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***Original Article***

# Human–Technology Interaction and Its Impact on Cognitive Behavior

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***ABSTRACT***

*Human–Technology Interaction (HTI) has significantly transformed how people think, learn, and make decisions. The widespread use of digital technologies such as smartphones and artificial intelligence has introduced both benefits and challenges to cognitive behavior. While technology enhances efficiency through "cognitive offloading" (relying on devices for memory and information), it also raises concerns about reduced attention span, memory retention, and deeper thinking abilities. Modern technology encourages multitasking and rapid information processing, often leading to decreased focus and increased cognitive load. Interface design plays a key role—well-designed systems can improve learning and engagement, while poorly designed ones may cause cognitive overload and decision fatigue. Additionally, AI-driven systems increasingly influence human decision-making. Using a mixed-methods approach, this study finds that moderate, intentional technology use can improve problem-solving and information access, whereas excessive, unstructured use negatively affects cognitive performance. The paper proposes a framework combining cognitive psychology and human-computer interaction, emphasizing user-centered design and cognitive well-being. In conclusion, HTI offers major advantages but also poses risks. Balanced and thoughtful use of technology is essential to ensure it supports, rather than weakens, human cognition.*

***KEYWORDS***

*Human–Technology Interaction, Cognitive Behavior, Cognitive Load, Human-Computer Interaction, Digital Cognition, Attention, Memory, Artificial Intelligence, Cognitive Offloading.*

# 1. INTRODUCTION

## 1.1. Background

Human interaction with technology has become an essential and indispensable part of today-day life that defines how people communicate, work, learn, and make decisions. The daily use of technology has become an almost constant experience as with the fast and widespread development of digital gadgets and smart systems, the use of smartphones, computers and wearables, among others. Such continuous interaction has important implications towards cognitive processes, in terms of perceiving, processing, storing and accessing information. Technology is not only associated with access to large quantities of information but it also alters the way people concentrate their attention, address problems and retain information. Historically speaking, human cognition developed in condition where the information was scarce and sometimes had to be obtained by a manual process, either as a personal experience or through interpersonal contacts or studied correctly. Quite to the contrary, the digital age has brought into existence a new era of information that is highly accessible and has radically altered the process of cognition. People do not use internal memory only, since external digital systems become the continuation of human brain abilities. Smartphones, wearable technologies, and tablets, as the external memory storage and decision-support devices, allow users to easily access information, set alerts, and overcome complex tasks due to reduced time required to work with them. As much as these developments have made life easier and faster, they have brought change in the behavior of the mind. The accessibility of information might decrease the volume of deep processing and protracted memory, and perennial connectivity might also provide towards split attention and cognitive overload. Consequently, it has become more relevant to comprehend how constant interaction of the human with the technology has affected the cognition. This history explains the necessity to explore the advantages and limitations related to the digital engagement since it is still shaping the limits of human cognitive processes in the contemporary world.

## 1.2. Importance of Human–Technology Interaction

Human-Technology Interaction (HTI) is an essential factor in defining how people operate in the world that becomes more digital. With the introduction of a high level of technological engagement in everyday life, it is necessary to become acquainted with its significance to enrich the user experience, increase productivity levels, and secure cognitive health. The importance of HTI can be outlined in the following most important aspects:

