

Mediating Organizational Innovation: A Study of Implementation of Digital Technologies in TV News

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Abstract

Successful implementation of IT innovations requires mutual adjustment of technical features and social practices and structures of an organization. In this paper, we develop a synthesized model for mediating organizational innovation, drawn from Roger's [9] model for organizational diffusion of innovation and Orlikowski et al.'s [9] model for technology use mediation, to investigate the implementation of digital technologies in TV news. Our analysis of two case studies of TV news stations highlights the phases of mediation that occurred in these organizations and points to differences in mediation styles from previous studies. We suggest that scope of the implementation and temporal pressure in the work context were important dimensions in the mediation process.

1. Introduction

Making the organizational decision to adopt a new information technology (IT) is often a long, contentious process, particularly when the technology is costly and requires substantial resources to implement. Problems in the decision-making process can contribute to poor project outcomes, but it is often the case that a good IT adoption decision “goes bad” due to a faulty implementation process. Studies suggest that many IT innovation projects fail to deliver all, or even some, of the anticipated benefits; some firms have even gone out of business trying to implement ambitious IT projects [9]. Thus, studying the process of IT implementation and what contributes to its success or failure is a major research focus among IS and organizational researchers [8], as well as for IT project managers.

One way to examine IT implementation is from a project management perspective, that is, the tasks, resource requirements, risk management approaches, and so on, that must be managed. While it is

extremely important to understand these explicit aspects of IT implementation, information systems (IS) researchers have argued that underlying social processes that occur in IT implementation must also be considered and managed [3, 5, 11].

Such studies suggest that implementing information technologies is not only a question of adjusting organizational practices to utilize IT features and functions. Instead, the “soft side” of the organization – the organizational roles, business processes, control mechanisms, and underlying social structures – and the information technology’s features, functions and limitations must be mutually aligned so that the IT works for the organization and the organization benefits from new capabilities of the technology. Alignment is not a one-time event but instead may become an ongoing process, as organization members learn how to take advantage of the technology’s capabilities [1, 11, 12, 13, 15].

In this research, we draw on two theoretical models that address the issue of mutual shaping and alignment in a study of the implementation of digital technologies in TV news. The first is Roger’s [14] model for organizational innovation. The second, Orlikowski et al.’s [11] technology use mediation (TUM) model, focuses on mediation strategies for technology and organizational alignment. We assess the similarities and differences in these models and develop a synergized model to examine our research topic, digitization in TV news organizations.

Since the new millennium, the application of digital technologies in TV news has been shaping the TV industry [2, 21]. Most TV news stations are at an intermediate stage between analog and digital processes. However, with regulatory deadlines to convert to digital transmission and the competitive opportunities for accessing outlets for digital new content (e.g., web sites, podcasts, mobile phones), TV news organizations are increasingly adopting and implementing digital production technologies. Doing so is not an easy task. Not only are digital technologies expensive, but the switch from analog

(tape-based) to digital technologies requires changes in the skills, knowledge, and responsibilities of news technicians, new workers, and managers. The competitive, time-pressured environment of TV news contributes to tensions that can accompany any substantive change in a production process.

In this paper, we report on the experiences of two TV news stations that have implemented digital technologies (e.g., components of the Avid News Gathering System, or ANGS). We developed a synthesized model for mediation of organizational innovation to examine how these organizations have addressed the need to mutually shape the technology and social practices during implementation. The two organizations differ in terms of technological infrastructures, role of the IT group, scope of implementation and temporal stress, which contributed to social and technological outcomes. We identified mediation stages (*establishment, reinforcement, adjustment, routinizing, and episodic change*) and observed that *reinforcement* included not only positive approaches such as training and encouragement [11], but also harsher managerial actions such as exams, oral threats, and sanctions. We also observed that the scope of implementation influenced the intensity of TUM activities, temporal stress complicated mediation efforts, and the coexistence of the old and the new technologies made the transition to digital technologies more difficult and heightened the need for intensive mediation.

In the next section, we review Roger's [14] model of organizational innovation and the literature on technology use mediation to develop a synthesized model. We then outline our research design and methods and give a brief overview of the digital news process. We present key findings from each case and discussed how context influenced mediation activities in the implementation process. We conclude with limitations and implications further research.

