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Technology Media, Service Innovation and the Shaping of Executive Cognition

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Abstract

The upsurge of information and communication technology innovations around the world has induced the establishment of many technology enterprises, mostly small-medium, that focus on service innovation. Due to the materiality of technology to this enterprise genre, its executive is significantly shaped by technology media, but explanations of technological shaping are low. This paper seeks to address this gap through a study informed by critical realism and media ecology. It argues that executive cognition is shaped because ICT media and service innovation imperatives combine to generate executive internalizations; and it is shaped by service innovation driven internalizations of technology media functions. The paper also discusses theoretical, research and practical implications based on these arguments.

Keywords: ICT, Media, Executive, Cognition, Service, Innovation, SME

1 Introduction

The business executive is an essential aspect of any business enterprise. It is the central and highest individual or composite authority of an organization. Based on its authority, the executive performs responsible and moral functions including management, motivation, and mentorship (Barnard, 1938; Godfrey & Mahoney, 2014). But for the information and communication technology (ICT) enterprise that is driven by technology service innovation, the technology is as essential as the executive to its socio-economic life. The ICT enterprise and its executive constitute a reality that is significantly different from the non-ICT enterprise and business executive; yet this reality is thus far under-explained. Fundamentally, executive cognition in this study is regarded as some technology with the potential of adding to the innovative capabilities of firms in their everyday organisational efforts.

In this paper we argue, firstly, that there is a contextual technological deficiency problem in the theory of the ICT business executive in Information Systems (IS), Organization, and Small-Medium Enterprise (SME) research streams. The context of technology entrepreneurship refers to situations where ICT experts establish and lead (as business executives) ICT enterprises that focus on service innovation. The ICT business executive is a typical IS phenomenon within an SME and both are shaped considerably by the ICT ecosystem. ICT is ubiquitous in this context from conception to actualization of ideas. But because these empirical realities are yet under-researched, there is currently limited technological explanations of executive cognition in existing publications. According to Marcel and colleagues (2011), executive cognition is the attention toward and interpretation of market moves.

The closest attempt to explain this reality has been made by Ramiller and Swanson (2003) in their study of how the IS executive is shaped by organizing visions. An organizing vision is “a focal community idea for the application of information technology in organizations” (Swanson & Ramiller, 1997; p.460); typical examples are ubiquitous computing, data analytics, digital innovation and smart computing. Thus, their study, like this one, focuses on the cognition and function of the IS executive. But it is different because of two main reasons. In the first place, organizing visions are social or “discursive constructions” (Ramiller & Swanson, 2003; p.16) determined by “community attention invested in the organizing vision” (p.15). However, in this research, technology is not conceptualized as a social construction but as an enduring enabler and constraint across space and time. Their research adopts an opposite conceptualization: “the organizing vision is best viewed as a discursive construction. That is, it is the product of ongoing community discussion, rather than a material entity” (p.16). Secondly, while the context of innovation is common to both studies, the ICT variable is weakly represented and SME enterprise context is also absent from theirs. As a result, their theorization of the IS executive is limited in scope compared with the ICT business executive. It is also limited in technology explanation because it does not address technology shaping.

We argue, secondly, that there is an under-explanation of technology in executive cognition. There is significant development of Organizational theories about executive functions at the expense of

cognitive theories. From the early work of Henry (1949) who discusses the psycho-dynamics of the executive's social role, to Yadav and colleagues' (2007) work on CEO attention, to Herrmann and Nadkarni's (2014) work on the duality of the CEO personality, there is insignificant attention paid to the cognition of the executive. Other scholars in IS who also explain executive cognition ascribe a narrow or particular role to ICT (e.g. Kaplan, 2008; Tallon, Kraemer, & Gurbaxani, 2000; Jarvenpaa & Ives, 1991).

Based on these arguments, we need a technological explanation of the business executive's cognition and function. To satisfy this need, we have to take approaches which are different from existing ones to the development of the technological explanation. In the first place, our arguments and purpose point to our technological approach which departs from existing instrumental assumption of ICT towards an essential one. An essential assumption presumes its materiality which is defined by Leonardi and Barley (2008) as "precisely those tangible resources that provide people with the ability to do old things in new ways and to do things they could not do before". In the second place, we take the broader ecological approach. According to Media Ecology theory, ecology implies the study of environments: their structure, contents, and how they shape people and cultures (Postman, 1992). The ecological approach assumes that the ICT enterprise and executive are integral parts of a global ICT ecosystem. This approach is more adequate than the particular ones.

In the next section, we review the literature on ICT to further motivate the technology approach. The review includes a more elaborate discussion of Media Ecology theory. In the third section, the methodology used in the empirical study and data analysis is presented, followed by results of the empirical study in Section 4. The actual data analysis is undertaken in Section 5, followed by discussion of findings and theoretical contributions in Section 6. Concluding remarks are presented in Section 7.

2 Literature and Theory

2.1 Technology Shaping

Technology shaping is a longstanding issue in IS (e.g. Leonardi, Nardi, & Kallinikos, 2012), and Science and Technology Studies (STS). The extreme perspective where technology imposes on human beings certain ways of behaving, thinking and feeling is labelled technology determinism. For instance, IS scholars who are technology determinists argue that ICTs have enduring properties which outlive and outlast their developers and which act autonomously to compel certain behaviors, thoughts and feelings. Thus, ICTs determine human action by inviting very specific forms of action because its use is situated, is confined to a set of predefined options, and the technology reflects the instantiation of a context-free logic embedded in it (Kallinikos, 2004). This argument resonates with the views of STS scholars who take a societal perspective to propose that technology in any society determines its structure and functions (White & White, 1962).