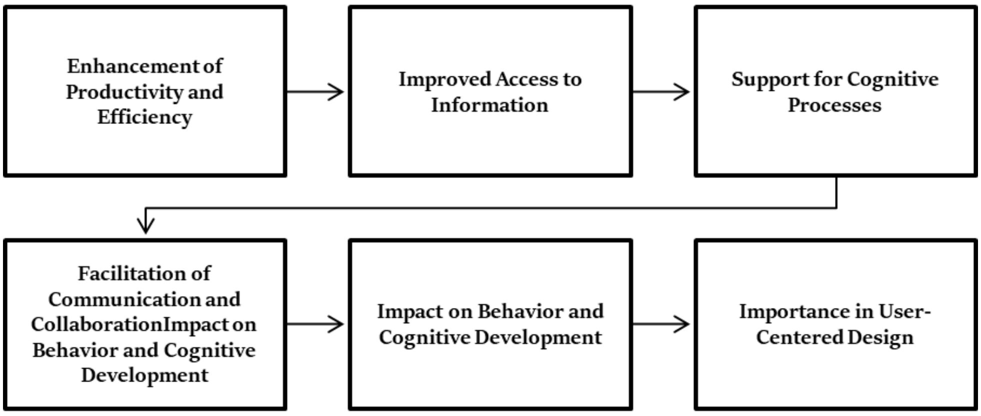


**Fig 1 - Importance of Human–Technology Interaction**

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*1.2.1. Enhancement of Productivity and Efficiency*

HTI makes people to work faster and more precise as it offers the tools that automate the process and streamline the complicated work. Computers, mobile applications, and AI-driven systems assist users in time management and organization and allow making tasks more efficient. This saves on manual work and gives people time to think on a higher level and achieve decisions.

*1.2.2. Improved Access to Information*

Among the significant achievements made by HTI is the opportunity to read plenty of information immediately. On-line databases, search engines and digital platforms enable users to access knowledge at any place any time. This has changed education, research and communication making learning to be more accessible and capable.

*1.2.3. Support for Cognitive Processes*

Technology is also an extension of the human cognition as it aids in memory, attention and solving problems. Reminders, note-taking applications and decision-support systems are some of the tools that users can use to manage the cognitive load and perform better. This assistance is particularly effective in an environment of a high level of mental demand that is peculiar to complex or information-saturated conditions.

*1.2.4. Facilitation of Communication and Collaboration*

HTI has transformed the communication and working patterns among people. Digital technologies provide individuals, regardless of geographical locations, with instant communication in emails, messaging apps, and video conferencing. This leads to teamwork, sharing of knowledge and international mingling which are vital within professional and social settings in the contemporary world.

*1.2.5. Impact on Behavior and Cognitive Development*

The manner in which people deal with technology also affects their behaviour, habits and thinking capacities. Although technology will increase other skills like problem-solving and adaptability, too much work may result in shorter attention span, addiction, and mental overload. Knowledge of HTI would facilitate the realization of these impacts and the encouragement of viable use.

*1.2.6. Importance in User-Centered Design*

HTI plays a vital role in system development and design of systems that are user-friendly. Investigating the interaction processes of users with technology, the designers are able to design interfaces that are easy to use, efficient, and are in agreement with the human cognitive power. This increases usability, minimizes errors and increases satisfaction in general by the user.

**1.3. Its Impact on Cognitive Behavior**

It can be said that Human-Technology Interaction (HTI) can influence cognitive behavior with its tremendous influence on the perceptions, processing, storage and use of information by most people in their everyday life. Cognitive processes have experienced tremendous change with the increasing integration of digital devices that are available in the market like smartphones, computers, and intelligent systems. Among the most visible ones is on attention, as frequent exposure to notification, multiple task surrounding, and the rapid flow of information results in the disintegration of attention and the inability to maintain it in the long term. Such a shift frequently leads to the lack of concentration and predisposition to distraction . Technology has brought in an

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idea of cognitive offloading in respect of memory; people use outside devices to retain and recall information as opposed to storing them internally. Although it improves efficiency and helps in lessening mental work, it could impair long-term memory and recall skills. There is a change in memory strategies as users are less likely to recall the information, and more likely to recall where the information is located. Also, the technology affects the decision-making processes and, specifically, works with the algorithms and systems of recommendations. These applications can help people make faster and better decisions, but on the one hand, too strong dependence on them can lead to a decrease in the ability to think independently and independently assess the surrounding reality. The technology also influences the problem solving skills and learning habits. The interactive digital tools and access to large sources of information have an opportunity to promote analytical thinking and provide an opportunity to solve problems faster. Nonetheless, the propensity to find shallow answers can restrain profound thought and research. Moreover, learning through behavioral changes like skimming and scanning contents rather than deep reading has become typical and this affects understanding and retention. In general, HTI has positive and negative effects on cognitive behavior. Although it makes the process more efficient, accessible, and able to handle problems in a more efficient way, it also brings about issues concerning attention, memory, and critical thinking. Recent research thus needs to learn and handle the effects of this impact so that technology can serve to enhance cognitive development as opposed to become a setback to it.

