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# Introductory Chapter: Convergence of Content and Technology - The Role of Interaction

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## 1. Introduction

Convergence is a transient and multifaceted process that can be examined from various perspectives and timescales [1, 2]. Studying convergence allows us to appreciate changes that occur in our proximity and how our reality is influenced by changes that occur globally [3]. Examining the phenomenon of convergence is a process that usually requires observance of global changes in order to interpret local changes.

The process of convergence is based on a transient mechanism that creates chain reactions affecting a wide variety of domains [4]. If we examine television as a closed system, we can see how those extend from technological to cultural, educational, and social. Take for example the case where advances in technology were significant and able to trigger change: the adoption of HD, 4K, and 8K resolution by the technological manufacturers. This change in resolution significantly affects the transmission process as more information needs to be transferred, the hardware has to be upgraded in order to process more information, and the software has also to be altered in order to support the new resolutions and enable viewers to access the content. The content production perspective has to adapt as well in order to utilize the higher-resolution imaging of the medium, a process that includes an upgrade across the complete content production workflow. The availability of new ultra-sharp content affects consumers who upgrade their viewing and content storing equipment. Other sections that have to adapt include the gaming industry, which needs to offer gaming experiences that support the new resolution, a chain reaction that pushes upward the processing requirements of video cards used in gaming consoles that traditionally use the television as a gaming monitor. Also, Internet-based streaming of content such as IPTV needs to be updated to support the new resolution, while the networks have to be able to sustain the increased data rate [5]. Following this discussion, one may now appreciate that changes that occur at other domains with no apparent direct connection to the domain of television such as a phenomenally simple change of broadcasted image resolution may affect the domain itself.

However, this evolutionary process is not new and is certainly not limited to television, as in the past, the simultaneous introduction of new media technologies enabled a lower-quality standard to evolve instead of the clearly superior one, for marketing reasons [1]. After the introduction of the VHS and BETACAM systems

in the market, the lower-end VHS systems won the competition and infiltrated the market as consumers chose to adopt VHS technology due to the wider content variety available [6]. As a result, only the television studios adopted BETACAM systems in order to support their content mastering tasks.

Clearly, convergence cannot occur without interaction between the key players. It is important therefore to define what interaction is and identify its role within the convergence process. The commonly accepted definition of interaction is described as "*a mutual influence or action between two or more agents*." Here, for the purpose of our investigation, we consider a triplet that involves content, technology, and consumers. They all have an active role in this process and this organization falls within the definition of interaction. We start our investigation with the introduction of the new medium and then follow up its evolution in relation with the other two parts: content and consumers. The same method can be applied to the new medium that seems to be used as the main platform to broadcast and access multiple types of content, including television-oriented: the Internet. Examining how users and content adapt and evolve through the new medium reveals the transformation processes that occur and drive the convergence process.

## 2. Television and Internet evolution

Television broadcasting networks were introduced at different times worldwide with US, UK, France, Canada, Australia, Germany, Poland, the Soviet Union, and Japan to support adoption until the 1940s [6]. Similarly, this was also the case with the introduction of the Internet communication network until its worldwide adoption as a platform for the support of communication that was concluded in 1993 with the introduction of NCSA Mosaic WWW browser, as it was ported to multiple platforms and was able to display multimedia content.

However, there exist great differences between the two content access platforms. We focus at their broadcasting architecture differences. Television supports *one-to-many* content transmission while the Internet support a *many-to-many* communication architecture offering advanced capabilities as it is classified as a higher-order architecture compared to that of television broadcasting. This is easily explained as the Internet can emulate the transmission method employed within the television architecture, while the opposite is not possible. As a result, television evolved as a closed one-to-many broadcasting system where only few had control over the content that was broadcasted, while the openness of standards and the connectivity capabilities offered by the Internet communication platform allows anyone to broadcast their own content.

However, here the role of the user is highly important and can function as a catalyst for the medium. It took many years after the introduction of the Internet for users to catch up and share their own content at a massive scale [7]. Note here that a basic condition in order to create what is called the "*information society*" is that all the users should possess the capability to contribute content. This clearly was not the case until the introduction of the World Wide Web (WWW), suitable content encoding standards that support content broadcasting and delivery [8]. Various factors may be identified for this negative development including the technical complexities of the task, the nonuniform encoding and broadcasting standards, the slow network speeds offered for uploads through the networks offered by service providers to home users, etc. However, those problems are solved today and in addition, the introduction of the social networks has sparked the public's interest into new uses of the communication networks which is more personalized mobile and allow them to share their daily activities, thoughts, actions, and ideas with

particular groups of interest. Another sign of this disorganization is the fact that up to this moment, the traditional communication models do not cover the case of social networks and their interaction complexities. As such, they are only extended to interactive TV modes which still use the one-to-many broadcasting model, supporting limited user interaction.

## 3. Conclusion: the future of television

Three key players, technology, content, and users affect the future of television. On the technological side, Quality of Service algorithms allow for the delivery of content at varying data rate and resolution, optimizing and automating the content delivery process. Torrent-based streaming solutions allow networks to provide fast live and on-demand content streaming without overloading the networks. It is the evolution of the Internet has reached a point where it features advanced interactivity capabilities and the tools that can support fully interactive information exchange and reproduction. As such, it provides a solid developmental platform for convergence.

From the developer's perspective, the above technological features permit highly interactive narrative scenarios to be implemented and distributed commercially. Yet the most important characteristic here is that normal users become content developers, changing their user-experience as they ultimately gain control over the content that is broadcasted. Social media such as YouTube enable them to create their own thematic channel. They are in a position to even create a media broadcasting station with the use of YouTube Live that provides live broadcasting tools and content archival services. At the same time, cloud-based editors may be used to directly edit and rebroadcast the revised content, while various tools are already designed to automate the capturing and editing process. Support for new content types such as interactive 360° videos are also embedded within social media platforms, enabling users to record, edit, and create their own interactive multimedia experiences. In conclusion, everyday users have today the ability to become content providers, a development that is highly important for the convergence process. However, there is one significant step that is required to complete the convergence process and shape the future of television, as the unification of content providers with the users has created a wide plethora of content sources and the real-life problem faced today is to select which content to access. This requires the use of artificial intelligence in order to provide a unique, entertaining [9], educating [10], gamified [11], useful [12], fulfilling, and easy [13] interactive content-accessing experience to each user.

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