A moderate perspective of technology shaping is in the concept of technology materiality which refers to the specific ways whereby material phenomena (whether physical and/or digital) are arranged into "particular forms that endure across differences in place and time and are important to users" (Leonardi, 2012; p.31). The arrangement of material phenomena *do* things that are not attributable to human agency (Pickering, 1995; Leonardi & Barley, 2008). But the materiality of technology does not determine human behavior, it enables and constrains without imposition. Materiality also differs from sociomateriality which refers to the constitutive entanglement of material and social phenomena *during* the practice or enactment of some activity (Orlikowski, 2007; Orlikowski & Scott, 2015). Materiality of ICTs emphasizes their enduring properties while sociomateriality shifts attention to the practice or enactment of technology use. Materiality disentangles the material and the social analytically and empirically leading to the treatment of technology as context (Faraj & Azad, 2012). But sociomateriality focuses on technology-in-practice by entangling the social and the material constitutively (Orlikowski, 2010).

Digital platforms, especially mobile and web versions, have emerged as the clearest expression of the materiality of ICTs. The materiality of digital platforms includes functions which have not necessarily determined but have enabled the establishment of service innovation enterprises across the world. Digital platforms are editable, reprogrammable, distributed, self-referential and data-homogeneous (Kallinikos, Aaltonen, & Marton, 2013; Yoo, Henfridsson, & Lyytinen, 2010). These are material properties that have afforded multiple inheritances of platform technologies. The main reasons

for multiple inheritances are the separation of form and function (Kallinikos, 2012) leading to the absence of a design hierarchy. Both reasons also reflect the burgeoning SMEs that practice service innovation. They leverage the materiality of digital platforms to realise distributed innovation processes (Reuver, Sørensen, & Basole, 2018).

2.2 Service Innovation and ICT-Based SMEs

Since the 1970s, the concept of service has become a subject of interest to both providers and consumers (Bell, 1976; Webster, 2014; Lusch & Nambisan, 2015). The rise of service sector employment has been at the heart of Bell's (1976) occupational theory of the information society. Unlike the extractive and secondary economic activities that are tangible and result in commodities, services are intangible. The traditional logic of service is that it is a value which is co-created during interactions between the provider and consumer. The closer the temporal and spatial distance between the provider and consumer, the greater the value and quality of service experienced by the consumer (Lusch & Nambisan, 2015). Thus, services are dynamic socially constructed processes that are reproduced and maintained in the interactions (Katzan Jr, 2008). But this traditional logic is limited when compared with the more recent service-dominant logic which includes other heterogeneous actors beyond provider and consumer in an exchange network or system. These actors co-create value by integrating tangible and intangible resources, knowledge and skills to provide and consume services (Lusch & Nambisan, 2015; Vargo & Lusch, 2004).

Service innovation is "the process of devising a new or improved service concept that satisfies the customer's unmet needs" (Bettencourt, 2010). In the new service economy undergirded by omnipresent digital platforms, service innovation relies heavily on innovations in ICT and digital information (Barrett, Davidson, Prabhu, & Vargo, 2015). According to Mathiassen and Sørensen (2008), this reliance reflects the need for organizations to strategize around everyday use of mobile devices and applications, specific customer requirements which may be emergent, heterogeneous portfolios of capabilities, and instantiation of services with other services.

The increasing predominance of service science in the global economy, combined with ICT innovation have made service innovation indispensable for organizational competitiveness (Chesbrough, 2011). An offshoot of organizational competitiveness is the innumerable ICT-based SMEs that have been born across the world. These SMEs depend heavily on ICTs to organize their processes and also provide information services to their customers. Thus, strategic information systems research now includes how SMEs capitalize on ICT infrastructure and service capabilities to provide information services that sustain their competitiveness (Ballantine, Levy, & Powell, 1998; M. Levy & Powell, 2006). Through these capabilities, ICT-based SMEs achieve the advantage of flexibility of organization and innovation ahead of large enterprises (M. Levy & Powell, 2012).

SMEs have peculiar characteristics such as flexibility (Levy and Powell 1998), limited financial resources (Soon-Yau, 1999), inadequate in-house IS skills (Igbaria, Zinatelli, & Cavaye, 1998) and high owner influence (Burns, 2001). Unlike large enterprises, they are often characterized by inadequate internal expertise and resources to undertake formal planning; and most of them cannot also afford external IS consultancy services for that purpose (S. Levy, Kafri, Carmi, & Barkai, 2011). The SME sector is characterized by high rates of firm entry, failure and exit; by control from larger organizations; by changing socio-technical environments; and by owners' personal interests (Storey 1997, Levy 2009, Levy and Powell 2006), all of which affect SMEs in unpredictable ways. But these challenges are equally opportunities for ICT and service innovation because the global ICT ecosystem is itself in a flux, quite unpredictable in terms of ICT innovations and consumer preferences. When the executive cognition has been shaped by ICT media, it has greater cognitive capacity to convert media functions into service innovation.

2.3 Media Ecology

Media Ecology theory assumes that "the medium is the message" (McLuhan, 1964; p.7). A medium is a perceptible manifestation of a dynamic process of mediating (Strate, 2017). The medium and message contents are not the same but are different logical types. The medium is the primary shaper of human behavior ahead of its contents. The message of any medium is "the change of scale or pace or pattern that it introduces into human affairs" (McLuhan, 1964; p.8) McLuhan's argument is that technology shapes and controls the scale and form of human association and action, ahead of its contents.

By this argument, the potential for interpretive flexibility of technology whereby the way it is used determines its value is secondary in this theory. Beyond the assumption that the medium is the message, Media Ecology is also the study of media as environments. According to Strate (strate 2017), the range of phenomena that qualify as media include technology, means, communication mode, channel, link, surface, language, grammar, code, relationship, container, extension and method (p.116-117). But in this research we are concerned with ICT media which constitute a narrower set of phenomena and their shaping of the ICT business executive.

Thus, media ecology in this research is the study of the ICT environment which is the specific technological environment or object of the business executive. In this context, an ICT medium such as a digital platform or the internet is a perceptible manifestation of a dynamic process of mediating between nature and culture. The key aspects of the ICT environment include “technology and techniques, modes of information and codes of communication” (Strate, 2017; p.45; Strate, 1999). Interestingly, the ICT environment is itself an aspect of the human condition which shapes and is shaped by ICT media. “The human condition comprehends more than the conditions under which life has been given to man. Men are conditioned beings because everything they come in contact with turns immediately into a condition of their existence” (Arendt, 1958; p.9). Thus, the ICT business executive is conceived as a conditioned entity which provides conditioned or learned response or reaction to ICT-based stimuli such as mobile and web technology platforms as well as digital information. Prior to this conditioning, the human being had developed ICT as an extension of the central nervous system.

