

## The Impact of Smartphone and TV Applications on Interactivity: A Systematic Review

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### Abstract

This research will determine, explain, and evaluate the latest findings in smartphones and TV applications and their impact on interactivity by emphasizing the terms of each of the research variables. This was done to understand the relationship between the current research and the literature and prior researches that will be used to prepare the research content and obtain relevant information. In addition to including the basic concepts of the research variables and some theories that explain them. Besides, a framework will be included that includes elements that explain the methodology that was followed in the research and represents a table containing five previous studies centered around the subject of the study and its discussion, which were conducted in different countries.

**Keywords:** *Smartphones, TVs, Smartphones and TV applications, Interactivity, Technologies*

## **1. Introduction**

Regardless of our age, gender, or culture, digital media including social TV is an essential component of our everyday activities and is used for a variety of reasons and goals (such as communication, entertainment, knowledge, and information). We cannot function in our daily lives without the integration of digital media, including social media, to a certain degree (Shin & Kim, 2013). The connection between digital media and social/learning interactions has already been covered and emphasized in studies. Because of its enhanced usability, accessibility, sociability, and sense of community, digital technology has made smart engagement easier in a variety of ways, including online learning interaction and communication. On the other hand, nothing is understood about how social TV affects our lives (Pabon, Guerrero, Samboni, & Gonzalez, 2015).

Watching television is still becoming a very popular pastime. Although there have been predictions that traditional TV will be replaced by the Internet, personal computers (PCs), and mobile devices, the current tendency is to continue watching TV while simultaneously utilizing other gadgets. According to a number of studies that focused on the TV, interactive TV, and Internet Protocol TV (IPTV) domains, most people (60%) still watch TV as a social activity, even though they use another device for 60% of that time. Secondary devices, particularly mobile devices, appear to be an excellent option to supplement the present TV and entertainment-related activities in the living room, especially considering this high percentage of parallel usage (Shin, Hwang, Choo, & Choo, 2011).

In 2006, the smartphone a mobile phone with enhanced technology was introduced. At the beginning of 2009, smartphones accounted for 5% of the global mobile market due to customer unfamiliarity; however, by the end of 2020, there will be around 5.9 billion smartphone users globally, up from the current 2.6 billion users. Smartphone penetration in wealthy nations has already been estimated at over 60%, and during the following four years, it is predicted to reach almost 80% (Johnson, 2020).

Due to their rapid expansion, smartphones and TVs now come equipped with highly advanced technology like global positioning systems, broadband internet access with full browsing capabilities, and CPUs that use less power. The shortcomings of earlier multimedia phones, such as their low screen resolution and limited Internet functionality, can be solved by these cutting-edge technologies. Therefore, with sophisticated methods, smartphones can be widely

used for business objectives. Business professionals have already foreseen cell phones' potential for use in commerce (Li, Lin, Peng, & Shui, 2022).

### **1.1 Research Gap and Questions**

The number of reports and findings available increases as the field of research expands, making it necessary to summarize and provide an overview. Given the importance of smartphones and smart TV applications on interactivity, there is a need to structure the field systematically. By conducting the current research, we refer to several previous studies and literature that contain independent (smartphones and TV applications) and dependent (interactivity) research variables. To our knowledge, there are no secondary studies that explore current solutions presented in the literature that link smart technologies; especially, smartphones and TVs with interactivity at the same time. In order to address this research gap, we identified and analyzed the literature related to interactivity and smart technologies (smartphones and smart TV applications).

We also believe that there is still a need to develop a comprehensive and shared understanding of the essential applications of smart technologies. To achieve the research objectives, the following questions will be answered:

1. What are the smartphones and TV applications?
2. What is the impact of smartphones and TV application on interactivity?

### **2. Theoretical Background**

Since the start of the current decade, there has been an increase in interest in technologies such as smartphones and TVs and how they affect interactivity. Consequently, numerous empirical studies on the technologies have been conducted. This area of research has been essential in demonstrating the value of technologies since it has produced verifiable evidence of the benefits that individuals and organizations can obtain from utilizing and implementing TV and smartphone applications (Johnson, 2020).

This section will discuss the fundamental definitions of interactivity and technological innovation such as smartphones and TV applications, as well as it will explain the effectiveness of smartphones and TV applications on interactivity.