2. Theoretic foundations

Rogers' [14] model of organizational innovation draws from research on a variety of innovations and organizational contexts; it offers a general process model for organizational innovation. Orlikowski et al. [11] defined a bounded theory focused on ICT innovations and the actions of organization members to align IT features and organizational structures, which they termed technology use mediation. We compare these models and suggest how combining key aspects of each model's processes, a synergized model may better explain the social and technical alignment processes

of IT organizational innovation.

2.1 Organizational diffusion of innovation

Rogers' [14] model of organizational innovation includes a sequence of five sub-processes: two in the initiation stage (*agenda-setting, matching*) and three in the implementation stage (*redefining/ restructuring, clarifying, and routinizing*). Our interest in this research is on implementation; thus we focus on the latter three phases. *Redefining/ restructuring* occurs when the innovation is refined to accommodate the organization's needs and social structures, and when the organization's structure is modified to fit with the innovation. *Clarifying* happens as the innovation is widely applied and encounters a variety of use contexts; the innovation's meaning becomes clearer to organization members and further refinement may occur. *Routinizing* occurs when an innovation becomes part of the regular activity of the organization and loses its identity as an innovation. This stage marks the end of Rogers' organizational innovation process model.

Rogers's model has been applied in IT research as a framework for organizational diffusion. Soroka and Jacovi [17] examined the organizational diffusion of collaboration technologies, finding that during implementation diffusion networks of early adopters are important to foster information flow and to sell technology to opinion leaders; they also suggest that context should be managed to foster collaboration and welcome new users [17, p.320-322].

2.2 Technology use mediation

The concepts of diffusion networks and managing context are also evident in Orlikowski et al.'s (1995) TUM model. TUM is the "deliberate, ongoing, and organizationally-sanctioned intervention within the context of use" [11, p.424] that helps organizational members adapt ICT to that context, modifies the social context to accommodate technological usage, and thus can facilitate effectiveness of that technology over time.

The TUM model identifies types of mediation activities, which may occur in phases. During *establishment*, mediators set up the IT system and articulate ways in which the technology could be used in practice. After the technology is established, *reinforcement* activities include offering assistance and encouragement to users to maintain the technology's reliable performance. *Adjustment* entails refining rules and procedures around systems use and adapting the technology to incorporate into

users' work practices. As users and mediators gain experience, or as organizational circumstances change, *episode change* may occur. In this phase, significant reassessment and restructuring of the artifact and its routine uses are considered, so as to create major improvements in its performance and coherence. *Episodic change* may be triggered by internal changes, such as new requirements, or external events, such as market or technology change.

The TUM model has been cited extensively in IS research and applied in studies of a variety of general-purpose ICTs, such as intranets [18] and groupware technologies [1]. Davidson and Chiasson [4] suggest that the applicable context for this model is broader. In a study of electronic medical record systems, they identified four social-technical dimensions that influence the trajectory and outcomes of TUM actions: 1) specialized, embedded work practices, 2) malleability of the underlying code, 3) organizational environment, and 4) organizational size [4, p.7-8]. They argued that contextualizing specialized IT begins during systems development with *establishment* of a configured IT artifact, and *reinforcement*, *adjustment* and *episodic change* follow initial system set-up. In organizational settings that have well-defined, embedded work practices, mediators might focus on altering the IT artifact to accommodate existing practices; if the artifact is not malleable, mediation may be limited. Professional organizations in which practices are regulated and institutionalized, as well as small organizations with insufficient personnel to dedicate to TUM activities, may be particularly challenged by the need for technology-use mediation.

2.3 Mediating organizational innovation

Rogers's [14] model for innovation diffusion and the TUM model have a number of similarities. Both draw attention to the refinement and alignment of innovation features within an organizational context, although the concept of *establishment* of the technology, that is, the set-up and configuration, is only implied in Roger's *redefining/restructuring* stage. *Reinforcement* activities are similar to the *clarifying* stage in Rogers's model, although *reinforcement* focuses on mediation strategies such as offering assistance and encouragement to promote usage, in addition to clarifying the meaning of the innovation. *Adjustment* activities are also similar to the *redefining/ restructuring* stage, in which the customized technology and organizational structures are modified to be more congruent, but again the actions of mediators are more apparent in TUM.

