male
Can't Say
Department:
Level of Education:
Attended school, did not finish.
Finished school
Finished college, graduate
Post-graduate or higher
Total Years of Experience
Less than 1 year
1-2 years
2-3 years
3-4 years
4-5 years
More than 5 years
Are you willing to use the Digital Health Tools?
Yes
No
Do you know how to use the computer?
Yes
No

**Fig 4 : Sociodemographic Determinants
in Study Tool**

	Clinical		Non-Clinical	
	Frequency	Percent	Frequency	Percent
Gender				
Female	32	35.56	12	46.15
Male	58	64.44	14	53.85
Total	90	100	26	100
Age (in completed years)				
15–47 years old (young group)	64	71.11	20	76.92
48–63 years old (middle age group)	26	28.89	6	23.08
≥ 64 years old (elderly group)	0	0	0	0
Total	90	100	26	100
Level of education				
Attended school, did not finish.	0	0.00	5	19.23
Finished school	1	1.11	3	11.54
Finished college, graduate	63	70.00	14	53.85
Post-graduate or higher	26	28.89	4	15.38
Total	90	100	26	100
Total years of experience				
Less than 1 year	3	3.33	0	0.00
1-2 years	5	5.56	2	7.69
2-3 years	7	7.78	5	19.23
3-4 years	5	5.56	3	11.54
4-5 years	3	3.33	3	11.54
More than 5 years	67	74.44	13	50
Total	90	100	26	100