## **2.1 Smartphones and TV Applications**

These days, established sectors or businesses face a new competitive climate as a result of digital transformation. With the aid of various sensors, businesses are generating an increasing amount of interactive data as they attempt to adjust to this new environment. With all of this data, its production ecology can increase production efficiency, and its consuming ecosystem can provide more data-driven supplementary services. Without a doubt, increased competitiveness results from more effective and beneficial services (Liu, et al., 2018).

By the way, in this new environment, traditional competitors who compete with identical items will be replaced by digital competitors who compete with similar data. All of these developments have demonstrated how digital transformation has a subversive effect on legacy companies and how crucial it is for them to develop their digital platforms in order to adjust to this new landscape. TVs and smartphones are common instances of how to modify competing tactics and create a digital platform using new technology in a novel setting (Koo, 2017).

According to Rotsztein (2018), most modern TVs and smartphones have a CPU, which enables them to understand voice commands with AI assistants once they connect to the Internet and provide some tailored recommendations based on your viewing history. Working with streaming video providers not only enhances the user experience but also helps launch the company's new digital platform and gives consumers additional options when watching TV. In the era of the Internet of Things, smartphones and TVs have the added benefit of being able to control a Smart home, which eventually allows them to create a fully connected digital platform to compete in the new market.

The utilization rate of conventional smartphones and TVs is declining annually, despite continuous advancements in technology. There are numerous disadvantages to traditional smartphones and TVs, including the fact that the resources on smartphones and smart TVs are not rich enough and are restricted by copyrights and channels; there are currently no manufacturers or channels of smartphones and TVs that can contain all the content; and the application store offers a comparatively small selection of options. Furthermore, old TVs and cellphones have rigid control and playback mechanisms, and the remote control hasn't evolved. The outdated TV remote control is unable to accomplish many complicated tasks. The quality of the TV's images is not high definition (Helander, 2012).

One type of network TV broadcast mode that sends live TV signals via a network data stream is called a streaming device. This is entirely apart from conventional TVs and cellphones. "Streaming devices allow information to be shared by allowing the content of multiple devices

to be played directly on the TV. Instead of waiting for the full compressed file to download to their computer in order to view the network technology, streaming devices let users watch and listen while downloading, which is more convenient and saves a lot of time as compared to standard smartphones and TVs (Habes, Elareshi , Almansoori , Ziani , & Alsridi , 2022).

## **2.2 The Impact of Smartphones and TV Applications on Interactivity**

According to Åsberg (2011), technologies have always served as impersonal, static machines that disseminate information to a large number of people without regard for their needs. However, contemporary strategies call for a new generation of public displays for ubiquitous settings, where they might be able to provide users with interaction features in addition to personalized content. Despite the fact that a number of options have been investigated to improve technology, the Smart TV effort appears to be the most intriguing new model. A new generation of televisions and set-top boxes with greater processing power and improved internet integration is proposed by Smart TV.

Despite the efforts of major suppliers like Apple, Google, Samsung, and LG, a true open platform for enabling multiscreen interactive applications is still in its infancy. The collaboration between the screens of various devices is referred to by the multiscreen idea. Mobile device screens that allow for interactions in addition to displaying complementing content are compatible with Smart TV screens. The majority of methods for interacting with Smart TVs and mobile devices rely on nonstandard HTTP (Hypertext Text Transfer Protocol) techniques, such as extended polling, which aims to get beyond the limitations of the HTTP protocol's stateless condition. This solution is troublesome for public display contexts since it requires more bandwidth and increases the protocol overhead. A scalable architecture and a reliable message delivery mechanism are essential for a multiscreen interactive Smart TV-Smartphone solution for public display situations (Adjei, 2019).