The medium of “technology,” says Strate, “can be understood as, in its most basic sense, the activity of altering the environment” (2017; p.70). According to McLuhan, technology results from man’s extension of the body in order cope with environmental burdens. The problem about the extended body (the technology) is that it causes irritation to the body because “it brings about a new intensity of action by its amplification” (p.47). To regain relief, the body reacts to protect itself by amputating or isolating the extended part which is causing the irritation. But after amputation, he beholds the amputated part (the technology) and embraces it because “[man] does not spontaneously recognize technology other than his own” (Fuller & Applewhite, 1975; p.17). In sum, man is fragmented by his technologies which are self-amputations of his own organs. In order to overcome the problem of fragmentation and achieve integration or “closure”, man must recognize, behold, embrace and use his own image in technology (McLuhan, 1964).

Man, because of his love for and use of his technology,

“is perpetually modified by it and in turn finds ever new ways of modifying his technology ... [the] machine world reciprocates man’s love by expediting his wishes and desires, namely, in providing him with wealth” (McLuhan, 1964; p.51).

In effect, technology is both an external and internal condition of man (Emerson, 1883). Thus, Media Ecology theory also holds a view similar to technology materiality. The technology condition underscores the primacy of the independence of materiality of technology, ahead of sociomateriality and relational affordances which are secondary. The internal and external technology condition does not necessarily pertain to an individual. According to Ellul (1964), Mumford (1961) and Postman (1992), the technology condition pertains to any form of human organization, including the business executive. By implication, ICT is both an internal and external condition of an individual business executive, a composite business executive, and an ICT-based SME. This technology condition is the result of both technology shaping of man, and human shaping of technology. But our primary interest in this research is technology shaping.

3 Methodology

With a critical realist approach to this research, the empirical study was done in a Ghanaian ICT-based SME (mCom: all names used are pseudonyms) that provides mobile communication services to other organizations and individuals. Critical realism is the philosophical basis for technology materiality as well as Media Ecology theory. For, it assumes ontologically that there is a material and independent reality underpinning actual events and perceptible experiences (Archer, Bhaskar, Collier, Lawson, & Norrie, 1998; Tsoukas, 1989). Conjoined to this ontology is the epistemological assumption that actual events and people’s experiences must be perceived by the researcher in their natural, social and cultural

settings (Walsham, 2006). Although ICT is pervasive in mCom, there are also several actual events and staff experiences that are generated by ICTs.

mCom was founded in September 2011 by two Computer Science students of a Ghanaian university. Its first product was an information dissemination application for higher educational institutions, which was piloted with over 1,300 students in the university. Since then mCom has grown steadily in terms of staff, products, revenue and space. During the empirical study, it had nine staff including the two co-founders who constitute the company's executive. During the study, it was also operating from the two largest cities in the country – Accra and Kumasi (it had begun in a small room in Kumasi). At the Kumasi office, it shared two rooms plus the front desk with another company, and housed three of the staff there (two software engineers and one Administrative Secretary). At the Accra office, it had one dedicated room which was not shared by another company. One of the co-founders (Kofi) plus four staff all operated from this room which was not partitioned with any solid dividers. The other co-founder (Kwame) operated from an external location which was not owned by mCom.

Its communication service innovation is delivered through “SMS and mobile applications (native and web) and devoted to help institutions/companies in the public and private sector improve customer relations and communication with their employees and suppliers.” It was selected for the empirical study because of three main reasons. Firstly, it was an enterprise that relied on digital (mobile and web) platforms for communication service innovation. Secondly, it was an ICT-based SME that bore characteristics such as high owner influence, flexible structure, and limited resources apart from ICT media. Thirdly, its executive was heavily dependent on and dominated by ICT media for overcoming some of the constraints presented by the limited resources. mCom used ICT media for every aspect of the business including accounting, human resource management, customer service, marketing, task scheduling, research, learning, planning and development. For example, the physical files in both offices were negligible, and the resident co-founder was pleased with that. This heavy dependence on technology had been the character of the company since its establishment, and although it was planning to move to a bigger office in Accra, it did not have intentions to reverse its increasing dependence on technology.

With process theory development in mind, a case study was undertaken at the company premises spanning a period of 4 months. In studying processes of communication service innovation, we sought to gain a greater understanding of the contexts of ICT media, service innovation and SME than we would gain through a survey or experiment. This context combination is unique to this explanation of the cognitive structure and functions of the business executive in this research because they constitute a context which has not been adequately explored in relation to the business executive. We took the advice by experts of case study strategy (e.g. Bonoma, 1985; Benbasat, Goldstein, & Mead, 1987; Yin, 2003) that this strategy is most appropriate when there are no clear relationships between the phenomenon of interest and the context. The absence of theories of the business executive developed within the context of ICT media and SME in existing publications means we had virtually no basis for conducting deductive analysis that would lead to formulation of hypotheses.

Being an SME and a young company, mCom had quite a flexible structure with staff performing multiple roles and dominated by informal and verbal communications mostly using ICT media but also considerably using face-to-face modes. Kofi, who worked from the Accra office (resident co-founder), was the Chairman of the four-person Board of Directors as well as the Chief Operating Officer (COO) and Chief Marketing Officer (CMO) at the same time. Kwame was a member of the Board, the Managing Director (MD), the Chief Technology Officer (CTO) and the Chief Financial Officer (CFO) at the same time. Besides, the Software Engineers doubled as Customer Service Officers, the Administrative Secretaries at both offices functioned as Customer Service Officers and Front Desk Officers, and the Marketing Officers doubled as Business Development Officers.