Fig 5 : Analysis of Sociodemographic Determinants

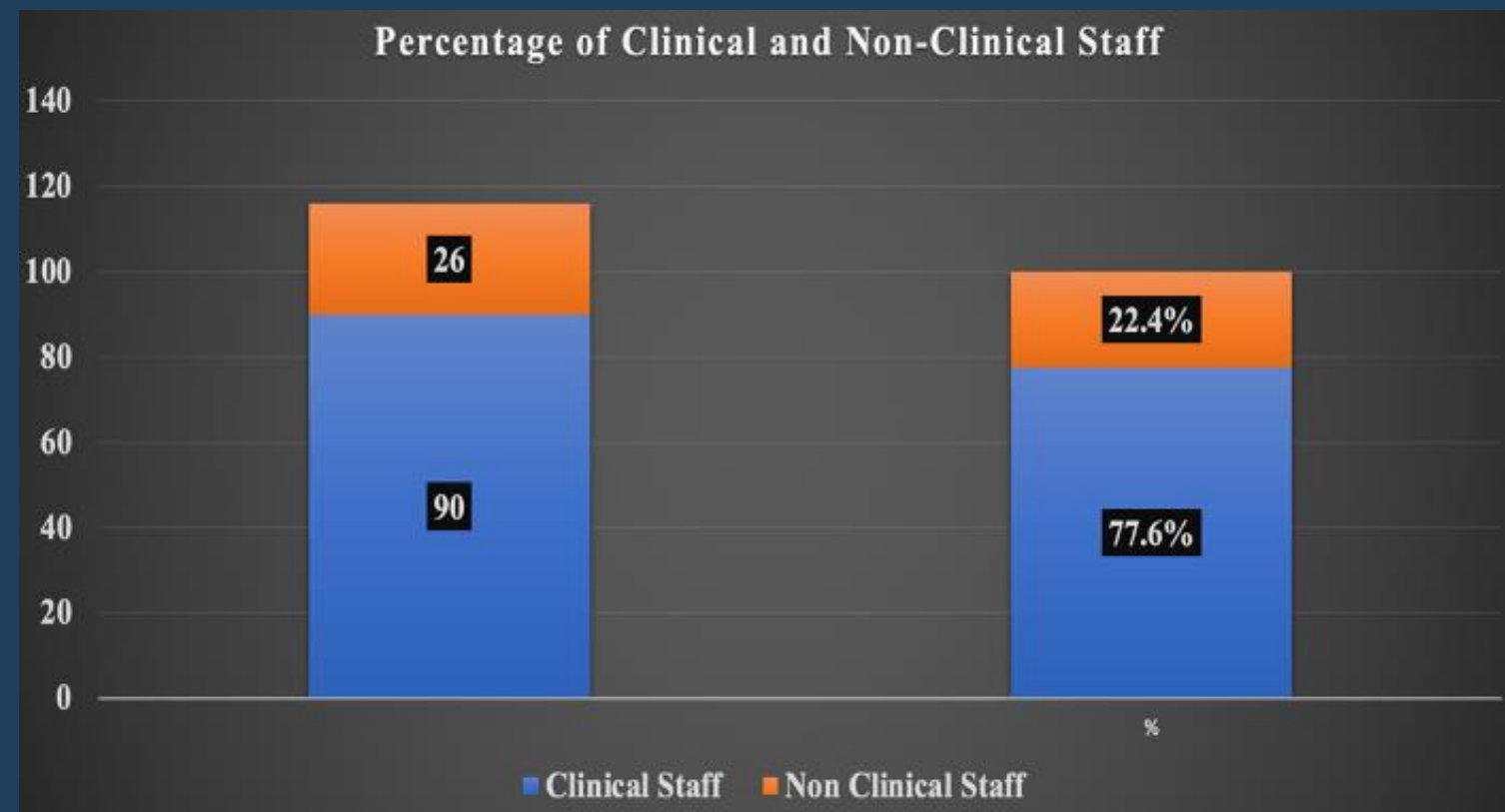


Fig 6 : Distribution of Clinical and Non-Clinical Staff

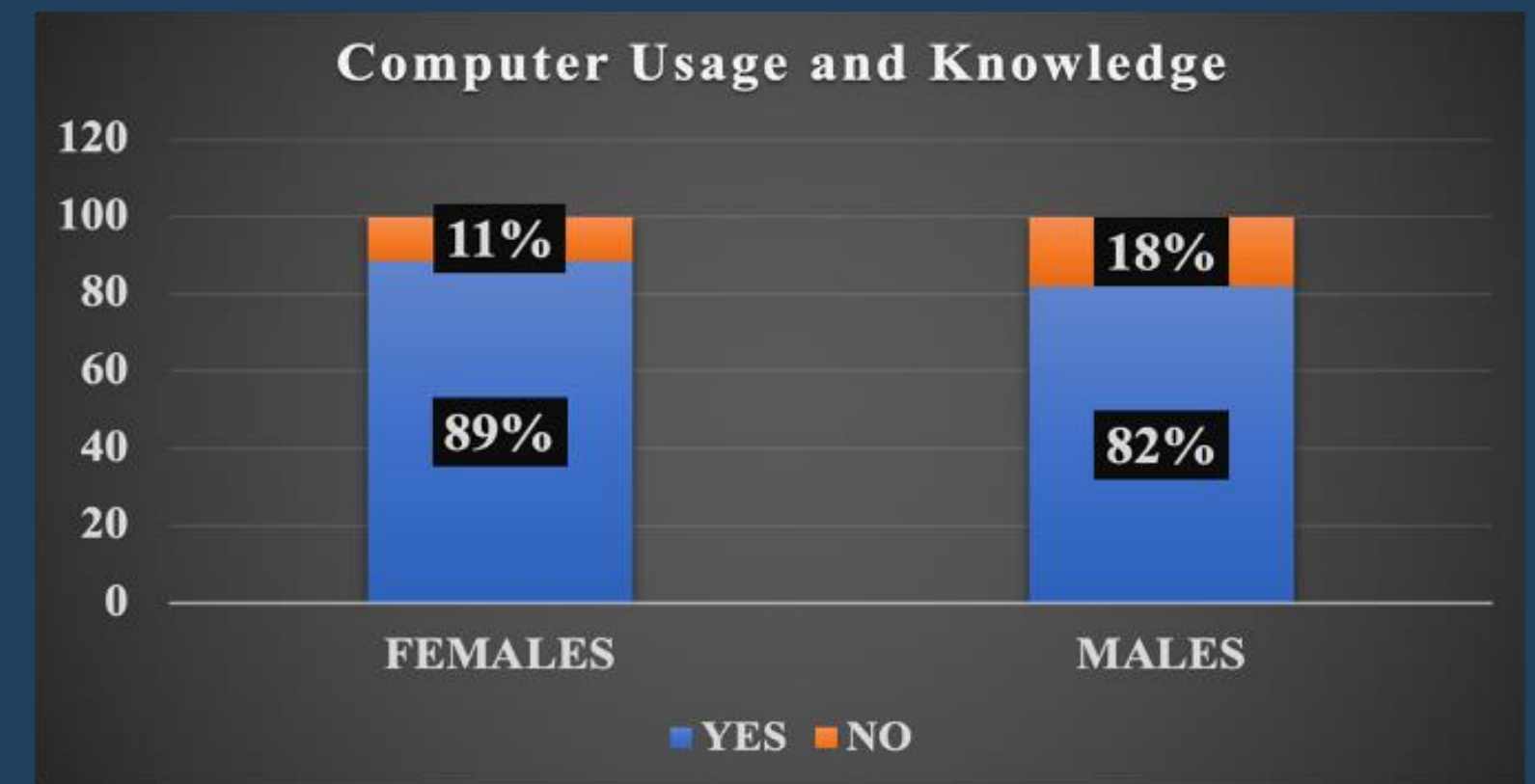


Fig 8 : Distribution of Staff with Computer Usage & Knowledge

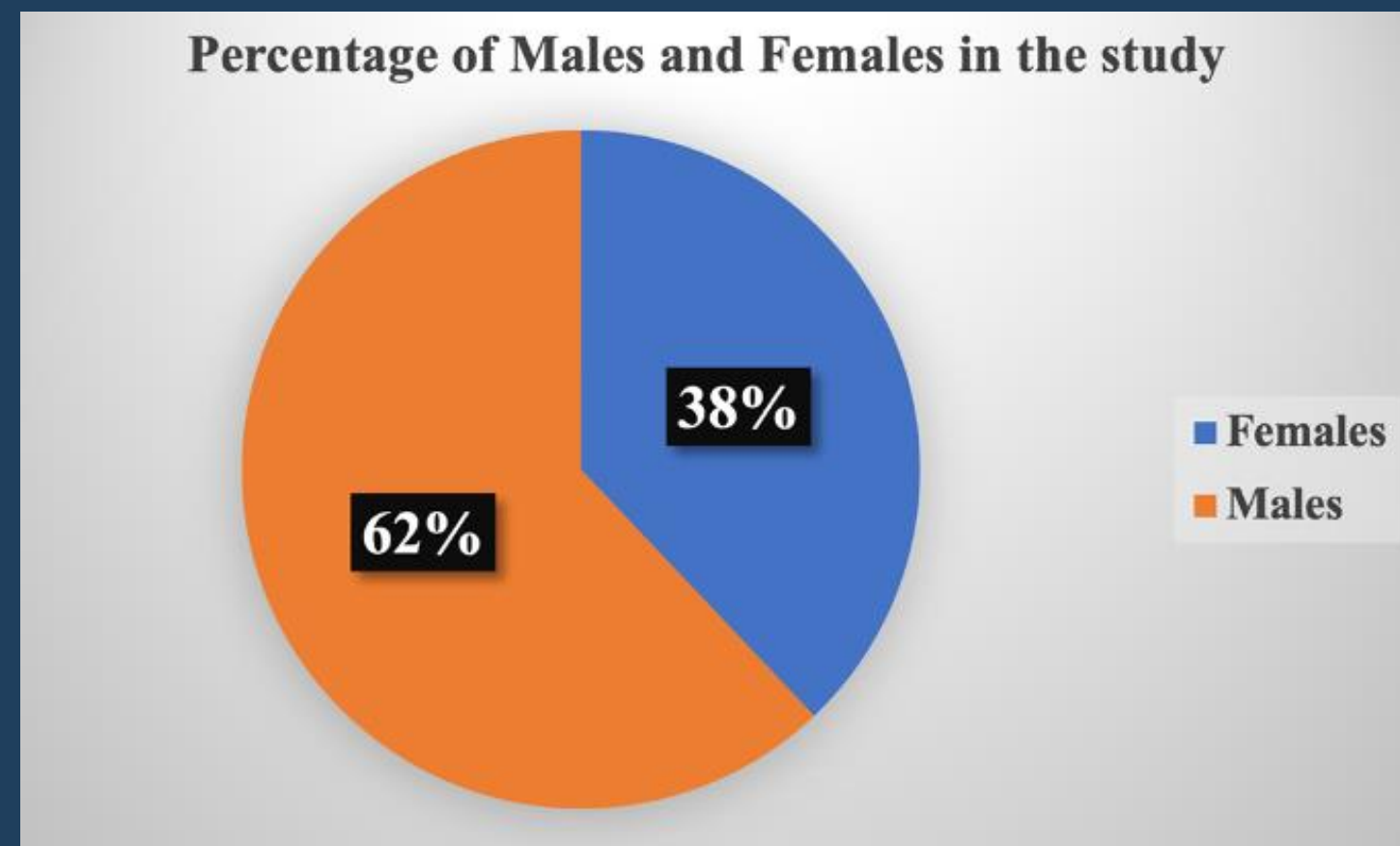


Fig 7 : Distribution of Males and Females in the Study

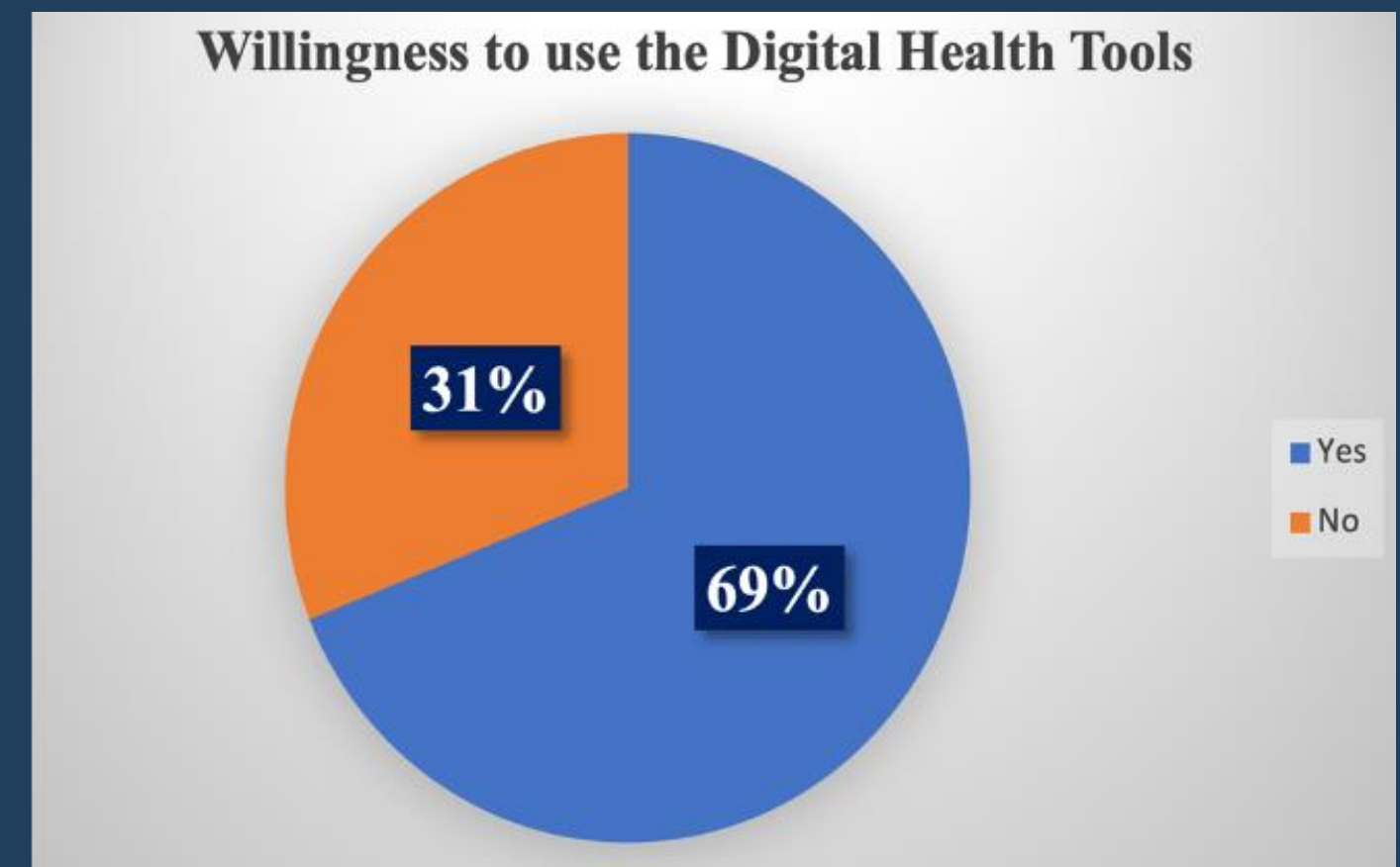


Fig 9 : Willingness in staff based on present knowledge

Fig 10 : Perceived Ease of Use Items in the Study Tool

Perceived Ease of Use : The degree to which a person believes that using a particular system would come without the need for training or managing developments.		5- Point Likert's Scale				
		Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree. 5
1	Self Efficacy : The degree to which an individual believes that he or she is able to use the technology					
a	I find it easy to use the technology.					
b	I can use technology, but it is much easier when someone gives me step by step instructions.					
2	Perception of External Control : The degree to which a person believes that organizational and technical resources are available from their employer to support the use of the technology					
a	With a little training, I can learn new technology and use it in patient care.					
b	We have a strong hospital information system that is at the heart of our operations.					
c	We have better internet connectivity at the hospital where I work with patients and that allows me to use digital tools.					
3	Technology Anxiety : The degree of apprehension or anxiety or fear a person may have when she/he is presented with the possibility of using technology					
a	Learning technical aspects give me anxiety. I get performance pressure at work and it's affecting my overall productivity.					
b	I feel that not every technology out there is easy to use and user friendly.					
c	I have a fear of losing the patients' data or of coming under a data breach					
4	Technology Playfulness : The degree of cognitive spontaneity in technological interactions					
a	I am a curious person when it comes to learning new things.					
b	I actively participate in trainings and take initiatives by offering innovative methods within my department.					
5	Perceived Enjoyment: The extent to which the activity of a specific system is perceived to be fun, especially when it comes down to use.					
a	I take training courses as an enjoyable learning experience.					
b	I am always willing to attend training programs conducted by the organization.					
6	Objective Usability : A comparison of systems based on an accurate estimation of the level of effort required to complete tasks.					
a	I find it easy to recover from errors when I use technology in patient care.					
b	Technology is a tricky runner. It doesn't always do as you want it to.					
c	Technologies can be challenging and rigid but having support from your team is invaluable.					
d	Interacting with technology can be mentally draining and needs regular training.					