The concept of *episodic change* is largely absent

from Rogers's model, which has been criticized as being too linear and static [18]. That is, Rogers's model does not take into account the possibility that endogenous or exogenous changes may accumulate, requiring a systematic, planned intervention to move an IT innovation process forward or to overcome implementation difficulties. On the other hand, the TUM model assumes that *adjustment* will continue until an *episodic change* is triggered. Given rapid changes in information technology capabilities, it is not unreasonable to anticipate that TUM may continue indefinitely. However, it is possible that *routinization* of the IT innovation may occur in some instances and for a time, if organization members are satisfied with current practices and IT capabilities.

Routinization has been viewed as a static concept [18] that appears to contradict the idea that organizational structures are enacted in ongoing practice, and thus there is always the potential for change [13]. Moreover, the appearance of stability may mask the ongoing, micro-level adjustments that maintain apparent stability [6, 12, 19]. King and Anderson [7] argued that routinizing is itself a dynamic process, as an innovation is adopted into practice. Schroeder et al. [16] further defined routinizing as the process in which the new and old innovations coexist and over time are linked together. These concepts of *routinizing* extend beyond Rogers' definition to encompass a more dynamic process of ongoing improvisations in practice [12].

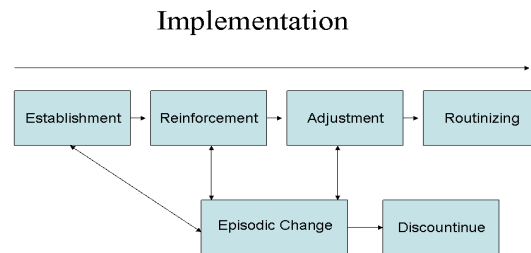


Figure 1. Mediating IT Innovation Model

Drawing from these two approaches, Figure 1 depicts the synergized model for mediation of IT innovation in organizations that guided our analysis. We adopted the TUM terminology of *establishment*, *reinforcement*, *adjustment*, and included the possibility of *routinizing* (as a dynamic concept) as a phase that may follow *adjustment*. *Episodic change* in response to internal and external change might shift the implementation process back to previous

stages, move the process forward, or lead the organization to *discontinue* use of the innovation, that is, reverting to old technologies and methods or switching to a different technology innovation.

2.4 The context of digital TV news

The switch to digital technologies is a regulatory mandate from national governments as well as a technological innovation in this industry [2, 21]. How digital technology innovations may affect the content of news, the professionals and technicians who produce news, distribution channels for news content, and industry structure are important research questions. In this research we are interested in the diffusion of digital TV new production technologies within TV news organizations.

Digital news technologies contain various modules: digital shooting (cameras), nonlinear news editing, news broadcasting, and digital video database, all of which contribute to a tapeless digital news production process [2]. Figure 2 depicts the linear process of digital news production. First, after collecting news materials, including digital video, reporters key in leads and news stories in the text/rundown system and cameramen ingest their digital footage into the nonlinear editing system and start editing. Concurrently, news producers write their headlines and arrange the rundowns in the text/rundown system. All the materials (news stories, footage, and rundown) are stored in the central video/audio servers. When a newscast is broadcast, the director in the control room cues the news from the server, based on the pre-arranged rundown. News broadcasting in the studio combines the anchor, computer graphics, news clips, SNG (satellite news gathering), and so on, and transmits the signals to the receivers. Digital news content can also be distributed through multiple platforms, such as PCs, mobile phones or PDAs, synchronously or asynchronously. News content created in these steps is stored in the database for future retrieval or reuse.

The diffusion of digital production technologies requires changes in the training of technicians, news workers, and managers, and it may significantly alter their roles and interactions. What components of a digital system are used, and how the organization adapts to their use, thus requires alignment of the social and technical aspects of the system.

The socio-technical context for digital TV news technologies includes several of the dimensions identified by Davidson and Chiasson [4] as applicable for TUM analysis. Although generating the content of TV news is a creative process, the production of the news, using recording and editing

technologies, is a structured process, with each technical step having well defined practices. Digital TV production technologies are configurable in use through the selection of components. The television industry is regulated in most countries, with some certification and licensing of technicians (as well as unionization) that may limit the redesign of jobs.