These multiple roles meant that the executive and staff of the company would have their own multiple interpretations of the events and experiences they were involved in. These interpretations were sought in the empirical study to emerge with rich qualitative data, following Weber (1947). Thus, the study pursued an understanding of their experiences, events and underlying technologies that shape the executive cognitive structure and functions – accounts from the “native's point of view” (Geertz, 1974). Thus, in this pursuit, there was a focus on exploring the meaning of the research topic for the respondent in order to emerge with a situated account (Qu & Dumay, 2011). This pursuit also required close contact

with them to empathize with their situations and experiences, and also to interpret the meanings they have assigned to those situations and experiences.

Therefore, the empirical study was operationalized with semi-structured interviews (the primary method), meetings, observations and document studies. The interviews were approached and framed with Myers and Newman's dramaturgical model which suggests that each interview is treated as a drama (Myers & Newman, 2007). All the nine staff of mCom were interviewed in an average of one hour per person. Each of the interviews was conducted at the office where the staff operated from. Guided by Qu and Dumay (2011), the interviews sought to obtain general data on the relationship between ICT, learning, and service innovation from all staff. However, the extent of questioning differed according to the staff category. Questions posed to the co-founders (the executive) included items that sought for particular data on ideas generation, concept formation, and their translation into service innovation through business development and product development. Questions posed to the Software Engineers included items that sought for particular data on technology development. Finally, questions posed to the Marketing Officers and Administrative Secretaries did not particularly seek for data on technology development. On the whole, the interviews were framed by knowing, doing and becoming which are the main facets of learning and cognitive development. All the interviews were digitally recorded after permission was sought from the co-founders, and the recordings were transcribed to result in close to 200 pages of text.

The first meeting that produced empirical data for this research was between one of the co-authors and the resident co-founder at a conference in Accra. mCom was introduced to the co-author because the resident co-founder and one of the Marketing Officers had mounted a stand at the conference to market their products to delegates. Although the company as the empirical study site had not been selected yet, the data obtained was useful in providing the researcher first-hand data on the company's technology service innovation. The second meeting was with the resident co-founder again at his office following the researcher's request. At this meeting, further data was sought about the company's size, structure, physical space, and service innovation. The third meeting was with all the Accra office staff during their weekly Monday morning cross-briefings about work done in the previous week and work to be done in the current one. During this meeting, data on these briefings were gathered through hearing and notes-taking during and after it. Attention was paid to service marketing efforts, new product developments, types of customers, and executive function in the hearing and notes-taking. All other meetings were for the interviews.

Documents on the company's profile, products, mission, vision and history were studied at its website. These data corroborated those obtained from the interviews and meetings.

Things that were directly observed were the company's physical space, arrangement of furniture, density of paper. These data corroborated the fact that mCom was indeed an SME dominated by ICT media. However, the proportion of observation in the entire empirical study is very low compared with interviews.

The guiding principle for our data analysis is that when interpretation is possible in the pursuit of causal relationships as in technological shaping of the business executive, it must be undertaken (Weber, 1947). Analysis must not end at establishment of relationships between variables. Following this principle, the data collected were interpreted inductively. Inductive reasoning about the data begun alongside the data collection especially during the interviews. The accounts of mCom staff which they provided were believed to be their own interpretations of their situations because the questions posed sought for their own explanations of how and why. Those accounts were validated with corroborative accounts by other staff, documents studied, meetings and observations. Following the data collection and their transcription, we identified themes in them that pertain to our pre-defined codes of technology shaping by materiality of ICT media. Examples of these codes are enabling or constraining verbs.

The themes were identified by careful readings of the nearly 200 pages of text from the nine interviews; by looking for statements made by the co-founders on decisions and actions they had taken by, with or through ICT media; and by looking for statements made by the seven staff members which corroborated the co-founders' own. For example, we identified a corroboration when one co-founder said "we're still monitoring [technologies], waiting for it to be fully developed then we can take advantage of it" and one software engineer said "this new thing is coming, what are you going to do about it? Then I go in, find my analysis, and then start." Each of the co-authors read the transcript

separately and independently to identify their own themes. After that we compared them in order to aggregate the different ones and join the similar ones.

The themes leading to the cognitive structure of the executive were identified by statements made by the co-founders on their technology-based knowing, doing and becoming with respect to ideas generation, personal development and service innovation by the company. The validity of these themes was determined by how they were corroborated by themes on the functions of the executive. The functions themes were identified by statements made by the co-founders on their technology-based intentions, decisions and actions for ideas generation, organizational development, staff development and the company's service innovation.

4 Results

Communication service innovations by mCom are achieved through its development of the following technology products:

- web-based short messaging service (SMS) application for sending messages to large numbers of people
- bulk voice calling application for recording, uploading and making multiple outbound audio calls at a time
- notification system used by organizations to send notices (including changes and updates) to staff and customers so that they receive the notices anytime anywhere
- reseller system that enables anyone to buy SMS credits at wholesale price and resell them to other people at suitable prices of choice
- interactive voice response (IVR) system that enables mCom clients to communicate with their customers by automatically calling their numbers anywhere with a pre-recorded voice message
- Short (unstructured supplementary service data [USSD]) and long codes messaging systems for sending messages and receiving feedback as in voting and examination results checking

These applications and systems are produced from web development frameworks and mobile telecommunications platforms owned by other companies. For example, the SMS application was produced with a Laravel PHP framework; and the short and long codes messaging systems are derived from one of the mobile telecommunications operators in the country. Thus, Kwame said “for us, we're a technology company. So without technology we wouldn't even exist as a company.”

Aside technology production, one of the company's dominant activities is customer service. Thus the two Administrative Secretaries in Accra and Kumasi are dedicated to receiving and responding to customer complaints throughout the day. The company's website also has an instant messaging application that always stays on top of every page visited, serving as another means for offering customer services. The customer service calls that are received and addressed are entered into PipeDrive, the sales and customer relationship management system.

The smallness of mCom and its technology service innovation required continuous learning by all staff, but especially by the executive. Executive learning by Kofi and Kwame was for developing their personal capacities, for generating ideas, and for innovating services. All these ends were being pursued with dependence on ICT media. Therefore, the pursuing processes were technology-based learning by knowing, doing and becoming.

Knowing what ICTs are available for mCom to leverage was one of the foundations for ideas generation and service innovation. This executive function included monitoring and identifying newly-added properties of individual technology media.