Fig 11 : Perceived Usefulness Items in the Study Tool

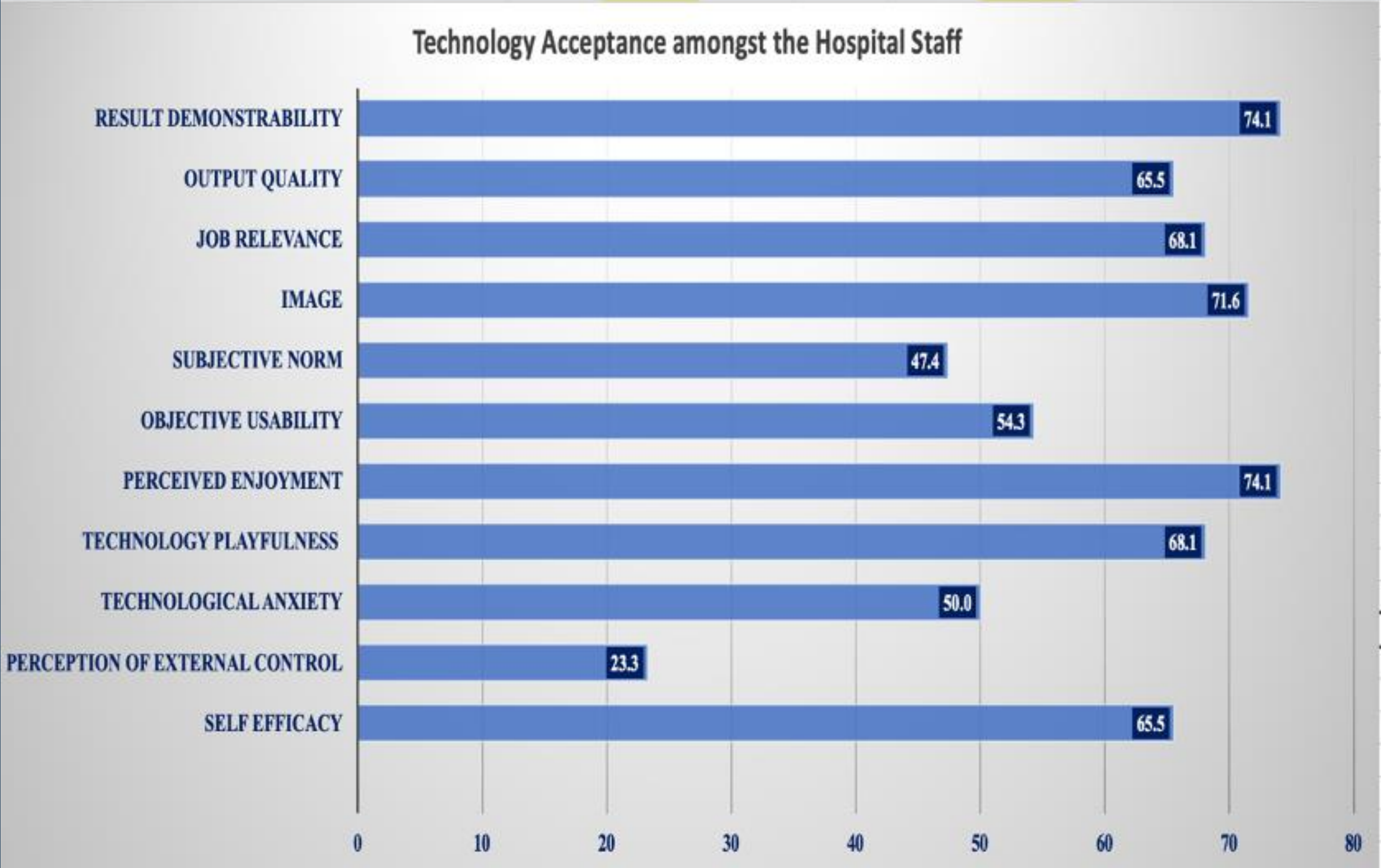
Perceived Usefulness : The degree to which a person believes that using a particular system would improve his or her job performance.		5- Point Likert's Scale				
		Strongly disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly agree. 5
1	Subjective Norm : The extent to which a person is aware that he is being encouraged, dissuaded or influenced in his decision to use a system by people who matter to him.					
a	I have personally witnessed the utilization of digital health tools used for patient care.					
b	I'm curious about new digital health tools that can help patients throughout their treatment.					
c	My peers feel I should hone my skills in digital health tools.					
d	People will support me through training in using the new digital health tools.					
2	Image : The degree to which an individual perceives that the use of an innovation will enhance their status within their social system.					
a	Learning new digital health tools will give me something new and special to talk about with my peers at a networking event.					
b	Learning new digital health tools will help me thrive in my career both personally and professionally.					
c	Digital health tools will help me improve my overall rating online because of my efficiency and effectiveness at work.					
3	Job Relevance: The degree to which an individual believes that the target system is applicable to their specific needs.					
a	Digital health tools can be very helpful in learning new ways that will support certain aspects of my job.					
b	Digital health tools will help me achieve my objectives in patient care.					
c	I'll feel in control with my work when it comes to patient handling and treatment.					
4	Output Quality: The degree to which a person realizes their jobs tasks are carried out effectively.					
a	It will reduce my time on unnecessary activities and help me focus more on my tasks in patient care.					
b	Using digital health tools can help improve my job performance.					
c	My job will be difficult to perform if I do not have the right Digital Health tools.					
d	Digital health tools will help me build confidence when it comes to handling patients and providing them with the right level of care.					
5	Result Demonstrability: The degree to which a person believes that the results of using a system are tangible, observable, and communicable.					
a	Digital health tools will address my job related health needs					
b	It will result in more effective, efficient care for my patients.					
c	I would advise others to learn and use digital health tools.					

Fig 12 : Mean, Standard Deviation and CI of the Determinants of TAM

		Mean	SD	95% CI	Range	
					Lower Limit	Higher Limit
Perceived Ease of Use	Self Efficacy	3.94	0.6	3.94 ± 0.10	3.83	4.05
	Perception of External Control	3.34	0.72	3.34 ± 0.13	3.21	3.47
	Technological Anxiety	3.73	0.71	3.73 ± 0.12	3.60	3.86
	Technology Playfulness	3.98	0.58	3.98 ± 0.10	3.87	4.09
	Perceived Enjoyment	3.99	0.64	3.99 ± 0.11	3.87	4.11
	Objective Usability	3.81	0.54	3.81 ± 0.09	3.71	3.91
Perceived Usefulness	Subjective Norm	3.83	0.6	3.83 ± 0.10	3.72	3.94
	Image	4.05	0.48	4.05 ± 0.08	3.96	4.14
	Job Relevance	4.01	0.58	4.01 ± 0.10	3.90	4.12
	Output Quality	4.01	0.47	4.01 ± 0.08	3.92	4.10
	Result Demonstrability	4.1	0.53	4.1 ± 0.09	4.00	4.20

- The **Standard Deviation** is **less than 1**, which means the data has **a low variance**.
- It also shows that we are **95% confident** that sample parameter about **Perceived Ease of Use** is between 3.21 (lower bound) to 4.11 (upper bound) and for **Perceived Usefulness** it is between 3.83 (lower bound) to 4.20 (upper bound).
- This shows an overall **positive attitude towards the usability of the digital health tools**.

Fig 13 : Applicability of TAM in the Hospital Staff



- **65.5% of hospital staff show self-efficacy** towards digital health tools. This displays their tremendous desire to learn new things and become tech-savvy.
- **23.3% hospital staff members who don't show a good level of perception for external control.** This shows that the hospital needs to be more lenient on training them with digital health tools or bring in new resources that can help provide better training opportunities.
- **50% of the staff expresses concern related to fear and anxiety** with using technology.
- **68.1% showed positive attitude towards technology playfulness.** Hospital staff feel they have an important role when it comes to helping deliver health care services and technology is essential for them when it comes down to their decision making. They are eager to learn new tools that will be useful in helping them perform their job functions easier and more efficiently.
- **74.1% perceived enjoyment towards using these digital health tools.** They believed that training with these digital health tools would be an enjoyable experience, because they will enhance their skill sets, allow them to do their tasks faster and end up being improved professionally.
- **47.4% of hospital staff believed the subjective norms affect their acceptance** in a way that they must adopt the digital health tools regardless of their will because peer pressure will make them by kicking and screaming into compliance. **71.6%** of the hospital staff believed that improving their image in the social standing in their respective professional standings can be achieved by training new skills.