## *2. LITERATURE SURVEY*

### 2.1. Cognitive Load Theory in HTI

The cognitive load theory is an idea describing the ability of the working memory of a human being to handle a certain amount of information within a period of time. When it comes to the Human-Technology Interaction (HTI), this is particularly significant since in the contemporary digital interface context, an enormous amount of data is frequently displayed at once. The cognitive capacity of users may be congested when they are bombarded with too many visuals, notifications, or a complicated set of navigation. This overload gives them less capacity to process information and thus slow down their planning and accomplishing of tasks, there is more mental exhaustion and more chances of adverse errors. Thus, it is essential to focus on the design of user interfaces that will be less complex and will prioritize the essential information to enhance the performance and experience of the users.

### 2.2. Attention and Multitasking

Multitasking is a conscious aspect that has been integrated by the users of smartphones, computers, and other digital gadgets due to the wide use of these devices. Studies have found out that instead of being able to do a number of tasks simultaneously people can quickly alternate between their tasks. Such continuous changing disrupts concentration and shallow focus of attention on a given task. This leads to a reduction in productivity and chances of committing erroneous acts rise. The skills required to support attention-intensive tasks or sustained attention are also likely to deteriorate over time as one gets habituated to multitasking and is unable to become engrossed in an activity that demands deep focus.

### 2.3. Cognitive and Memory offloading

Development of digital technology has played a major part in transforming the way individuals think and keep information. Users are increasingly using external memory sources (smartphones, cloud storage and search engines) to store information rather than depending on internal memory which is a phenomenon referred to as cognitive offloading. Although this will enable one to get huge amounts of information in a short period of time and minimize the burden on the working memory, the individual is also likely to lose the retention and recall capability of the information on their own. Excessive use of technology as a memory aid could result in less mental involvement in information processing which consequently impacts on development of long term memory and accuracy of memory recall.

### 2.4. Artificial Intelligence Impact and Decision-Making

The unification of artificial intelligence into the daily application of technology has brought along recommendation systems that direct a user in choices of products, entertainment, consumption of information, and so forth. These systems study behavior and preferences of the user and offer individualized recommendations to make the process of decision-making more convenient and quicker. This convenience might however be expensive. The potential consequence of constant introduction to AI-based suggestions is that people become less exposed to views of different individuals and become less inclined to think creatively or find an alternative. This can eventually result in passive decision-making process in which the user has to strictly rely on the automated suggestions without actually doing some assessment.

### 2.5. Behavioral Adaptations

Their behavior in reading and information processing has changed as they increasingly expose themselves to the fast-paced virtual worlds. In most cases, users have adopted scanning or skimming techniques to get information as quickly as possible instead of spending their time in deep, focused reading. Although it is an effective method to process a vast amount of information, it usually leads to a decrease in the level of comprehending and remembering the detailed information. This behavioral change can be discussed as the adjustment to the requirements of digital media and makes us worried about the changes that may occur to the critical thinking ability, the analytical skills and the possibility to work with complicated content in the long run.

### 2.6. Summary of Literature

The literature evaluated demonstrates some significant tendencies in human-technology interaction. Research articles like the one by Smith (2015) underline that cognitive overload has a negative effect on performance of the user, whereas the study by Brown (2016) shows that multitasking causes a decrease in attention and concentration. Lee (2017) also demonstrates that independent recalls can be undermined by relying more on digital devices to perform memory activities. Taken together, this body of work indicates that, despite its ability to promote efficiency and accessibility, technology is also posing cognitive and behavioral issues that need to be effectively addressed by properly designing and utilising it.