“initially when we started out ... erm ... we were looking more at SMS based solutions. But then as time went on we realised that ... ok, no, we could leverage on let's say ... some technologies that are available. So for example maybe ... that's we could use mobile apps to still achieve the communication goal. So that is one thing that we say ... ok, probably, erm some advancements in mobile app development has benefited us as a company because some of the services we now want to provide, previously we couldn't have done that but with the introduction of these advancements we could do that, because even though let's say smart phones have existed for a while now, the smart phones then and the smart phones now are not

the same. There have been some improvements, there's been improvements in let's say how apps are developed" – Kwame

"I think for us as a company, we have identified that within the voice space, there's a lot that we can take advantage of. ... we've identified that USSD will become quite big so that's an opportunity for us to step in ... erm ... voice will also become big, we've identified that so that's also an opportunity for us to step in." – Kofi

The executive was not only monitoring and identifying the opportunities presented by ICT media to develop ideas for service innovation. Kofi and Kwame were also using ICT media to develop their personal capacities according to their specific roles in mCom. Kofi, being the Board Chairman, CMO, and COO, was more interested in organization and management issues. Thus, he was using various ICT media to practice learning-by-becoming a better manager and marketer. And he said:

"So in terms of learning, me I think from day one, I was always reading books on marketing though I don't have any formal background on it, I ... even right now on LinkedIn I'm doing a course ... that one is more on management but it combines a few of business stuff and all that. So I do a lot of online courses, I used to do some on Coursera and then Lynda.com as well, and I read a lot online, so I'm also good in social media marketing as well."

At the same time, Kwame, being the MD, CTO, and CFO, was more interested in technology platforms, frameworks and development issues. Thus, he was using various ICT media to practice learning-by-becoming a better CTO. And he also said:

"ok as an individual it helps ... based on some of the new things that are coming up, it opens up your mind to other things that you can do. So ok probably let's take ... let's take Android as a platform for example. As an individual I don't have control over ... that much control over what feature will be included in Android or what it needs to do, but then when it gets to the point where ok there is a news update or a release that ok this new feature has been included, then ok, I have to ask myself ok, what can I do as an individual to take advantage of this thing that has been introduced? So that is one part. For self-improvement, I think there's been a lot of platforms for taking online courses some free, some paid. Previously I think that would have been a challenge. So you don't really have to find yourself in a typical classroom to acquire new knowledge. There are forums and stuff out there. So that's another ... erm ... I think I would say ok, without the help of technology when it comes to self-improvement has made it much for me."

During the empirical study, both of them, through their dependence on ICT media, were becoming more competent in their technology and management functions. All the three software engineers and Kofi eulogized Kwame for his high technology competence. Likewise, all the three software engineers and the two Administrative Secretaries also eulogized Kofi for his management competence.

Kofi and Kwame were also using ICT media to learn-by-doing; that is, each of them was developing personal technology and management capacities through ICTs. By managing the operations, marketing and customer service activities through the software tools on his laptop computer (Google Drive, PipeDrive, Asana, etc), Kofi was increasing his management competence through experience and feedback.

"This's actually what helps me a lot in terms of supervising. So when I go to ..., I'm able to see the things that [Kwasi] has done has worked. I'm able to see the prospects and what he's done so far. This's what actually helps me ... so instead of me always asking that what is the newest with this client, I always go there and I check and I'm able to see the new and ... and also Asana as well. This one also really helps with supervision because you're able to tell what task has been worked on, which hasn't been worked on, which task has been completed because when they complete a task, I get an alert. Yeah, so they actually help for supervision. I think I didn't mention it, but they help a lot for supervision because instead of asking questions

always I can go online and find all the information that I need. We have Google forms as well that they fill with their weekly task, what they've done as well so when they fill those tasks I'm able to get the feedback and know, ok, this what they've done ... this is what's pending and all that."

Similarly, Kwame performed his CTO, MD and CFO functions through ICT media. He was not operating from mCom's Kumasi or Accra offices, and so he was mostly accessible to the Software Engineers via the internet or mobile phone. Through technology-mediated communications with them, he was doing his CTO work. But he spoke more clearly about his learning-by-doing in his answer to the question about how he gets to know an idea for technology service innovation before he researches about it:

"Ok, alright, it mostly starts with the challenge that we have. So now there's a challenge and it needs to be solved. But we don't know how we're going to go about it. So then that is the starting point. So then trying to find out ok "what technologies are out there that can be used to solve this problem?" Because you ... you come across some that might look like initially it's a fit, then you realise that ok this wouldn't work for me. So most of the time our research starts with the challenge that we're having or what we intend to do, because even though we know ok this is where we want to get to, we don't know how to get there because we don't know which platform or which technology exists to help us achieve that. So probably maybe in the course of the research, it could also happen that we'd have to adjust our initial goals because probably the technology to do that is not yet available. So we just make do with what we have now, and then we wait for that technology to be developed. Then when it is developed, we can go back and then implement the original solution that we had in mind."

His answer highlights his active researching with ICT media to identify the appropriate technology for the service solution in mind. Thus, his learning by knowing and becoming is based on doing research.

Having achieved high levels of executive competence in technology and management domains through learning, Kofi and Kwame were also using ICT media for developing both the staff and the organization. Their pursuit of these ends was evidenced by taking technology-based decisions and actions. In developing staff of the company, Kofi spoke about getting them to take courses on Lynda.com, which was a decision that was largely possible because of ICT media.

"So on Lynda.com, you have a lot of courses as well, so what we did was that we gave them some courses to also take over there, so when you complete they get a certificate for it. So for example with [Ama], because she does telesales we gave her a course on how to do code calls and the rest. Then with the technical guys we give them courses on Python and all those things. So it's a paid service that we have, so ... currently we pay for it, so what we are trying on doing this year is to enforce it more."

The goal of such decisions was to facilitate self- and cross-learning because meetings were called for each staff member to share their learning experiences and, effectively, upgrade every staff member's knowledge in both technology and management.