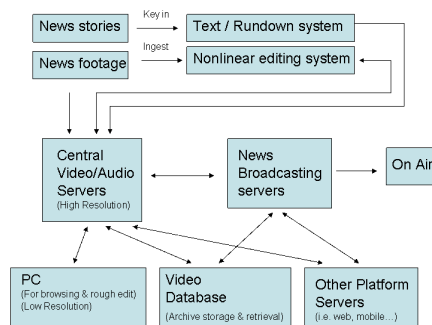


Figure 2. Digital News Production Process
(Modified from Chou & Ju [2])

The socio-technical context of TV news also suggests other relevant dimensions. Because an organization can choose to implement a limited number or a wide range of digital components within the scope of a tapeless production process (see Figure 2), the *scope of the innovation* may become an important dimension in the mediation process of this IT innovation. Organizational complexity is determined by the organizational span (the number of people affected by the innovation) and organizational scope (the number of organizational that must accommodate an innovation); the larger the scope and span, the more organizational complexity the IT implementation effort [8]. Within the context of specialized production technologies [4], the scope of implementation (features and functions of technology, number of organizational units involved) is likely to affect mediation activities, with greater complexity requiring greater TUM attention.

Another contextual dimension in this setting is *temporal pressure*. TV news stations must respond to “breaking stories” and maintain tight broadcast deadlines, while avoiding on-air interruptions or breakdowns. Although there may be “slow news days,” there are not “no news days” when the production process might be brought off-line to implement new technologies. The switch to digital systems under time stress of TV news stations may heighten user resistance to changing workflow, technological infrastructure, collaborative style, and organizational structure and management [2, 21].

3.0 Research Design and Methods

This paper reports on two case studies of TV news stations that implemented components of digital TV new technology, the AVID system. These cases provide an opportunity for comparative analysis, as they adopted components of the same technology but they differ in terms of scope of the innovation and temporal pressure. Data were collected in interviews and observations. Utilizing qualitative data presentation and analysis techniques [10] and comparative case methods [20], the authors produced detailed case narratives, highlighting evidence of the mediation stages, activities of technology mediators, and contextual influences on the mediation process.

The first research site is a large national broadcaster running a 24/7 news channel located in Taipei, Taiwan (thereafter referred to as ‘the broadcaster’). In May 2003, it launched ANGS and became the first digitalized news TV station in Asia. In August 2005, the first author interviewed 12 news personnel (news managers, photographers, producers, directors) and the IT manager and observed the process of digital news production and the collaboration of news crews for two days. In December 2005, the author revisited the site and did a follow-up interview with the IT manager. Data from field notes were analyzed to focus on technology mediation actions and processes.

The second research site is a medium-sized TV news channel producing 3.5-hours of local, daily news in Honolulu, USA (thereafter referred to as ‘the network affiliate’). It is a licensed broadcast affiliate of a nation-wide broadcaster and is one of a number of TV stations owned by a media corporation. In 1999, it became the nation’s first commercial digital TV station. In March 2006, the first author interviewed six news personnel (news director, producer, director, photographers) and the engineering director and observed digital news production process and collaboration for two days. Interviews were recorded and later transcribed. Data were analyzed to focus on technology mediation actions and processes.

4.0. Findings

We now outline the IT innovation implementation process in each case. We summarize findings in terms of the model depicted in Figure 1.

4.1. ANGS implementation at the broadcaster

The broadcaster’s first step into digital TV news

began with the Avid text editing system, BASYS, when the station opened in 1997. Several years later, to catch up with TV news digitalization, the broadcaster took a high-risk approach of implementing the whole ANGS system. Station management hoped to earn revenue by selling ANGS as a regional reseller and providing consulting services to other stations.

Beginning with the video nonlinear system in 2001, the broadcaster sent three potential “champions” of the technology – a cameraman, director, and news assigner -- to AVID seminars in Singapore. The first intra-organizational training was in the fall of 2002. However, implementation was delayed due to the news frenzies at that time (e.g., SARS outbreak, build-up to Iraq War), leaving little time for organization members to learn a new technology. In April, 2003, the news crews were retrained. One month later, the broadcaster launched a \$3MM beta version of ANGS, which incorporated the nonlinear editing system, text system, broadcasting system, and video database. Beginning in July, 2003, the station used ANGS to broadcast all newscasts. The broadcaster’s IT department became the agent for ANGS in this region.