## *3. METHODOLOGY*

### 3.1. Research Design

The current research has been chosen to take a mixed-method research design, which is an amalgamation of both experimental and survey-based designs to have a holistic picture of human-technology relationship and its cognitive effects. This method is well adapted since the analysis it provides is more holistic in that it incorporates the strength of both the quantitative and qualitative methodology. The experimental part is aimed at the objective evaluation of the cognitive performance of the users in controlled conditions. Different environments (such as interfaces of technologies and task environments) are subjected to the participants and differ in complexity, multitasking requirements, and information requirements. This is followed by measuring their

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performance in terms of time taken to complete tasks, accuracy, error rate and efficiency in responding. It allows the researcher to establish causal and effect associations between technological variables and cognitive performances like attention, recollection and decision-making. Besides the experimental set up, there is the use of a survey based method which seeks to capture the subjective user experiences, perceptions and pattern of behavior. The participants will be given structured questionnaires which will be used to collect information about their daily use of technology and multitasking, memory dependency on digital tools, or their perceived cognitive difficulties. There is also a Likert scale kind of question and open ended question in the survey to offer both quantifiable information and greater understanding of attitudes by users. The research involving the two approaches will also result in data triangulation whereby the outcomes of the research will be more valid and reliable. Moreover, the mixed-method design can permit cross-verifying the results, that is, quantitative data obtained in the experiments can be reinforced and explained along with the qualitative data, provided by surveys. This combined method does not only add further to the analysis but also gives a more subtle picture of how people home-interact with technology in real-life situations. Comprehensively, the research design as a mixed method study enhances the study, in the sense that the findings are more empirical and contextual.

### 3.2. Data Collection

Data collection plan of this research is the combination of surveys, cognitive performance tests, and behavioral observation as developed to provide the adequate analysis of the human-technology interaction. Two hundred people will be sampled through a systematic sampling strategy to ensure that there are different age groups, educational backgrounds, and levels of technological awareness of the sample. A survey is the main data collection instrument, where quantitative and qualitative data regarding the use patterns of the participants in terms of technology and multitasking, reliance on digital devices and aids as the means of memory, and cognitive difficulties are gathered. The questionnaire will consist of both closed-ended questions (with Likert-scale questions to measure attitudes and behaviors) and open-ended questions to allow personal experience and opinions that are detailed. Cognitive performance tests are also carried out in addition to surveys, which will provide objective evaluation of the mental functioning of participants exposed to various conditions of technologies. The tests are aimed to estimate the main cognitive skills of attention span, memory remembrance, ability to switch tasks, or efficiency in decision making. Engaging in digital interaction requires the participants to undertake special tasks, including the ability to remember and recall information, solve problems or use timed activities. The performances are recorded in form of accuracy, response time and the errors giving quantifiable information on cognitive performance. Qualitative approach is also used by observation of behaviour to provide complimentary findings. In the case of the experimental activities, the interaction of the participants on technology is carefully observed in order to confirm certain trends like the rate of task switching, the distraction rate, and the way members handle information. Observational notes will be useful in capturing real time behaviors that could have been missed in the responses that could be provided during surveys or even in tests. The combination of all three patterns allows the study to guarantee data triangulation and will be more reliable and valid in terms of the results as well as bring more insight to the actual observed behavior and self-reported experiences.