Fig 16: Application of TAM among the Male Staff

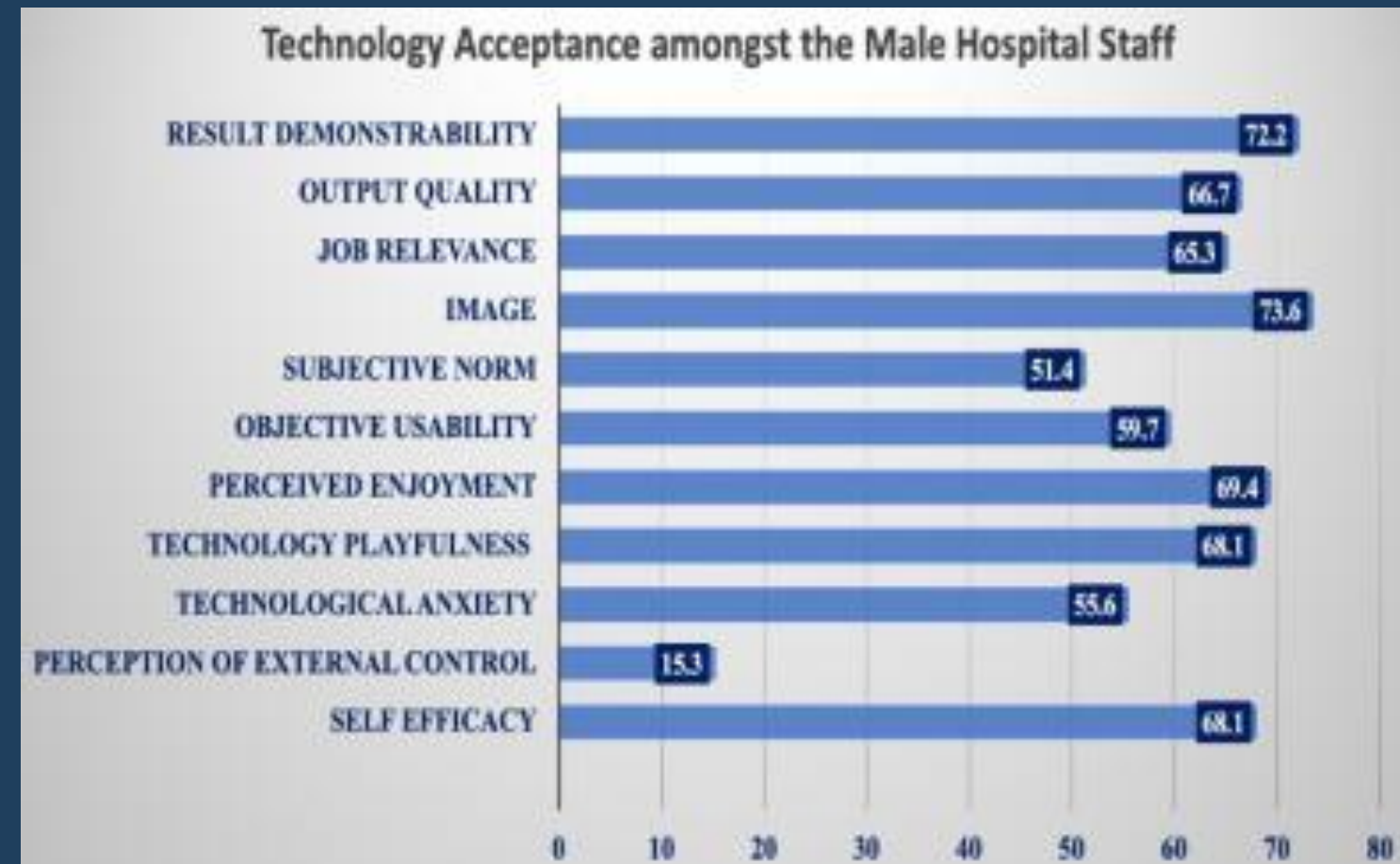
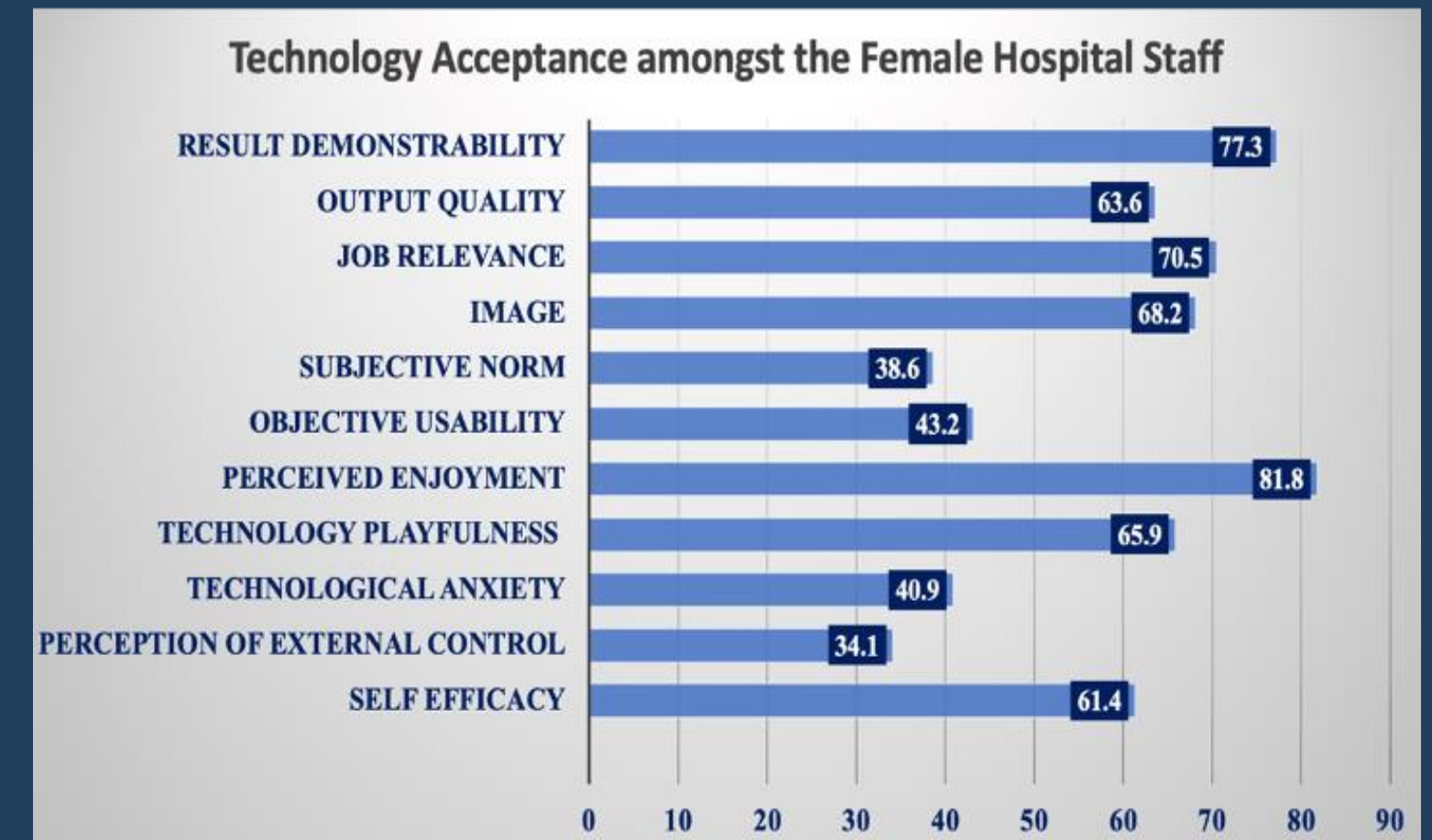


Fig 17: Application of TAM among the Female Staff



- **Male staff** were more likely to accept new technology and felt that the learning curve was more challenging and rigid than their female colleagues.
- **Female staff** took more initiatives than their male counterpart during training.
- Females perceived usage of these digital health tools as less dangerous and saw more danger in handling patient data when it comes to data security.
- Males also perceived less enjoyment while learning new skills than their females.
- Female staff also believed that the digital tools will make them more effective and efficient and will decrease their unnecessary time on paperwork.