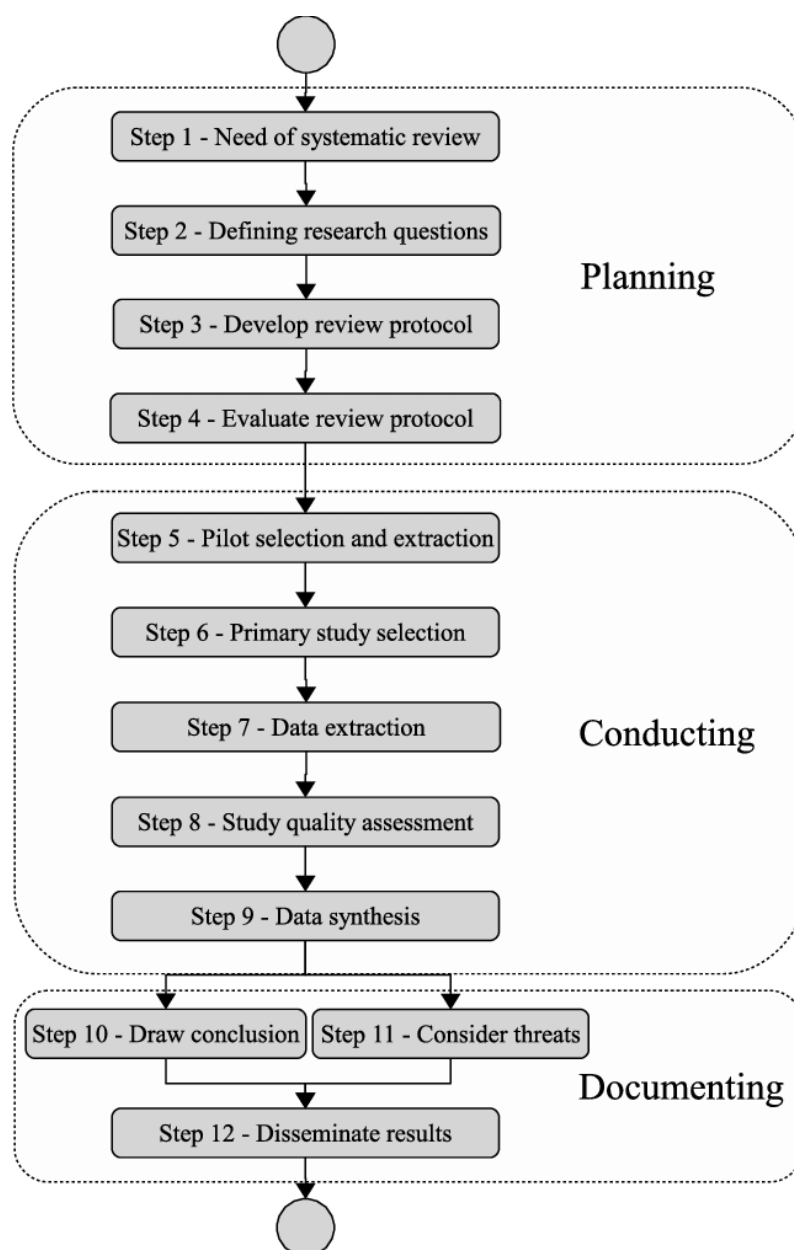
Globally, the development of smart TVs television sets with built-in interactive Internet capabilities is accelerating. By sending content straight to consumer devices in the living room, the quick expansion of high-speed broadband connections is making it possible to create a smarter TV. The success of smartphone app stores has been adapted by STVs and introduced into living rooms. STVs let users to access internet content including news, weather forecasts, stock market data, maps, and games in addition to live programming. Among other things, it will be able to communicate, tweet, browse the Internet, engage in online social networking, and conduct televised commerce. STVs give producers of consumer electronics new chances

to differentiate their products and add value through user-driven innovation. With a direct line to the user, media corporations will be able to offer more options and novel forms of content in a tailored, on-demand service (Liu, et al., 2018).

After the triumph of the smartphone era, it is anticipated that the era of STVs would arrive much sooner than anticipated due to all the progressive activity. Every electronic product and communication gadget used in households will be powered by STVs. Some even forecast that STVs will be used in the next year or two. By linking computers and phones in homes and automating utilities like power, tap water, home security, and other entertainment systems, these optimistic forecasts contend that STVs will turn into a "hub" at home (Bernhaupt & Pirker, 2014).

### **3. Framework**

To find journals and publications from a variety of sources, search variables are utilized, where finding relevant study material to address the search queries is the main aim.



**Figure (3-1):** Represents the systematic review steps

### 3.1 Planning the Review

The research will start with identifying the need for the review and developing a protocol including all steps, research questions, inclusion and exclusion criteria, and analysis procedures.

#### 3.1.1 Identification of the Need for a Systematic Review

The need for this systematic review will be described in the motivation in previous part.

#### 3.1.2 Background

The background information of the systematic review will be presented.

### 3.1.3 Research Question

The main question of the study is; **“How does the smartphone and TV applications and their impact on Interactivity?”**

### 3.1.4 Data Sources and Search Strategy

The goal of a systematic review is to locate as many primary papers as feasible that address the research topic. To achieve this goal, a search method will be created and deployed to multiple electronic databases.

The database and terms used in searches have a significant impact on search results. A brief search is performed to obtain a general estimate of the number of articles. It is characterized as experimental research from Google Scholar using the **independent variable** (Smartphones and TV applications) and the two **dependent variables** (Interactivity). The search will be fine-tuned by putting quotes around the query and rerunning it. The actual selection of articles follows the search technique to be designed.