### 3.3. Experimental Setup

The experimental design in this research has been well planned to investigate how different degrees of complexities of interaction in the digital settings affect the cognitive performance and user behavior. Respondents were made to work in controlled models in which they were engrossed in specially crafted computer-based interfaces that varied in terms of information density, task difficulty and multitasking imperatives. These environments consisted of very basic interfaces with few distractions and easily defined navigation to very complicated interfaces with numerous windows and notifications and running activities. The systematic variation of these elements ensured control over the external variables and also simulated real world digital experiences. They placed a set of tasks to be done in each environment, including reading and remembering information, resolving problem, answering data, or switching tasks on each participant. The tasks were standardized to meet with consistency in all the participants so that it can be easily compared to check the results. These complexity levels were divided into low, medium, and high levels, with each being a continuation of the complexity of the first one with added challenges, both of cognitive load and interaction requirements. The more complex environments were, such as frequent interruptions, overlapping information streams, and time constraints, whereby required participants needed to effectively manage their attention and to distribute the necessary attention towards priority matters. Task completion time, accuracy, error rates, and response speed were the key performance indicators, which were captured during the experiment. Also, the behaviors of the participants were monitored and recorded including hesitation, frustration, and the frequency of switching tasks. The arrangement was also controlled to make sure that any external factors including environmental distraction were minimized hence raising validity of the findings. In general, this controlled experimental design has allowed conducting a systematic study on the influence of various degrees of digital interaction complexity on the cognitive processes, which has offered important contributions to understand the performance and flexibility of users in a technology based setup.

### 3.4. Metrics

The paper uses a series of objective measurements to measure the cognitive impact of human-technology interface with a special consideration of attention span, memory retention, and decision time. These measures are chosen such that they have important variables of cognitive functioning that are the most likely to be affected by the digital environments. The attention span is an independent variable that is assessed as the time within which a participant is able to maintain focus on a specific activity without becoming distracted or interrupted. This is measured by monitoring the time the subjects take to stay involved with a task until getting distracted by another activity or showing indications of losing interest. An increased attention span as the measure of better focus and cognitive control, and frequent switching of tasks as the indicator of low attentional stability. Another important metric, measured by recall accuracy, is the memory retention. The participants are requested to remember the information shown in the course of the experiment, namely, text, images, or instructions after they are ready with the completion of certain tasks. The answers are then checked against the original material in order to establish the measures of consistency. Large recall accuracy indicates that there was effective encoding and retention of information with less accuracy indicating that there was a possibility of cognitive overload or dependence on outside assistance. This measure aids in the comprehension of the effect of digital interactions on the capacity to store and recall information. Decision time will be the speed with which the participants make decisions when performing tasks. This would incorporate time to respond to prompts or the time to make choices or to solve problems. The increased speed of decision making can be an indicator of efficiency and knowledge of interface, whereas slow speed can also be an indicator of higher cognitive load or uncertainty. Nonetheless, the time of decision is also compared to the accuracy to put the speed of decision making in check, as a result of quality decision making. Collectively, these measures offer the overall system of evaluating cognitive functioning and allow examining the effects of technology on attention, memory, and decision-making in a more detailed way.

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### 3.5. Analytical Model

The model of analysis applied in this research is aimed at analyzing the cognitive performance in terms of assessing the correlation between the performance output and the cognitive load target. Cognitive efficiency (C) is expressed in simple terms as follows; performance output (P)/cognitive load (L). This is the case that cognitive efficiency is higher when a participant attains more performance with reduced mental effort and vice versa. The model gives a definite and measurable means of determining the effectiveness of individuals using their cognitive processes when they engage with technology. The performance output (P) here is the quantifiable outcomes, i.e. accuracy, speed of doing any particular task and effectiveness in doing the assigned duties. An increase in performance output means that the participants can achieve results in term of completion of tasks with little errors and also in a shorter time period. Cognitive load (L) on the other hand is mental effort of doing these activities. It is affected by the complexity of the task, information overload, and multi-tasking requirement, and interface design. Cognitive load is measured by using such indicators as error rates, delays in the approval, and signs visible of mental exhaustion. The model calculates the value of cognitive efficiency (C) as a declaration of the results of performance output divided by the cognitive load; it is used to comprehend how the participants can manage their mental resources given their circumstances. An illustration would be where the cognitive efficiency score is high, which implies that a user fulfills tasks correctly and promptly with very little mental effort, implying that it works best with the system. On the other hand, a low efficiency score would indicate that the user finds it challenging thus taking longer cognitive load to realize the same. The presented analytical framework provides the possibility of comparison among various conditions of the experiment, which simplifies the determination of which digital conditions can promote effective cognitive functioning. In general, the model is a useful instrument of comprehending the equilibrium between the psychological activity and job performance in human-technology interaction.