Fig 18: Application of TAM among the Clinical Staff

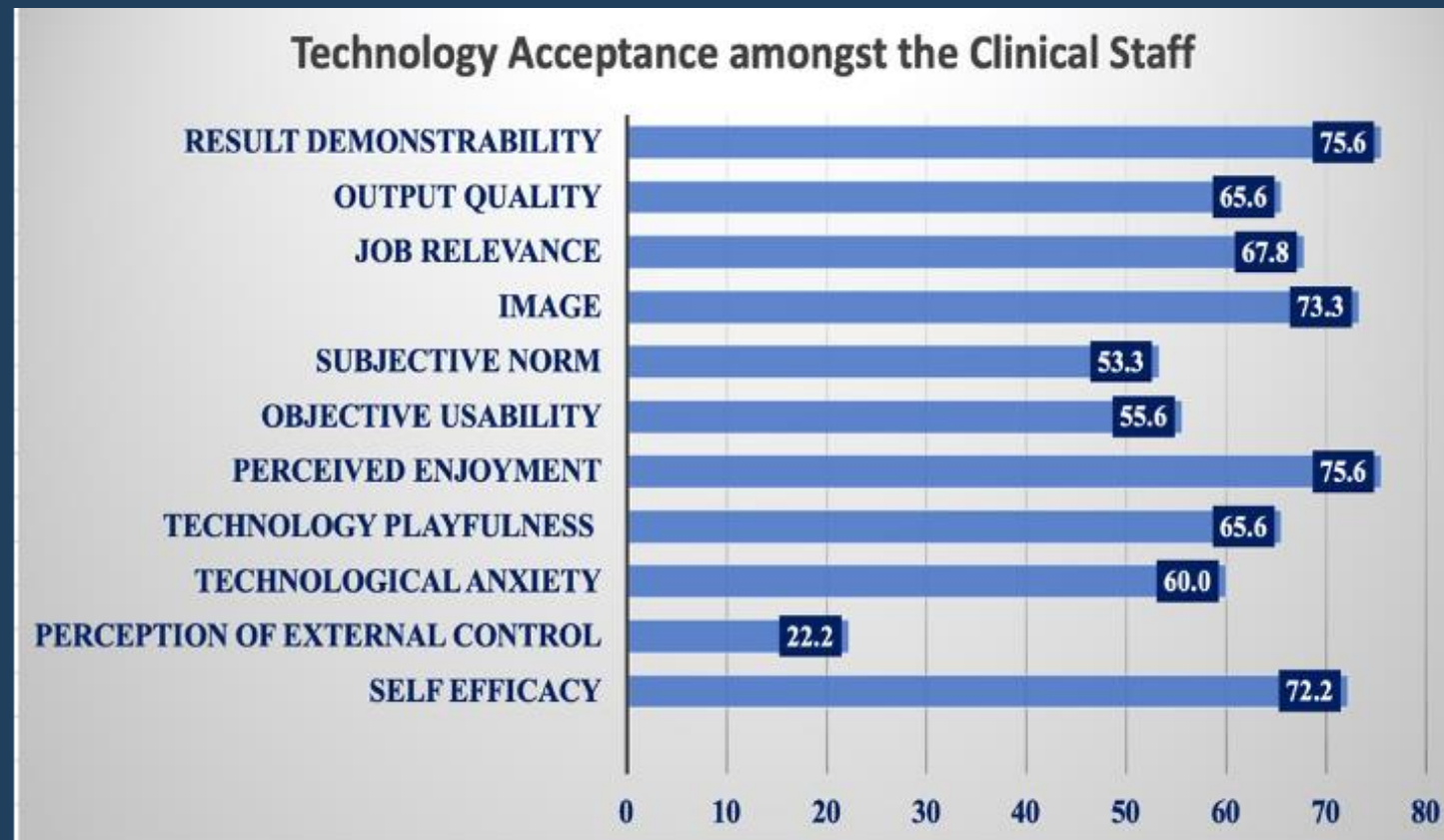
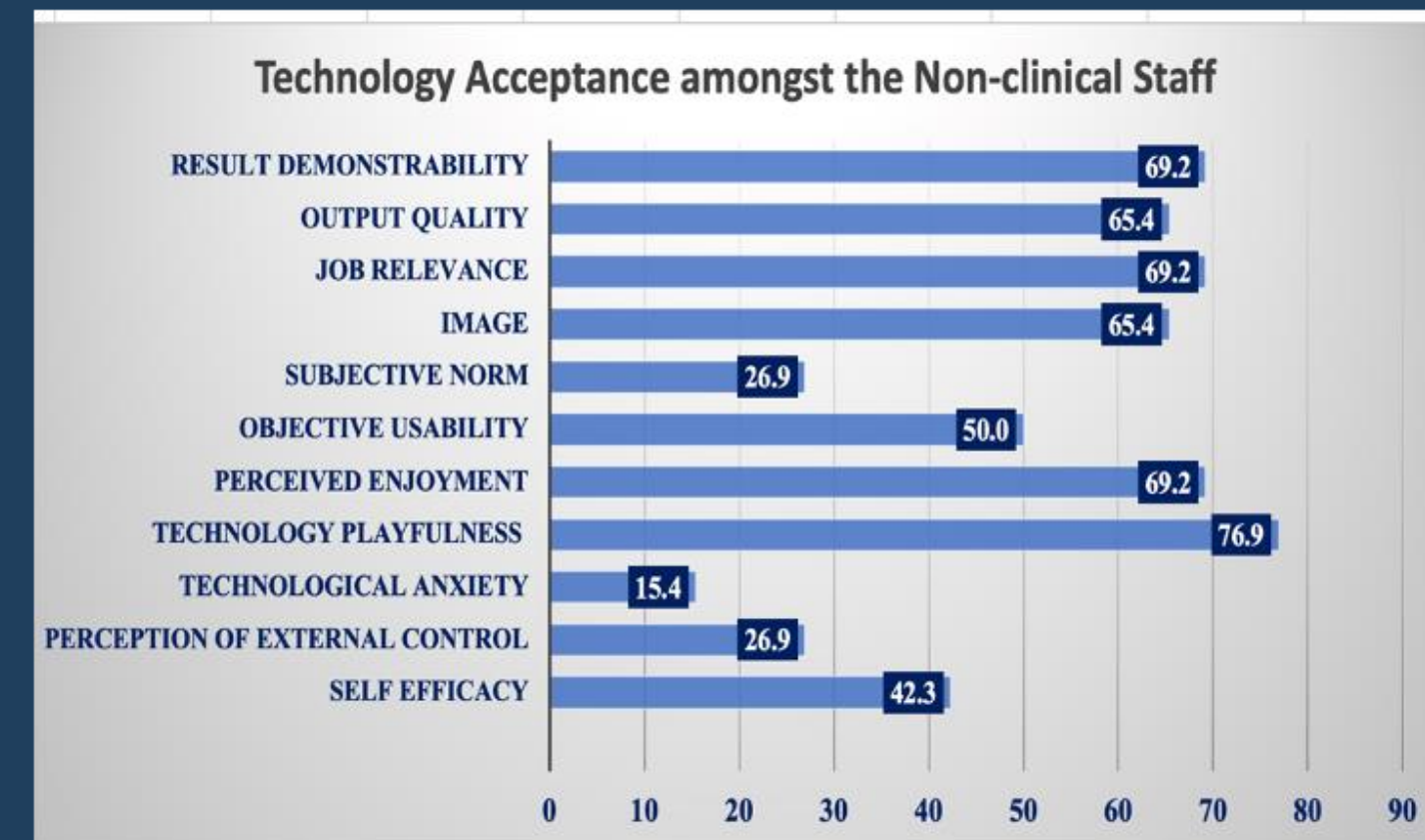


Fig 19: Application of TAM among the Non- Clinical Staff



- **The clinical staff** is more accepting towards using digital health tools than the **non-clinical staff**. They seem to be more motivated and know their intentions right when it comes to using these tools in the patient care.
- They seem to perceive more usefulness of these tools in achieving their patient care objectives. The non-clinical staff is also somewhat similar when it comes to their perception of the usefulness of these tools, however they feel that they will use it only because of their peers using it.
- Non-clinical staff has less technological anxiety (60%,15.4%) than the clinical staff because clinical staff is more closer to patients when it comes to handling their data and they fear more challenge at work while handling data and want to save themselves from the data breaches and challenges that come with handling these digital health tools.