Establishment: Establishing the ANGS system at the broadcaster was a protracted process. The station had attempted but failed to implement an immature nonlinear editing system in 2000. The IT manager later persuaded top executives to purchase ANGS, a tapeless digital news system. The broadcaster expected the digital text system, BASYS, from the same vendor (AVID) and ANGS would be compatible. However, the ANGS interface required significant work to produce a Chinese language version (a local customization and configuration), requiring the IT department to debug and troubleshoot the configured system.

Station managers, IT technicians, and champions in the news department acted as mediators during this stage, stressing the significance of TV news digitalization and elaborating the advantages of new technology. The broadcaster bought a 3-day training program from the vendor and recruited 24 people from different units to learn the system. The employees later served as instructors (a kind of mediator) to teach peers how to utilize the digital system, write user manuals, develop standard operating procedures, and arrange training and exam times. Their actions helped contextualize the application to the TV news department’s existing practices and routines. In July 2003, after one year, the broadcaster finally established the technology and successfully broadcasted news via ANGS.

Reinforcement: The transition from analog to

digital was a painful experience to the users. In the months after initial implementation and training, the broadcaster continued to commit substantial mediation resources to *reinforce* the use of the digital news system. After training, different units proposed their own plans to evaluate their crew members by giving exams. Twelve newscutter workstations were placed in IT department to allow people to practice and play with the technology during shift breaks. In the Production Center, technicians not only had written and hand-on exams, but mediators also announced the results to generate a sense of honor and peer pressure to learn the technology.

The IT manager stated his philosophy: “There is no unworkable system or technology. It depends on how you implement it, with what strategies,” He emphasized that finding champions (aka *mediators*) in different units and gaining their support were the keys to success. These users communicated with other users to get feedback, identify problems, and remedied them. They also reinforced the vision of appropriate usage. For instance, mid-level news managers listened to users’ frustrations. A Director in the Production Center commented, “every mistake deserves an explanation; every hurt feeling should be comforted.” He talked to subordinates, such as assistant directors and the line producer, who had doubts or fear about this system, to solve their problems and boost their confidence. Frequent meetings about use of ANGS helped transfer knowledge through the station and build involvement.

Ongoing training was critical to reinforcement of ANGS use. Using train-the-trainer approaches, the station sent additional employees to the vendor to learn the system. This resulted in informal mediation of the technology and of use practices. For instance, two cameramen trained by the vendor not only taught their peers how to use the nonlinear editing systems, but they also assured them of the superiority of the new technology. The broadcaster brought the vendor back for in-house training on several occasions, followed by exams that the users had to pass to be certified in use of the technology.

When faced with resistance, managers took a tough stance. Seasoned cameramen were resistant to learning the nonlinear editing tools. News managers threatened to phase out the old equipment completely and threatened job loss if users did not take the initiative to learn the technology. The news director indicated he has “only threatened a few cameramen” who were “lazy” in learning new equipment.

Adjustment: To save money, the broadcaster initially bought a beta version of the software, concurrently used analog and digital equipment, and purchased insufficient on-air system features. These

decisions contributed to a series of crashes when broadcasting newscasts. Thus, the IT department was constantly *adjusting* ANGS to make its performance more reliable. The system breakdowns created tension between the IT department members, who had taken a leading role in the establishment and application of ANGS, and the news department users. The news department blamed the IT manager for sluggish ratings during this period, citing on-air crashes as the cause. As a result, the IT department upgraded ANGS twice and renewed the IT infrastructure to improve performance.

As the broadcaster gained experience using ANGS, social adjustments were also required, including changes in the tasks of particular roles, the new production process, and collaboration between various roles. Cameramen, producers, and assistant directors were most affected by diffusion of ANGS. For instance, under the time pressure of deadlines, cameramen had to ingest their footage into the computer hard disc before editing it. Producers’ workload increased as they edited video clips to enhance visual representation. In contrast, with the easy-to-use countdown system, assistant directors no longer had to examine tapes and could concentrate more on broadcast quality. Generally, the previously sequential nature of producing the news for broadcast became a more parallel process, as various production jobs could be carried on simultaneously.