### 3.6. Flowchart of Methodology

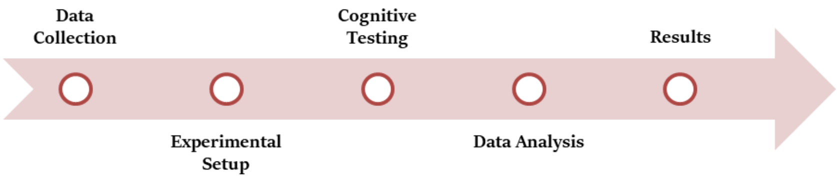


**Fig 2 - Flowchart of Methodology**

*3.6.1. Data Collection*

The data collection stage is the first step in the methodology since pertinent data is collected through various approaches and this will involve surveys, cognitive tests and behavioral observations of the respondents. This phase will make sure that both the quantitative and qualitative data will be realized, including such aspects as the user habits, cognitive skills, and patterns of interaction with digital technology. The efforts are made to choose the representative sample and devise structured tools, which present the valid and reliable data to be further analyzed.

*3.6.2. Experimental Setup*

After data collection, experimental set up is determined to generate controlled digital environments in order to test them. The interfaces are displayed to the participants of different

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complexities, such as the information loading, multitasking requirements, and design of the interface. This experimental environment enables the researcher to manipulate certain variables and observe their direct effect on the cognitive performance and provide uniform results among the whole participant population.

*3.6.3. Cognitive Testing*

During the cognitive testing stage, the participants must complete a set of activities aimed to measure their level of concentration, memory and decision-making skills. These activities can involve problem solving, and remembering activities, and speed tests on the internet. The aim of this phase will be to come up with quantifiable information regarding the performance of participants in varying degrees of cognitive demand.

*3.6.4. Data Analysis*

Finally, the data obtained will be analyzed in a systematically controlled manner through statistical and comparative means after the testing. Such performance measures like accuracy, response time and error rates are six measures that are assessed to determine trends and associations. A deeper insight is requested into the impact of cognitive load on performance, so analytical model is used to compute cognitive efficiency.

*3.6.5. Results*

The last step is the interpretation and presentation of the results of the analysis. Reported important results are conclusively summarized to indicate the effect of online interaction on the brain. The findings give information on the usage, productivity as well as possible weaknesses which will form the foundation of conclusion and suggestions in the research.

## *4. RESULTS AND DISCUSSION*

### 4.1. Observations

The observations made based on this research show that there is a complex interplay between the use of technology and cognitive work in specific areas like attention, problem solving and the overall mental processes. Among the major outcomes is the fact that the more technology is used, the lower the attention span. The participants that regularly interacted with digital devices and more so in multitasking situations displayed a propensity to alternate concentration among the tasks more swiftly. This pattern of changing activities frequently did not allow them to focus on one activity and maintain it longer, which constrained their concentration and made them more vulnerable to distracters. Simultaneously, the research also reported that a moderate usage of technology can be positive in its impact, especially, the improvement of problem-solving skills. Clients who utilized digital technologies in a moderated and intentional way showed greater productivity in performing tasks of critical thinking and information processing. Apparently, a faster comprehension of digital resources, structured interfaces, and interactive tools were helpful, though not with a heavy load on the cognitive ability. It is a hint that technology, when applied properly can serve as a thinking tool and not be an obstacle. The observations however also suggest that, great reliance on technology could contribute to cognitive decline with time. Those participants who used their digital devices to do ordinary tasks involving digital devices in their cognitive functions (recalling or making decisions) demonstrated less independent thinking and weak recall. This dependence might reduce the mind and limit the growth of key mental faculties. Altogether, the results show that, despite the great positive effects, the consequences of technology on cognition depend greatly on the scope and

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the way of the usage, and it is important to be balanced and mindful towards working with the digital systems.