Fig 20: Application of TAM among the Nurses

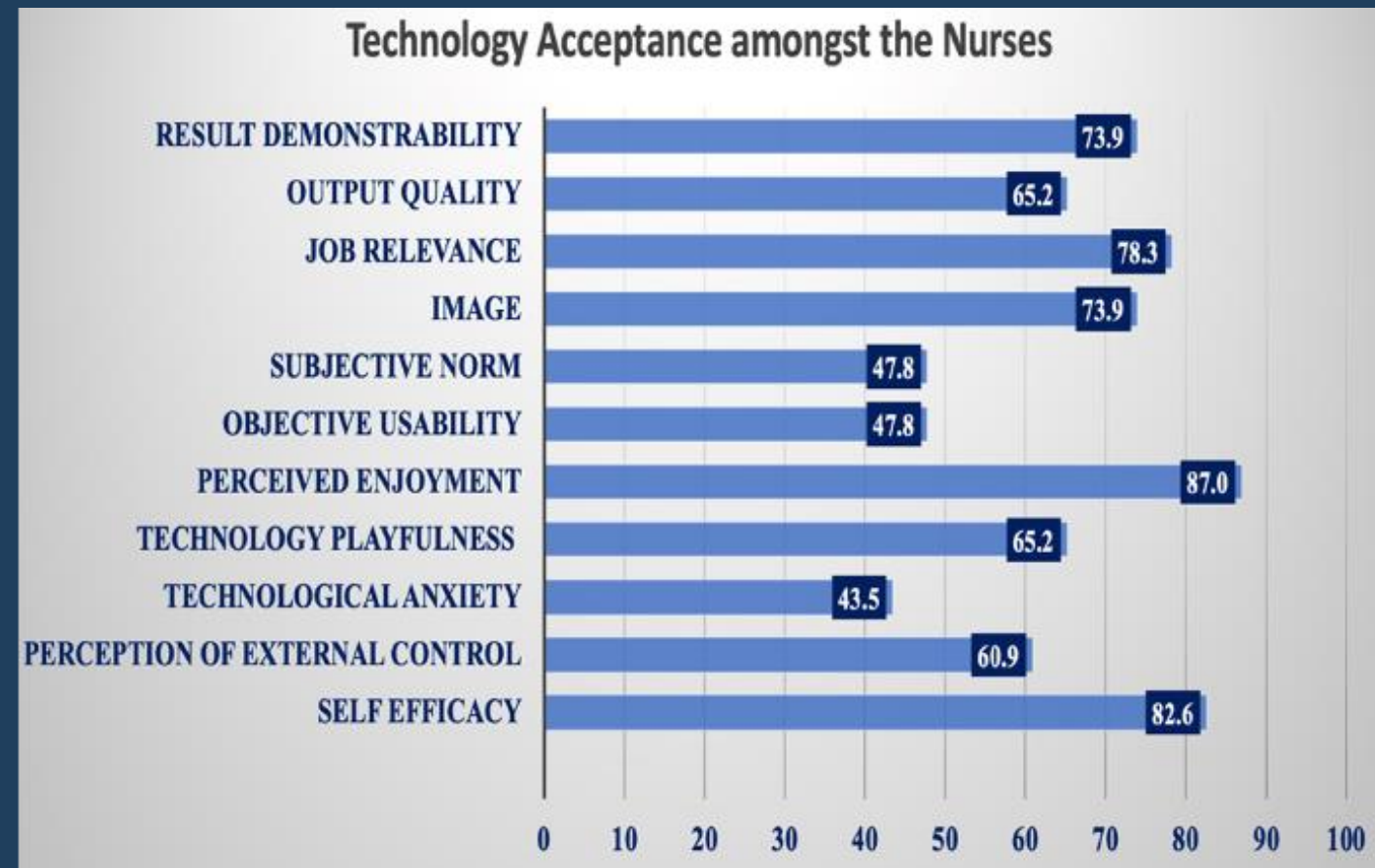
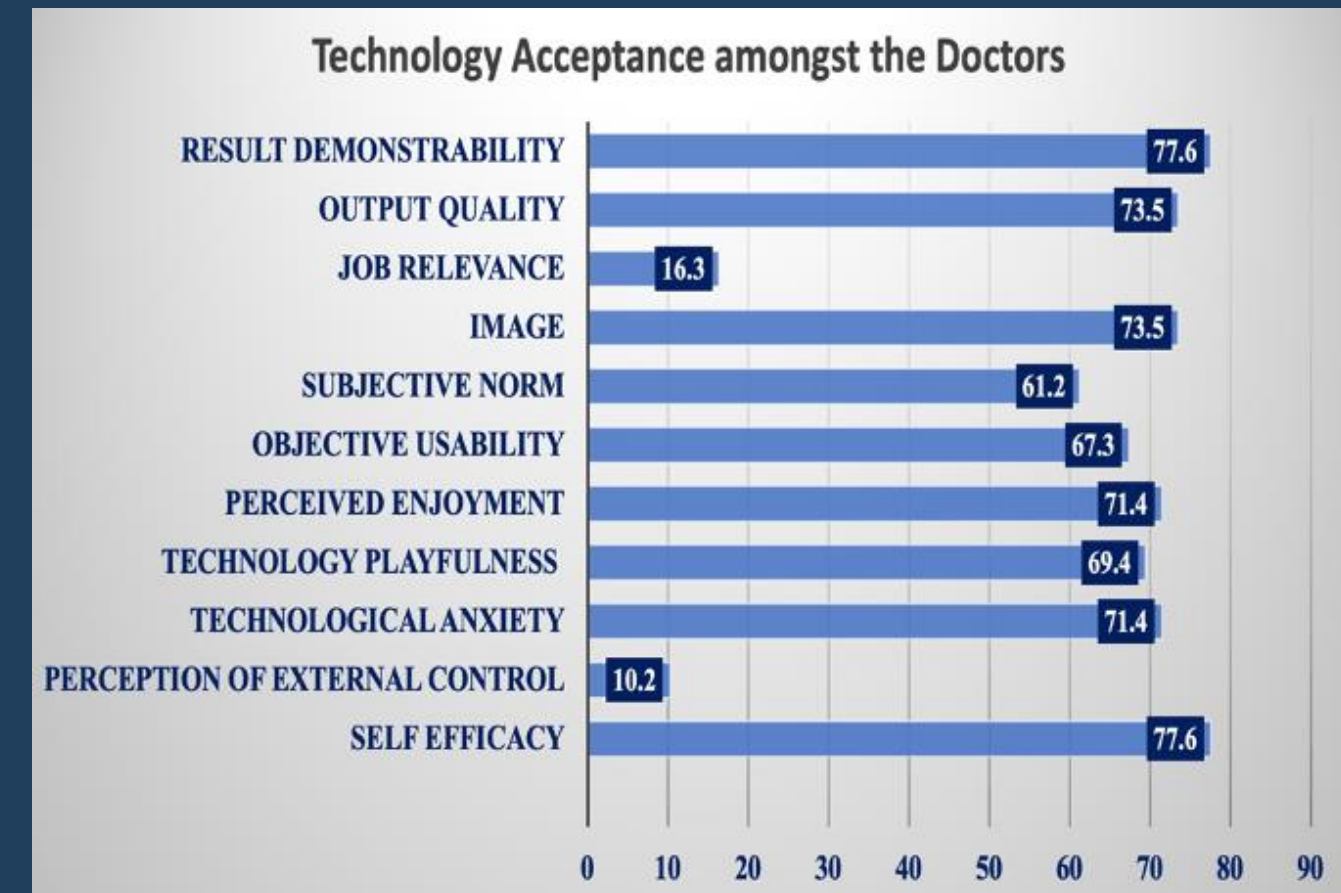