The scope of the innovation project and the temporal pressures a 24/7 news operation were evident in the difficulties the broadcaster faced with transiting completely away from analog to digital technologies. Under the pressure of deadlines, and with all members of the station involved in the technology transformation process, the station maintained the analog equipment along with the digital equipment. The Director of the Production Center considered the coexistence of the new and the old system to be the biggest obstacle to this transition, because workers who were resistant to the change could continue to use the old technology, thus delaying the diffusion of ANGS. The deputy news manager suggested taking away all analog equipment in the station, but at the time of the second research trip the broadcaster was still concurrently using analog and digital components.

Routinizing: *Routinizing* here represents a temporary stasis when use of the technology becomes a part of regular activities. It does not imply that there is no change at all. Interestingly, at the broadcaster, handling the disruptions from crashes in the ANGS system became a routine socio-technical process. When the system crashed, the production crews developed a standard procedure to cut to

commercials and bring up the newscast within five minute, by switching to the analog VTR system. In August, 2005, the vendor sent specialists to help the broadcaster debug the system. After some technical fixes, ANGS became more reliable and its use at the broadcaster became routine, after two years of mediating the implementation process.

Episodic change: During the research study, there was no evidence of an episodic change phase. Instead, mediators at the station had helped routinize the use of the ANGS system through reinforcement and adjustment actions. It is possible that in the future, the station will re-examine its use of the technology, especially as digital TV technology develops, and episodic change will then occur.

4.2. ANGS at the network affiliate

The network affiliate began its transition to digital TV news technology in 1999, when the station moved to a new building and adopted components of the AVID system. Using outsourced technology experts to assist with system configuration, equipment purchases, and onsite integration of equipment, the station eliminated analog shooting and editing equipment. The general manager (who arrived after the process) described this digital transition as a painless experience, however news crews, especially the cameramen, took months to get used to new equipment. Because the station and its owner are interested in leading edge technologies, the station has upgraded its digital components several times since 1999, adopting up-to-date digital cameras and a non-linear editing systems that can transfer files directly for webcasting . The station also uses a digital text system to connect reporters' news stories, producers' rundowns, and directors' broadcasting system. The station still utilizes analog VTR for the broadcasting system, after an unsuccessful attempt to set up a digital broadcast system in 2004

Establishment: The station used technology experts from an outsourcer firm, along with the in-house engineers, to set up the digital cameras and editing system. The news director, engineering director, and selected users, who were dedicated to using the technology, acted as mediators to plan for the implementation. They first identified the introduction and setup plans and communicated with users officially and unofficially to promote the systems' benefits. The chief cameraman, who taught his peers how to use digital cameras and the nonlinear editing systems, found the initial transition from analog to digital technology to be a difficult and time-consuming process, compared with later system upgrades. However, the organizational complexity

was lessened by the limited scope of the innovation, focused on taping and editing.

Reinforcement: Mediators at the station trained and encouraged others to use the new technology for several months during the *reinforcement* stage. The learning curve was steep and required a sustained effort to reinforce use of the technology. The news director commented, "New technology and new ways of doing things are always scary to people. There is always the excitement and there is always the fear." To build excitement and reduce fear and resistance, mediators articulated rules and practices for using the technology, identified errors and provided training, identified and corrected errors, and clarified the value of the technology to reduce doubts.

Adjustment: The network affiliate not only changed the technological infrastructure to combine the legacy system with the digital TV news technologies, but it also reshaped work roles and organizational structures to adapt to the application of new technology. In terms of technology adjustments, the engineering director indicated that technology convergence continues to be a major challenge, because standards for digital TV technologies have not yet solidified. To maintain system performance, the engineering department, working with the IT department and engineering at the corporate headquarters, has constantly adjusted the infrastructure and equipment, as components have been upgraded or replaced.

TV news work is highly user and task interdependent, requiring collaboration from different units. In this case, the roles of cameramen and editors were most affected, because the digital cameras and nonlinear editing systems directly affected their tasks and skills. However, the rest of the news crews had to alter their interactions. During the early days of system use, they had to be more understanding of their colleagues' problems with the system and allow more time for a response from cameramen and editors. As users became more experienced, even when equipment was upgraded, social adjustments were lessened and thus required less mediation.