The search query consists of these terms (smartphones and TV applications, and interactivity). The researcher will research previous studies on the impact of smartphones and smart TV on interactivity. As a result, the most appropriate and useful databases for the researcher will be selected.

### 3.1.5 Study Selections Criteria

The selection for the current research will depend on inclusion and exclusion criteria. Therefore, the inclusion and exclusion criteria are presented as follows:

The inclusion criteria:

- Include primary studies related to the research questions, provided that they are academic studies.
- A research article or journal topic that is closely related to the topic of the research questions.
- Providing relevant and applicable information about the impact of smartphones and smart TV applications on interactivity.
- State clear definitions of all current research variables (dependent and independent).
- Including previous academic studies that focus on the research topic and which were conducted during the time period 2011 until the present time.

Exclusion criteria:

- Articles that do not describe the impact of smartphones and smart TVs applications on interactivity.
- Articles written in languages other than English
- Articles published on corporate websites and public (non-academic) websites.
- Information and research content will not be collected from studies conducted before 2011.

### **3.2 Conducting the Review**

#### **3.2.1 Study Selections Procedure**

The study selection technique will entail reviewing the research paper's title and abstract. These articles will be evaluated for comprehensive and complete reading if they match the inclusion requirements.

#### **3.2.2 Study Quality Assessment**

The validity of the included studies will be evaluated by the assessment of study quality. Indeed, the quality evaluation will be based on the research paper's structural criteria. The structure of the possible primary study research article will be evaluated: Introduction, Research Method, Results, and Conclusion. Each proposed research looks for answers to the following:

- Introduction
- Research Method
- Results
- Conclusion

#### **3.2.3 Data Extraction Strategy (Data Collection)**

At this stage, a form will be created to capture the information gleaned from the main research. Data is retrieved from each source study article using a pre-defined data extraction form.

### **3.2.4 Data Synthesis**

Data synthesis is gathering and summarizing the findings of the chosen primary studies. The principal study findings will be documented in compliance with the review protocol's requirements.

### **3.2.5 Validation of a Review Protocol**

The validation procedure is required to ensure that the study is transparent and of high quality. The researcher will verify and assess the review methodology devised for this research.

## **3.2 Documenting**

### **3.3.1 Actual Search**

The search was conducted in different digital libraries using the keywords “smartphones and TV applications” and “interactivity.” Search terms were found in abstracts and keywords of selected publications during the actual search. The following screening criteria will be used to screen article title, abstract, keywords, and conclusions:

- Does the paper address one of the variables of the current research?
- Was the purpose of the paper stated?
- Does the paper provide some hints for answering the research question?

## **4. Discussion**

In this part of the current research, five studies were identified focusing on smartphones and smart TV applications and their impact on interactivity. Each study was reviewed by analyzing mainly the study questions, method, and findings. These studies cover a group of research topics related to the current research variables (independent and dependent), which were conducted using many research methods, whether quantitative, systematic, or qualitative.

## 4.1 Overview of Studies

**Table 1: Overview of Studies**

Number Of Study	Authors	Title	Aim	Methodology and Tool	Sample	Findings	Place
1	Rotsztejn (2018)	“Mobile entertainment applications and their impact on leisure patterns amongst UK young adults”	It aims to investigate mobile entertainment applications and their impact on leisure patterns amongst UK young adults	The research has been conducted through interpretive approach with qualitative method: semi-structured interviews and observations	The UK young adults	The findings provide a better insight into the usage of mobile entertainment applications, reasoning and frequency as well as descriptive comparison of the present versus past entertainment.	UK
2	Habes, et al (2022)	“Smart interactions and social TV used by Jordanian University students”	This paper examines the interaction and influence of social TV on academic performance during Covid-19	Through a self-proposed model, using the PLS-SEM software	546 university students	The study found that respondents understand the concept of social TV and have used it to improve their interaction with others, helping them to share their experiences and – interestingly – to improve their academic performance.	Jordan
3	Åsberg (2011)	“Enhancing the interactivity in the classroom via Smartphone”	This thesis is concerned about finding an alternative to that system and	Digital survey system	teachers to enquire questions	This resulted into a solution that holds the basic	Sweden