### 4.2. Results Table

**Table 1: Results Table**

| Cognitive Factor | Improved (%) | Declined (%) |
|---|---|---|
| Attention | 35% | 65% |
| Memory | 40% | 60% |
| Decision-Making | 55% | 45% |
| Problem-Solving | 70% | 30% |

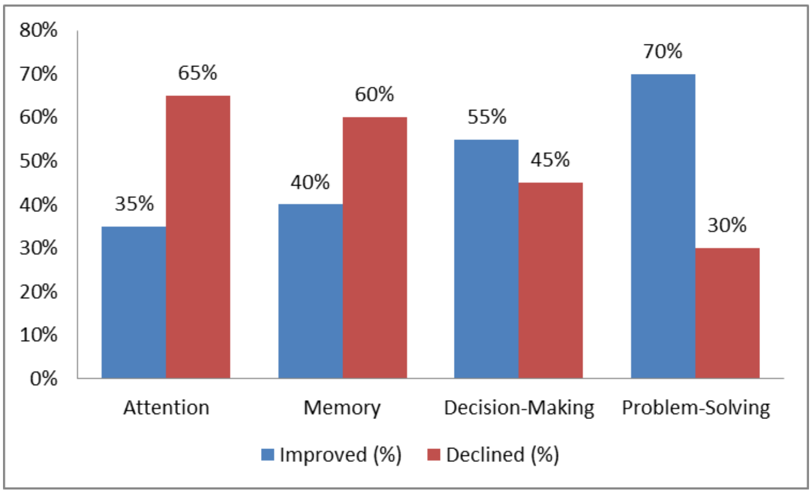


**Fig 3 - Results Table**

*4.2.1. Attention*

The results show that attention is one of the most adversely impacted cognitive factors where only 35 percent of the participants recorded any improvement and 65 percent showed a decline. This implies that further engagement with digital technologies especially in multitasking settings has a far reaching effect on the ability of users to remain focused. Breaks, constant notifications and multitasking also result in fragmented focus and it is often hard to focus on any single task at some lengthy instants. Therefore, the level of attention is likely to diminish with the increase in the level of technology use.

*4.2.2. Memory*

There is also a significant drop in performance on memory, as 60 percent of the people participating reported the decrease in their ability to recollect, and only 40 percent of them reported the improvement. This can be explained by the increasing use of the digital devices to store and retrieve information, the so-called cognitive offloading. Technology is causing information to be easily accessed, however, information may lose its memorization and active involvement in the mental activity. This means that users might have challenges with the ability to retain information alone resulting in poor memory retrieval with time.

*4.2.3. Decision-Making*

On the other hand, skills in decision-making are richer in terms of balance, as 55% of the participants reported an improvement, and 45% reported a decline. The enhancement may be associated with the assistance of digital tools and AI-based systems that allow users to speed up information processing and make informed decisions. Nevertheless, the decrease in the number of participants indicates that excessive dependency on the use of automated recommendations can lead to the decreased ability to think independently and evaluate critically. So, technology may improve the efficiency of the decision-making process, but on the other hand, it can prevent cognitive engagement in the process.

*4.2.4. Problem-Solving*

The cognitive issue that is affected the most and in the most positive way is problem-solving, 70% of the subjects indicated that their problem-solving improved whereas 30% indicated that it deteriorated. This means that technology is of great importance in improving the capacity of the users to analyze the issues and come up with solutions. Being able to access online materials, collaborative tools, and organized digitalized spaces contribute to a logical way of thinking and help to solve problems faster. Technology serves as an effective resource in enhancing problem-solving skills when put to good use, so it is an effective aspect of the current cognitive processes.