"That way, everyone knows what everyone is doing more, and everyone is able to learn some new skill. If, let's say, I'm a programmer, at least I've learned how to do code calls so that I'll be all-round but not really just a programmer I'm always behind my PC and ... let's say I'm a sales person, at least I'll know a bit of coding and some of the technical languages. That way, when later I'm in a meeting and I'm being asked technical questions at least the basics I'll be able to answer. So that's the goal."

One of the Software Engineers at the Kumasi office, Kwaku, confirmed Kofi's contribution to his personal development. Kwaku gave the following answer to a question about Kofi's mode of helping him to develop communication skills for customer service:

“we have a chat channel that we use, and then he’ll tell you that you have to talk to this customer for me? Tell him that this, this, this and that. And ...sometimes, I’ll be ... like, how am I going to do this, and ... so, I have just have to ... and I’ve seen him ... the way he talks to the clients too, so I pick some things from there, yes.”

Kwame’s mode of developing mCom staff was by “pushing” them to do internet-based research and some self-directed learning;

“So sometimes even though some information can be presented to them, the information is withheld, but then pushing you to go and find out more about that; and then in case in your findings you leave out certain things, then we can fill in the gaps... I believe in the process of doing that you learn much more than if I just tell you, ok, this is what you need to do to get this done. So the opportunity mainly lies in trying to get them to solve problems with little directions from us so you figure it out on your own. And we believe ok, once you do that, it opens you up to other things that probably in the process of directing you I couldn’t have told you about.”

One of the Software Engineers at the Kumasi office, Akos, corroborated Kwame’s mode of staff development that promoted self-directed learning:

“Sometimes when you get to [Kwame] and he ... he’s somebody ... if he expects that you do something A, and you’re not going the extra mile and you ask him, he won’t mind you. He won’t mind you ... aha ... so even if I look up to him, I will still have to sit and then do my own learnings.”

On organizational development, mCom was seeking to exploit more service innovation opportunities through development of communication solutions.

“so what we want to achieve now is to get to the point where we are more like a virtual mobile network operator where we are able to ... provide communication services ... So then that is where we want to get to, but then unlike the traditional mobile operators who focus on maybe delivering communications using ... or voice and SMS ... now we then decide then to now provide technology solutions probably that can be accessed on the mobile phone or that can be accessed on the ... via web, which some traditional mobile network operators don’t do because their main focus is on the traditional communication medium that is voice SMS.” – Kwame

5 ICT Media and Executive

As a “technology company,” mCom had an ecology of ICT media (devices, applications, infrastructures, protocols, platforms, and frameworks) whereby the media interconnected to shape its executive and staff. The company was characterized by integration of functions and staff relationships within the company as well as integration of the executive’s cognition with the ICT media extended outside of itself. The case data show quite clearly that mCom was characterized by fusion of learning, technology, information, decision making and production due to ICT media. This fusion reflects the way the ICT media enabled the executive to achieve instantaneous and interrelated processing of information and knowledge for the company’s communication service innovation. But how and why was the executive cognition shaped by the technology condition or environment generated by ICT media?

The steps towards explaining technology shaping are to consider the two main functions of the executive which were studied in this research. The assumption informing this consideration, based on Media Ecology theory, is that ICT media shapes the human sensorium (the entire set of sensory faculties) which in turn shape cognition.

5.1 Technology-Based Learning

The first set of functions is technology-based learning – called inward human agencies. In the technology-based learning by knowing, doing and becoming by the mCom executive, the empirical data

suggests that the co-founders of mCom were performing the following specific technology-enabled processes that were shaping the executive cognition: assembling ideas, exploiting opportunities, and totalizing awareness.

5.1.1 Assembling

Assembling was an act of searching the internet to gather pieces of executive function ideas for personal and organizational development. The executive of mCom was assembling communication service innovation ideas by virtue of the material agency of mobile technology frameworks and platforms. These are ICT media that open to enable people to draw upon or build upon. The executive was specifically being shaped by how the need to innovate services induced it to continuously update itself with new technology development ideas: “as an individual it helps... based on some of the new things that are coming up, it opens up your mind to other things that you can do. So let’s take Android as a platform for example ...,” says Kwame. This is a reference to how the building of executive cognitive capacity is enabled by the technology platform and according to communication service innovation demands.

The two factors (technology platform and service innovation demands) enable the building of the executive cognitive capacity by the human agency of technological inquiry. Technological inquiry by the executive was evidenced at mCom in Kofi and Kwame were questioning, anticipating and researching things pertaining to technology platforms and frameworks. Thus, Kwame said: “So now there’s a challenge and it needs to be solved ... So then trying to find out ‘what technologies are out there that can be used to solve this problem?’ ... So most of the time our research starts with the challenge that we’re having or what we intend to do.” The specific aspect of these technologies that builds executive cognition capacity is openness which is due to their infrastructural natures. Their openness combines with service innovation demands to generate technological inquiry that leads to open executive cognition. This opening of executive cognition and the speed involved in the opening process is a manifestation of integration or closure between man and his technology which is a core assumption of Media Ecology. An open executive cognition therefore becomes an assemblage of technology platforms and frameworks; and it pretends to be an infrastructure just like the technology that is recognized and beheld by the executive. Thus, the open executive cognition of mCom served as the platform that staff members drew upon to develop communication technologies for service innovation.

5.1.2 Exploiting

Exploiting was evidenced by continuous monitoring of ICT innovations and identification of opportunities by the executive for mCom’s communication service innovation. It is a processes that led to enhanced executive cognition because the ICT medium (SMS technology in this instance) was a condition that evoked the executive’s learned reaction. The messaging technology having been developed by man previously, it has become a technology medium between man and the environment. Thus, before exploitation of this medium by the executive, it was an external condition. In order to convert this external condition into a communication service innovation, the executive must first internalize it as its internal condition. The material agency of the SMS technologies is that it routes information between a sender and receiver. Therefore, they are ICT media that convey the details of the information exchanges between two parties.