Routinization: At the time of the research study, the network affiliate had been using digital technologies for over five years. Long-term employees at the station, such as the engineering manager, could recall how the process operated before the digital cameras and editing technologies, but newer employees accepted these technologies as the status quo. In particular, cameramen realized the digital cameras helped them work more efficiently and create fancier visual effects. The news production process had settled into a seamless flow.

Episodic change: Episodic change has occurred

periodically, when station managers, the engineering manager, and technical engineers at the affiliate's corporate headquarters evaluated upgrading the digital systems. For instance, the news director asked the CEO for funds to purchase new digital cameras, because the cameramen complained the old equipment was not reliable and had failed to capture some important shoots. Although challenging in terms of technical adjustment (due to evolving standards for component compatibility), these types of changes required relatively little adjustment in roles, tasks, or interactions.

Two years ago, the station attempted to build on their innovation with digital news creation to include digital broadcasting. However, the system caused several crashes, including frozen video and random stories. Such unreliable performance forced the network to abort the technology and switch back to VTR for broadcasting. As the technology becomes more mature, the network may reconsider digital control room technology, which would trigger a substantial episodic change process.

The most recent episodic change, which occurred just before the research study, was an upgrade to the nonlinear editing systems, which allowed the station to transfer finished video clips to the station's web site directly. As media channels (TV, Internet) are increasingly intertwined, news producers vie for competitive advantage by moving digital content through multiple channels as quickly as possible. At this station, the ability to move video clips to the web site was increasing the pace of work and time pressure on news workers, requiring attention to changing work process and structure.

5.0. Discussion

These cases of organizational innovation with digital TV news technologies illustrate how mediation to align technology and social structures occurred and how these actions improved organizational outcomes. Utilizing the process model depicted in Figure 1, we illustrated how *establishment*, *reinforcement*, *adjustment*, and, in one case, *episodic change* were carried out by organizational mediators, as suggested by Orlikowski et al. [11] and Davidson and Chiasson [4]. However, mediation took on a different flavor than reported in previous cases. Orlikowski et al. [11] described *reinforcement* as activities to encourage and assist IT implementation. Here, we found mediators used not only positive actions, like training and praise, to enhance the IT usage, but they also used oral treats and sanctions to punish technology resistors. At the broadcaster, testing to "certify"

users and announcement of test scores to praise and prod users illustrated harsher aspects of mediation.

We also found evidence of *routinization* in both cases, after technological and organizational adjustment periods – a phase not identified in Orlikowski et al.'s [11] model. With core production technologies, in contrast to general purpose ICTs typically studied in TUM research, stabilizing the work process and regaining efficiencies may be a more compelling organizational objective than ongoing innovation, particularly after a period of high investment in IT.

Finally, we noted at the network affiliate that one episodic change failed, and the organization reverted to the previous technology. In this instance the failure was due to immaturity of the technology, but this outcome highlighted the possibility that, even after implementation and a period of use, an organizational innovation may still fall into disuse.

5.1 Contextual influences in innovation processes

Our study supports Davidson and Chiasson's [4] suggestion that TUM-type activities are important to understand and manage innovation in structured work processes and specialized information technologies. In addition to the contextual dimensions they identified, our study of organizational innovation with digital technologies in TV news suggests two additional contextual dimensions of importance. Table 1 highlights these dimensions in the cases.

Organizational scope of innovation: A tapeless news production system such as ANGS has different modules, including a text system, nonlinear editing system, on-air broadcasting system, and video database. Various modules affect different aspects of the news production process and news workers and technicians, whose work role and tasks in the production process are influenced by the organization's adoption decision. In these cases, the broadcaster's goal was a seamless digital production process – a broad organizational (and technical) scope that influenced all of the 300 employees in the news department. The network affiliate focused on the front-end production of digital news feeds, effecting about 30 cameramen, editors and production crew members. The broadcaster's innovation required a larger implementation effort at greater time and expense than did the network affiliate's innovation. Although this is not surprising, it is important to recognize that the mediation process to align technology capabilities and organizational practices, as a "process within the implementation

process” was also more difficult and intensive.