Fig 21: Application of TAM among the Doctors

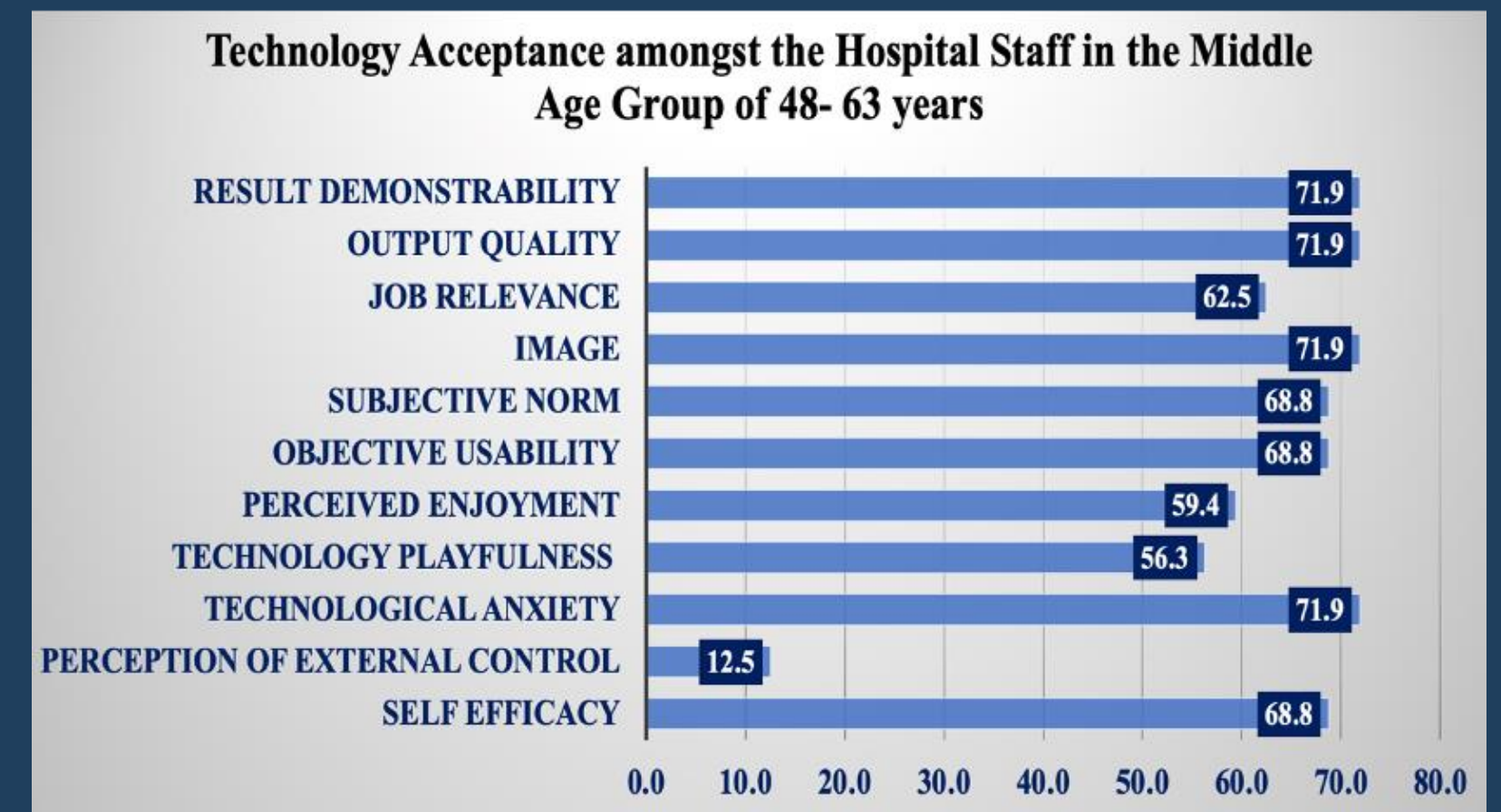


- **Doctors** feel that technology hasn't yet arrived at a point that it can be as effective as them. This could be due to years of training and experience, and the way they are wired neurologically that allows them to gauge human emotion beyond just the natural human desire for human touch.
- Doctors appear to be more concerned about technology (71.4 percent , 43.5 percent). Technological apprehension can cause resistance to change due to uncertainty and unanticipated technological mistakes.
- However, compared to **nurses**, who are aware that management will provide them with better tools if they need them but who also trust themselves to improve their behavior, doctors' impressions of external control (10.2 percent, 60.9 percent) appear to be less favorable.

Fig 14 : Application of TAM amongst the Hospital staff of 15-47 years



Fig 15 : Application of TAM amongst the Hospital staff of 48-63 years

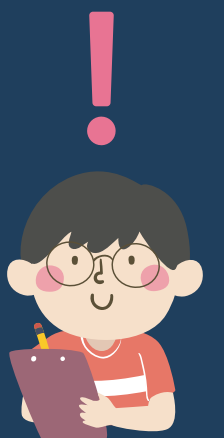


- **Younger staff members feel less motivated** to use digital health tools than the older ones because they worry about peer pressure, but also feel that sometime in the future they could be more motivated to use them once the senior members of their teams start using them too and offer some motivation in this regard.
- The **young age group** felt less open than the middle age group, in believing **that these tools will make them more efficient and effective at work** and save them time by reducing paperwork.
- Even though the middle age group was more motivated towards using these tools, feeling it would increase their efficiency, they felt that hospital management did not have those kind of resources for training or having better access to connectivity.

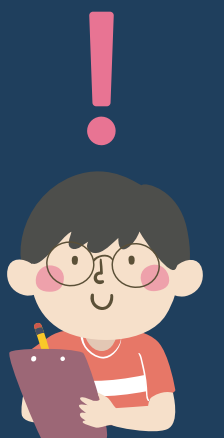


CONCLUSION

- The results showed that most of the **Hospital Staff** had a somewhat positive and agreeable attitude towards using these tools in the patient care, which was majorly influenced by **taking up new challenges** at work, **learning new skills** by taking initiatives during training sessions and **expecting the same from their hospital management**. The hospital staff in general was accepting and **expressed willingness** towards using these digital health tools in patient care.
- The staff of this hospital agreed that digital health tools **would make their work more efficient** and cost effective and **allow them to remain competitive** within their area as well as across broader market standards.
- They also saw these tools as **relevant within their jobs**, and after some learning, would **increase their productivity**, streamline paperwork, and **would allow for better disease surveillance**.
- They perceived using these tools an **enjoyable experience** as well; after just a short adjustment period, they **felt motivated at work** because they could notice themselves becoming more efficient with what they were doing while working with these tools.
- They also believed that learning these tools will give them a **higher social standing within their peers** at the hospital and other people in the conferences and meetings outside of work.



- However, our group did perceive these things as being quite **challenging and rigid**, which could **possibly make them lose data related to their patients**.
- They expressed an **associated problem regarding data breaches and potentially getting themselves into trouble** if they misused these digital health tools. It does challenge a lot, but might lead to lose of data or get one into trouble.
- They expressed the **associated anxiety** which comes along **with** everything related to these **technologies**. They hoped that their hospital would provide better infrastructure, but noted **insufficient availability of resources or connectivity problems** when using these digital health tools.
- Apart from this, they perceived that the **peer pressure which comes from using these technologies** by one member can induce a certain level of motivation in an individual for learning these new skills as well.





RECOMMENDATIONS

1) The hospital's staff exhibited a neutral to somewhat **agreeable attitude** despite having digital EMR and EHR capabilities in place. They refused to reply when **asked if a pre-survey was done before these tools were used** in the hospital or if it was run as a trial programme before a survey was taken. Additionally, **they didn't conduct any follow-up questionnaires** to assess how things were progressing after the use of these digital tools.