This material agency enabled the executive to gain instant comprehension of the largeness of “the voice space” in SMS technology and opportunities therein. The material agency also enabled the executive’s use of envisioned service innovation prospects to filter the messaging technology’s properties. Thus, Kwame said that “some of the services we now want to provide, previously we couldn’t have done that but with the introduction of these advancements we could do that.” He was referring to SMS technology advancements being exploited for service innovation, and that reference was in relation to his knowledge that “the smart phones then and the smart phones now are not the same.” By relating technology properties with service innovation continually, the executive was routing ideas between them. In these processes of comprehending, identifying, relating and conveying by the executive, its mind was also a conveying system. Given the conveying similarities between the media and the executive mind, it can be concluded that the media had generated a conveyor executive cognition. Further evidence of how the media were implicated in the conveyor cognition is in Kofi’s operational

function as a human SMS. He was regularly providing quick answers to spontaneous questions posed by staff members, and also posing spontaneous questions to demand quick answers at the Accra Office.

5.1.3 Totalizing

Totalizing refers to the act of mCom executive's use of ICT media to obtain organizational information in order to achieve complete awareness of production, prospecting, marketing and customer serving by staff of the company – what McLuhan (1964) calls “total field awareness” enabled by ICT media. The host of business applications constituted the ICT media with several material agencies that in turn generated several human agencies among mCom staff (Table 1). For these reasons, we first characterize these business applications as ICT media that converge in companies and work together. Among the executive of the company, the material agencies generated the predominant human agency of supervision. Kofi, for instance, mentioned Google Drive and Asana as specific applications that enables and enhances his supervision: “you're able to tell what task has been worked on, which hasn't been worked on, which task has been completed.” On the whole, the executive either logged into these applications or configured them to send notifications as means of achieving complete awareness of staff members' learning, production, prospecting, marketing and customer serving. This awareness included continuous checks or updates that led to executive interventions such as support, follow-ups, cautions, and instructions.

These business technology media constituted an external technology condition that was shaping the executive cognition ahead of the outward function of supervision. Such media combine with service innovation demands to avail business activity information to the executive at electrical speed. But since “the medium is the message” rather than the contents, the business technologies instead of the information are foregrounded in this explanation. The business technologies and service innovation demands enable the building of the executive cognition capacity by the human agency of technological perception: “instead of asking questions always I go online and find all the information that I need,” said Kofi. The specific aspect of business technologies that enable technological perception by the executive is their convergence in one company's repertoire of technologies according to service innovation demands. The convergence of these otherwise scattered technologies on the internet is necessitated by the non-linear service innovation activities which the executive has to perceive in their totality almost at once. Convergence of business technologies and the electrical speed characterizing their functionalities lead to an integrated executive cognition which resonates with McLuhan's idea of ‘cosmic consciousness.’

5.2 Technology-Based Managing

The second set of functions is technology-based managing – called outward human agencies. These agencies are witnessed in mCom's executive's technology-based managing by decisions and actions towards staff and organizational development. The empirical data show in taking decisions and actions, the executive was technologizing the company, liberating the staff, and developing service solutions. But before the executive ensures these processes, it must have a certain cognition that has been shaped by ICT media. The following sub-sections explain how the shaping occurs.

5.2.1 Technologizing

The executive function of technologizing every domain of the company is demonstrated by how it was getting every staff member know some basic ICT, even if the staff member was a marketer but not a software engineer. Kofi's reason in respect of a marketer was “because else you don't know what you're selling, because you're selling a technology, you're not selling a chair.” This is in addition to how it was making every staff member use business technologies for activities that traditional companies would use paper for. Thus, technologizing is an executive function that is traceable to ICT media within and without the company. The material agency of ICT media is that they receive, process, store, secure and disseminate information. When they converged at mCom, they constituted an external technological condition that enabled staff development, innovation management, and strategy execution. To the executive, this external condition had to be translated into an internal organizational condition to drive the company's communication service innovation. But there had to be a translation into an internal

cognitive condition before further translation into an external functional one, according to the Media Ecology assumption that ICT media transform the human sensorium.

In the context of service innovation by an ICT-based SME such as mCom, the executive cognition had been transformed from non-digitized to digitized by ICT media. This transformation may be ascribed to their academic training as Computer Scientists; but that background is not necessary since there exist executives of ICT-based SMEs who have no formal training in any computing discipline. The technological transformation of executive cognition is properly ascribed to the ICT condition or environment – technology company, technology products, technology tools, and technology infrastructure: “for us, we’re a technology company. So without technology we wouldn’t even exist as a company,” said Kwame. This was both a belief and a reality at mCom, but it is generally true of ICT executives because “to a man with a computer, everything looks like data” (Postman, 1992; p.14). A digitally transformed executive cognition that is focused on non-linear and integrated service innovation pretends to be a computer. When there is a problem, the solution is technology: “what technologies are out there that can be used to solve this problem?” said Kwame. When there is a technology, the solution is technology” “I have seen this technology. What can I do with it?” said Kwame again.

5.2.2 Liberating

When the executive of mCom both encouraged and coerced staff to continuously undertake online learning in a self-directed mode, they were liberating the staff because they were providing them resources for freedom to think. In its service innovation context, freedom to think was necessary for staff to learn more and for the company to provide its customers with excellent services. All the staff including the executive received a lot of customer information and feedback which needed to be processed and converted into service innovation efforts and solutions. This was done through considerable thinking individually and collectively (at their weekly meetings). Online tutoring websites such as Lynda.com and Coursera plus online discussion forums were therefore very helpful sources towards this liberating the staff. Therefore, these websites are media that inform. Their material agency is that they teach courses, and this agency generates the human agency of self-directed learning. These media constituted an external technological condition that had to be internalized by staff members and the company to enable staff development and service innovation.

For this external technological condition to be internalized in mCom at large, it had to be internalized first by the executive (as we have indicated in the process of assembling ideas through audiobook). Thus, these media had generated a pedagogic executive cognition through its own self-directed learning. Both Kwame and Kofi had used online resources not only to learn more about the latest technologies and management, but also to learn about how to teach these ideas in a self-directed mode. They had not just become technology and management gurus and executives; they had also become teaching executives, teaching the staff to learn about technology and management in a self-directed mode (just as the online media was teaching them). And so Kwame said, “I believe in the process of doing that you learn much more than if I just tell you, ok, this is what you need to do to get this done. So the opportunity mainly lies in trying to get them to solve problems with little directions from us so you figure out on your own.” In sum, the pedagogic executive cognition is more about instruction than information for generating the process of liberating.