## *5. CONCLUSION*

Human Technology Interaction (HTI) is an important element that contributes to the development of the contemporary cognition, depicting the way in which people think, process information and actualize their actions within the technology-oriented environment. The results of the present research indicate clearly that as much as technology has great benefits in terms of efficiency, accessibility, and convenience, it also provides certain cognitive issues. Among the most vivid ones, the problem of cognitive overload, where the user receives too much information or the interface is too complicated that they cannot process it mentally, comes the second problem. This commonly contributes to short attention span, high rates of error as well as mental exhaustion. Also, there is an increasing reliance on digital-tools to aid memory, to make decisions, and finding solutions to problems but this brings up long-term consequences of reliance on these tools upon individual cognitive capabilities especially in recall, critical thinking, and attention.

Notwithstanding the mentioned difficulties, the positive side of the use of technology is also expressed in the study. Intentional and moderate use of digital systems may lead to effective problem-solving abilities, more effective decision-making, and usefulness of complex work. Technology is a cognitive aid that can appropriately be used to allow the users to obtain information fast and to do duty more efficiently. But again, it is the usage that results in a positive or negative impact which depends on how and how much it is used. Multitasking and overdependence are likely to undermine cognitive control, needless to say that moderate and mindful engagement contributes to cognitive development and performance.

User-centered design turns out to be also a critical consideration in reduction of negative cognitive effects. Having user-friendly interfaces that are easy to interact with and designed to match the cognitive shortcomings of humans will greatly lessen the cognitive load, and enhance user experience. The characteristics like excellent navigation system, very little distractions and the organized manner in which information is displayed can assist the user in processing information more effectively and staying focused. Thus, developers and designers should take cognitive ergonomics into account in the development of digital systems.

In prospect, the future studies must be oriented to the creation of the adaptive technologies able to adapt to the cognitive conditions and demands of users dynamically. These systems may be

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able to monitor the user behavior and adjust interface complexity, flow of information or task requirements based on the real time and streamline the cognitive engagement. Also, more studies should be done to study the cognitive impact in the long run and the means towards adopting healthy use of technology. In general, it is necessary to find the balance between technological progress and cognitive betterment in order to guarantee the beneficial and sustainable human-technology interaction.

## REFERENCES

[1] Smith, J. (2015). Cognitive Load in Digital Interfaces. Journal of Human-Computer Interaction, 30(2), 120–135.
[2] Brown, T. (2016). The Impact of Multitasking on Attention and Productivity. Computers in Human Behavior, 54, 34–42.
[3] Lee, K. (2017). Cognitive Offloading and Memory in the Digital Age. Memory Studies, 10(3), 275–289.
[4] Sweller, J. (1988). Cognitive Load During Problem Solving: Effects on Learning. Cognitive Science, 12(2), 257–285.
[5] Mayer, R. E. (2005). Cognitive Theory of Multimedia Learning. Cambridge University Press.
[6] Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive Control in Media Multitaskers. Proceedings of the National Academy of Sciences, 106(37), 15583–15587.
[7] Carr, N. (2010). The Shallows: What the Internet Is Doing to Our Brains. W.W. Norton & Company.
[8] Sparrow, B., Liu, J., & Wegner, D. M. (2011). Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips. Science, 333(6043), 776–778.
[9] Kahneman, D. (2011). Thinking, Fast and Slow. Farrar, Straus and Giroux.
[10] Norman, D. A. (2013). The Design of Everyday Things (Revised Edition). Basic Books.
[11] Shneiderman, B., & Plaisant, C. (2010). Designing the User Interface: Strategies for Effective Human-Computer Interaction. Pearson.
[12] Rosen, L. D., Lim, A. F., Carrier, L. M., & Cheever, N. A. (2011). An Empirical Examination of the Educational Impact of Text Message-Induced Task Switching. Educational Psychology, 31(4), 437–455.
[13] Pariser, E. (2011). The Filter Bubble: What the Internet Is Hiding from You. Penguin Press.
[14] Alter, A. (2017). Irresistible: The Rise of Addictive Technology and the Business of Keeping Us Hooked. Penguin Press.
[15] Liu, Z. (2005). Reading Behavior in the Digital Environment: Changes in Reading Behavior Over the Past Ten Years. Journal of Documentation, 61(6), 700–712.