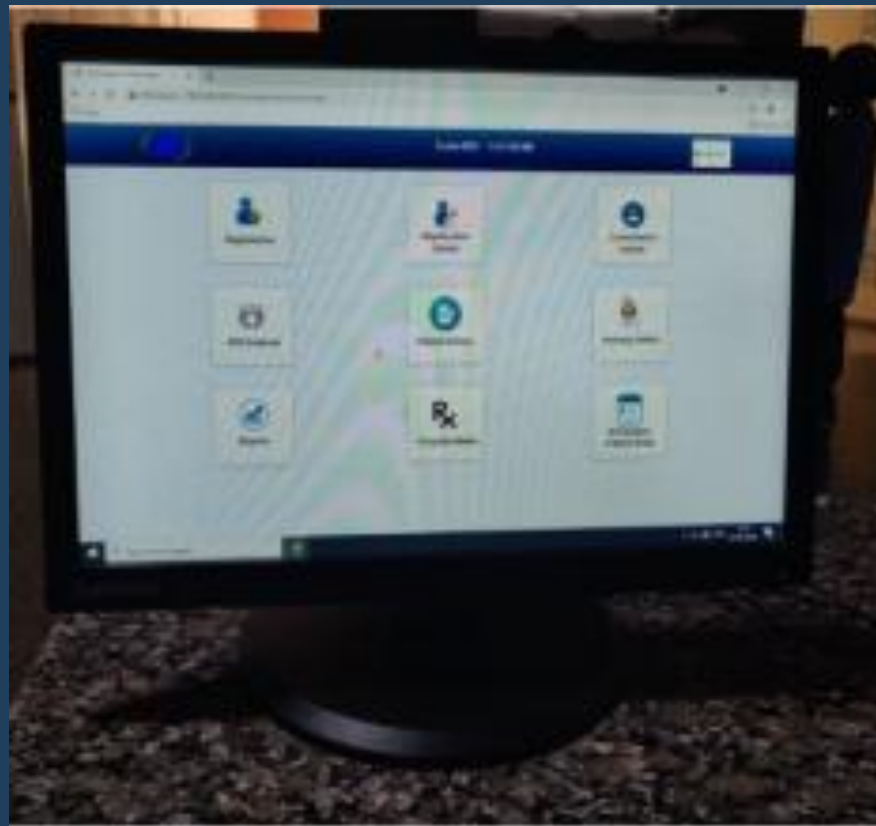


Fig 22 : **Binix DHT**

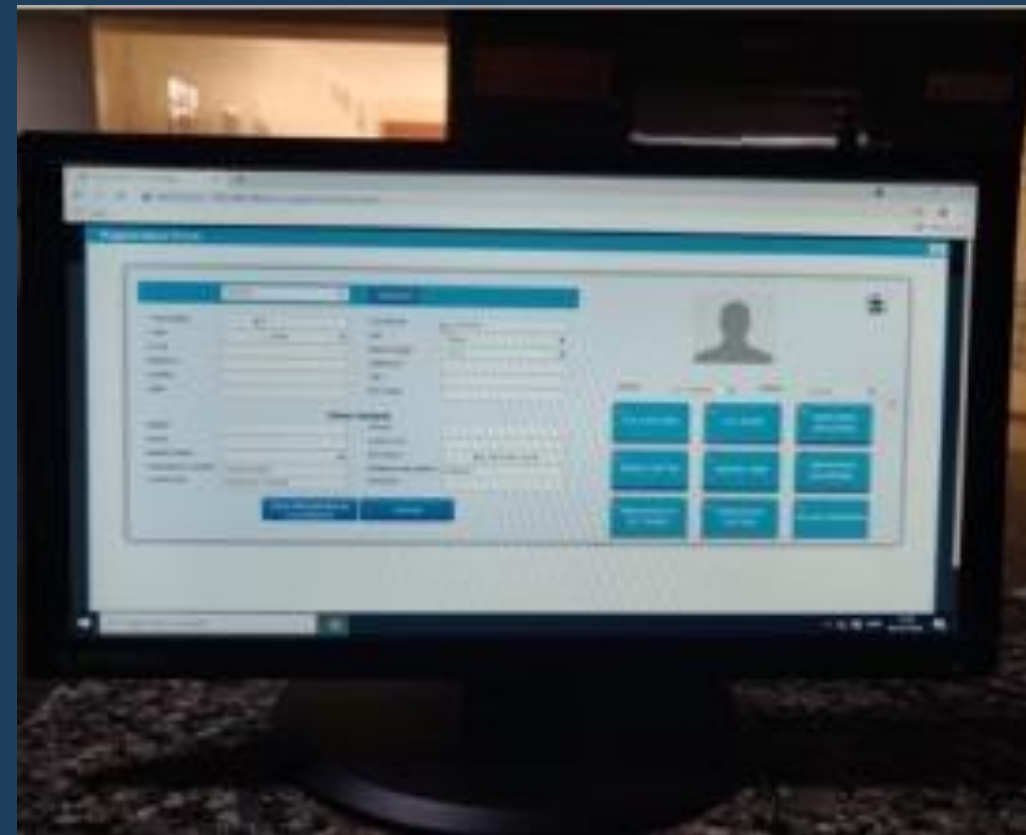


Fig 23 : **Medsynapse DHT**



Fig 24 : **GE Healthcare DHT**

2) The hospital **must regularly upgrade its resource base** in order to accommodate the patients' continually changing needs. This process is known as change management. In incorporating new technology in the hospital, **management must involve everyone at all levels of the organization and not just the top or middle management.**

3) The "**People, Process, and Technology (PPT) Framework**", which consists of three pillars, must be taken into account to enable the successful adoption of newly introduced systems at the hospital.

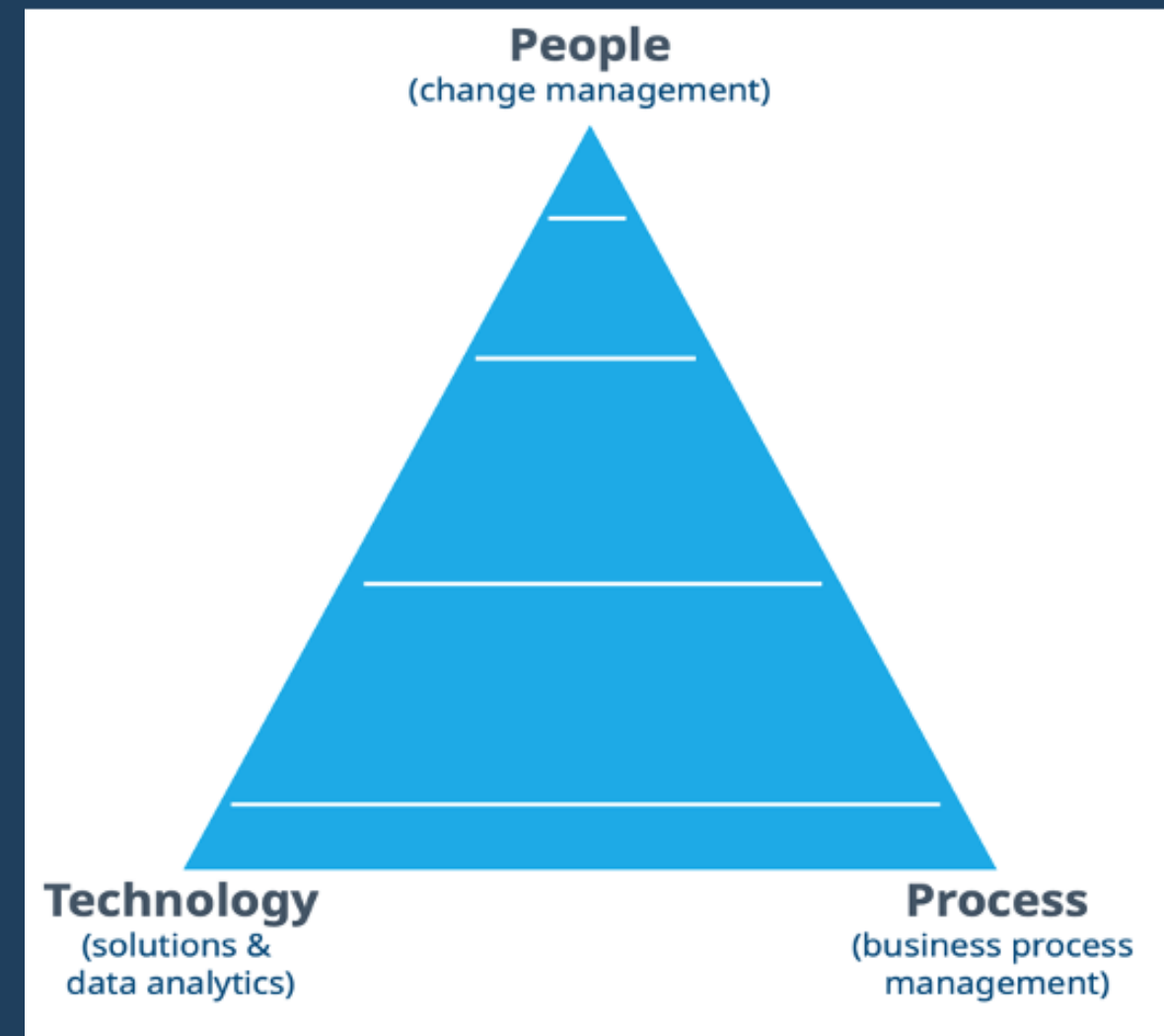


Fig 25 : **PPT Framework**

4) The hospital staff believes that employing digital health technologies requires additional knowledge and abilities. **Regular training sessions** should be conducted to address this. This will help them become **more capable and self-assured** when using these technological tools. Additionally, they believe that for learning to be effective, **peer support is crucial throughout**.



LIMITATIONS

- As there are so many determinants in the **Technology Acceptance Model**, the questionnaire was created accordingly. Since the workforce was not familiar with The questionnaire was developed in accordance with the Technology Acceptance Model's extensive list of determinants. The questionnaire was printed out on paper because the workforce was unfamiliar with online forms. Because there were so many factors, **the questionnaire was lengthy and took each participant roughly 15-20 minutes to complete.**
- Although the **employees were assured that their answers would remain anonymous** once management had reviewed the data, it is unlikely that they did. The only possible interpretation of the results is "full willingness" against "uncertain about use plus no willingness."
- The potential influence of regional factors on the decision made by healthcare professionals to use particular digital technologies could not be taken into consideration, to sum up. This study was **not intended to examine context variables (such as cultural and social characteristics)**, expectations placed on hospital staff, or their level of eHealth literacy.





REFERENCES

1. Statista Research Department,[Internet] [Place Unknown], 2021 ; Published on October 27, 2021. **Available on :** <https://tinyurl.com/3b72dma8>
2. Chris Shudes, Maulesh Shukla, Christine Chang, Chuck Appleby, John Hendricks, Janice Wurz, Deloitte Insights [Internet] [Place Unknown], 2021; Published on October 26, 2021. **Available on :** <https://tinyurl.com/4ptvxpnr>
3. Jones P, Wynn M, Hillier D, Comfort D. The sustainable development goals and information and communication technologies. Indonesian Journal of Sustainability Accounting and Management. 2017;1(1):1-5. **Available on :** <https://tinyurl.com/4b7fzc8p>
4. Lai PC. The literature review of technology adoption models and theories for the novelty technology. JISTEM-Journal of Information Systems and Technology Management. 2017 Jan;14:21-38. **Available on :** <https://tinyurl.com/2p8w2d7s>
5. Engin M, Gürses F. Adoption of hospital information systems in public hospitals in Turkey: An analysis with the unified theory of acceptance and use of technology model. International Journal of Innovation and Technology Management. 2019 Oct 20;16(06):1950043. **Available on :** <https://www.worldscientific.com/doi/10.1142/S0219877019500433>
6. Thapa S, Nielsen JB, Aldahmash AM, Qadri FR, Leppin A. Willingness to use digital health tools in patient care among health care professionals and students at a university hospital in Saudi Arabia: quantitative cross-sectional survey. JMIR medical education. 2021 Feb 19;7(1):e18590. **Available on :** <https://pubmed.ncbi.nlm.nih.gov/33605896/>

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