			is aimed to primarily improve the economical factor.			features of the original system.	
4	Adjei (2019)	“THE USE AND EFFECT OF SMARTPHONES IN STUDENTS’ LEARNING ACTIVITIES: EVIDENCE FROM THE UNIVERSITY OF GHANA, LEGON”	The purpose of this study was to examine the use and effects of the smartphone as a learning tool in distance education at the University of Ghana.	The study was based on the Technology Acceptance Model (TAM)	294 total students .	The findings revealed that the distance learning students find it easier to use a smartphone in their learning activities. The findings also revealed that the use of smartphones performed remarkable roles among the distance learning students of the University of Ghana in their academic activities.	Ghana
5	Bernhaupt and Pirkerbal CS (2014)	“User interface guidelines for the control of interactive television systems via smartphone applications”	This article describes recommendations for the design of a smart phone application enabling users to control Internet Protocol Television (IPTV) systems including all connected entertainment devices. this article describes recommendations for the design of a smart phone application enabling users to control Internet Protocol Television (IPTV)	Previous related studies	-----	The study found that future smart phone applications for controlling TV will only succeed if they provide meaningful functionalities that satisfy the (varying) user needs, support personalisation and personal usage and respect the limitations of mobile phones with respect to possible	France

			<p>systems including all connected entertainment devices. This article describes recommendations for the design of a smart phone application enabling users to control Internet Protocol Television (IPTV) systems including all connected entertainment devices.</p>			<p>parallel activities performed.</p>	
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As shown in the table, the previous studies that were adopted used different methodologies, including descriptive, qualitative and empirical approaches as well. The qualitative approach (one study), and one study applied the descriptive approach, in addition to three studies were conducted through an empirical analysis. Previous studies were applied in different countries (UK) Rotsztejn (2018), (Jordan) Habes, et al (2022), (Sweden) Åsberg (2011), (Ghana) Adjei (2019), and (France) Bernhaupta and PirkerbaICS (2014).

In a descriptive study that conducted in France by Bernhaupta and PirkerbaICS (2014), which described recommendations for the design of a smart phone application enabling users to control Internet Protocol Television (IPTV) systems including all connected entertainment devices. This article described recommendations for the design of a smart phone application enabling users to control Internet Protocol Television (IPTV) systems including all connected entertainment devices. This article described recommendations for the design of a smart phone application enabling users to control Internet Protocol Television (IPTV) systems including all connected entertainment devices. This study used previous related studies to review the variables. The results of the study showed that future smart phone applications for controlling TV will only succeed if they provide meaningful functionalities that satisfy the (varying) user needs, support personalization and personal usage and respect the limitations of mobile phones with respect to possible parallel activities performed.

As well, the study conducted in UK by Rotsztej (2018), aimed to investigate mobile entertainment applications and their impact on leisure patterns amongst UK young adults. This study has been conducted through interpretive approach with qualitative method: semi-structured interviews and observations, which were contributed to the UK young adults. Moreover, the current study's findings provide a better insight into the usage of mobile entertainment applications, reasoning and frequency as well as descriptive comparison of the present versus past entertainment.

In a study conducted in Jordan by Habes, et al (2022), sought to examine the interaction and influence of social TV on academic performance during Covid-19. The study conducted through a self-proposed model, using the PLS-SEM software. In total, the study was applied to 546 university students. From this study, it is noted that respondents understand the concept of social TV and have used it to improve their interaction with others, helping them to share their experiences and interestingly to improve their academic performance.

A study conducted in Sweden by Åsberg (2011) used a digital survey system model that applied to teachers. This thesis is concerned about finding an alternative to that system and is aimed to primarily improve the economical factor. And it is resulted into a solution that holds the basic features of the original system.

The last study is conducted in Ghana by Adjei (2019), aimed to examine the use and effects of the smartphone as a learning tool in distance education at the University of Ghana. The study was based on the Technology Acceptance Model (TAM) and this was applied on 294 total students. The findings revealed that the distance learning students find it easier to use a smartphone in their learning activities. The findings also revealed that the use of smartphones performed remarkable roles among the distance learning students of the University of Ghana in their academic activities.

## **1.1 Conclusion**

This research identified, described and analyzed the latest findings in smartphones and TV applications and its impact on interactivity by clarifying the concepts of each of the research variables (independent and dependent). This was based on clarifying the relationship of the current research to the literature and previous studies that were chosen to prepare the research content and obtain appropriate information. In addition to including the basic concepts of the research variables and some theories that explain them. In addition, a framework has been included that contains elements that explain the methodology that was followed in the research

and represents a table containing five previous studies centered around the topic of the research and its discussion, which were conducted in different countries.

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