To manage this extensive range of mediation activities, the IT department, lead by the manager who championed the use of ANGS at the station, played a central role. In the *establishment* stage, they helped train the news department trainers and stressed the importance of the new digital system. In the *adjustment* stage, they consulted with the vendor, conducted troubleshooting and debugging, and worked closely with the news managers and crews to cope with the system breakdowns, even working round the clock with news personnel to stabilize the system. Given the scope of the process, such intensive, on-site mediation was essential in the early stages of the process. In contrast, at the network affiliate, the small engineering staff, outsourced experts, and later corporate staff located in a distant office, provided sufficient technical resources and guidance to manage the implementation process and to support cameramen’s and other news technicians’ mediation efforts among their peers.

Temporal pressure: TV news is a stressful work environment, with uncertainty and rapid change the norm for responding to local and world news events. News workers and technicians face high cognitive and affective loads, given this level of work stress. They are likely to postpone, partially use, or even reject technology change, as the job provides little slack time to learn, play with, and adjust to new technologies. Temporal pressure at the broadcaster was extremely high. This station broadcasts 24/7, creating a high pressure, deadline driven environment in sharp contrast to the “off-line” worlds of many knowledge workers. Implementation of the ANGS technology aroused more user resistance and suspicion than was reported at the network affiliate, which has a somewhat less demanding schedule of morning, evening, and late night news. User resistance to change in these circumstances is understandable and may explain why mediation actions to reinforce technology had a harsher tone than has been reported elsewhere [1, 4, 11, 15]. That is, mediators may have been faced with the need to use both “carrots and sticks” to motivate employees to adopt the system given the level of temporal pressure.

5.2 Organizational outcomes of innovation

In both cases, the news stations, with investments not only in digital TV news technology but also in mediation resources to support implementation, achieved significant organizational goals. Each station noted they are able to produce news more efficiently, enhance news visual presentation, store large amount of video, and update news to the

website more quickly. Both stations have made significant strides towards the digital future of TV.

At both stations, the role of IT staff, and more generally, the IT knowledge of news workers and technicians, is clearly becoming more important. At the broadcaster, IT staff became the mentors of content creators and news crews. This altered the social hierarchy in which IT staff was merely support to news crews. This change initially resulted in discomfort and distrust between the two departments. At the network affiliate, IT knowledge and experience is more highly valued for potential news employees, as the station looks to hire or replace personnel. During this period in which old (analog) and new (digital) technologies co-exist, news workers who can operate in both technical worlds are especially valued, but soon, the old technologies will become the responsibilities of the “old timers” and social distinctions between digitally-trained and analog work will most likely develop.

6.0. Concluding remarks

In this study, we developed a synergized model for mediating IT innovation in organizations focused on the mutual shaping of technology and social practices required for successful implementation. We focused on the high-stress, deadline driven world of TV news, because digitization is a transformational technology trend occurring in this industry and because the context offered interesting insights on mediation processes. Although our empirical findings are applicable only to the contexts studied, we suggest that organizational scope and temporal pressure are important dimensions to consider when investigating implementation processes in other industries and settings. We also note that routinization, when considered as a dynamic process in which stability is maintained through ongoing, micro-level adjustments, should be integrated into mediation models such as TUM.

Our research has limitations that must be addressed through further research. Further refinement of our model and dimensions will be needed in other contexts. Although our cases involved stations in two national settings (U.S. and Taiwan), we did not delve into the influences of national culture or the regulatory environment on mediation processes, as this was beyond our research scope. Cross-cultural comparisons may be of interest in future research. Additional research will also be needed to consider how the organizational decision-making process for adopting IT innovations facilitates or limits mediation outcomes.

Table 1. Contextual influences at research sites

Social-technical dimensions	Broadcaster	Network Affiliate	Implications for mediation process
Scope of implementation	Multiple technical components; all news production functions	Limited technical components; only some roles directly affected	Need for mediation increased with scope and complexity
Temporal pressure	Extremely high: 24/7 news with primetime news broadcasting channel	High: 3.5 hours daily news, 3 times per day plus national news broadcasts	Limited slack time increased tensions/need for mediation

7.0. Reference

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