5.2.3 Creating

The process of creating innovative technology service solutions was the organizational development goal of mCom. To achieve this goal, the company depended on existing ICT media by appropriating their properties and combining them to develop customized solutions. These processes for creating innovative technology service solutions at mCom were only possible because the relevant ICT resources (infrastructure, platforms, and applications) are media that beget. Technology begets technology through a process of combination (Arthur, 2009), and that is a basic material agency of ICT media. At mCom, this material agency generated the manifold processes of assembling, exploiting, totalizing, technologizing and liberating which underpinned the company’s technology service innovation. The executive traced mCom’s production and market position to how the company can appropriate and combine existing ICT media into new solutions: “so what we want to achieve now is to get to the point where we are more like a virtual mobile network operator ... via web which some traditional mobile

network operators don't do because their main focus is on the traditional communication medium," said Kwame.

We ascribe the technology-enabled creating process at mCom not only to the begetting material agency of ICT media, but also to internalization by the executive to make up its combinatory cognition. Combination as the material agency of ICT media shapes executive cognition by enabling thought processes that combined the organizational goal or challenge with ICT media properties. Through these thought processes, the executive had not just become informed about new technology ideas; they had also become begetters of new technology service solutions based on appropriating and combining existing ICT media.

The analyses in this section are summarized in Table 1 below.

| Table 2: Summary of Technology Shaping of the Executive | | | | |
|--|----------------------------|-----------------------------------|----------------------------|----------------------------|
| ICT-Based Functions | ICT-Enabled Process | ICT Media | ICT Material Agency | Executive Cognition |
| Technology-based Learning | Assembling | Web Frameworks & Mobile Platforms | Open | Open |
| | Exploiting | SMS Technology | Route | Conveyor |
| | Totalizing | Business Applications | Converge | Integrated |
| Technology-based Managing | Technologizing | ICT General | Transform | Digitized |
| | Liberating | Teaching Websites | Inform | Pedagogic |
| | Creating | ICT General | Beget | Combinatory |

5.3 The Executive as Platform

The analysis in the previous section shows that ICT media shape executive cognition significantly, confirming that the medium is the message. The interpretation of the data and technological explanations provided point to the significant change of the scale, pace and pattern of executive cognition and functions due to ICT media. The particular human agency processes (assembling, exploiting, totalizing, technologizing, liberating and creating) which have been explained as derivatives of ICT media correspond to certain technology-like characters of executive cognition. These correspondences together reflect technology shaping of executive cognition and functions. The Media Ecology assumption for the analysis is that the executive is shaped primarily by technology ahead of the information it handles. On the whole, paper has explained how ICT media shape executive cognition as follows: *by service innovation driven internalizations of ICT media functions*. It has also explained why the shaping occurs as follows: *because ICT media and service innovation imperatives combine to generate executive internalizations*.

Each of the six explanations establishes a causal link between the media and executive cognition (Table 2). But the link is not direct because the two variables are moderated by ICT service innovation and executive functions (Figure 1). These two variables moderate the link because the effects of ICT media on executive cognition depends on them individually and collectively. In terms of the theory of explanation, although the two variables are moderating the link, yet they are significant final causes of executive cognition. Thus, although in practice, cognition precedes function, yet the finality of something to be practiced can significantly shape the cognition ahead of the practice. This moderation underscores the materiality of ICT media which denies technology determinism. Therefore, the effects of ICT media on executive cognition are stronger or weaker depending on the variety of ICT services innovation and of ICT media applied to executive functions. The greater the variety, the stronger the media effects on executive cognition, and vice versa. These explanations are summarized in Figure 1.

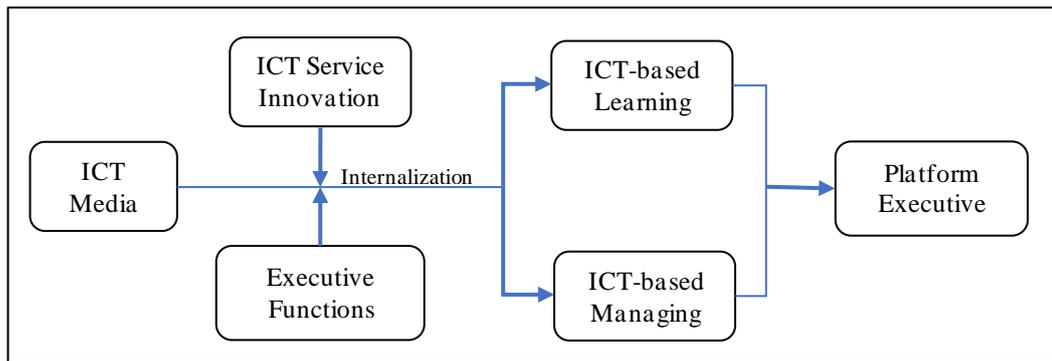


Figure 1: Technology Shaping of Executive Cognition

6 Discussion

6.1 Theoretical Contributions

The explanation of the relationship between ICT and cognition fills an epistemological gap in the theory of the executive in IS research. For, existing publications on studies of the executive do not include this explanation. In the first place, we have searched the mainstream IS journals and scholarly books, and found that there have not been any explicit studies on ICT and executive cognition. The nearest studies which may stand as exceptions have been undertaken by Swanson and Ramiller (Swanson & Ramiller, 1997; Ramiller & Swanson, 2003) and Kaplan (2008). The theories developed from these studies are comparable to the findings of this paper because all of them provide some explanation of the relationship between ICT and executive thinking. And because this paper's conceptualization of ICT media includes cognition, change, perception and organizing visions pertaining to them, its technological explanations complement theirs. However, this paper's own departs significantly from theirs because we explain executive cognition *as* technology and ecology (platform) while they explain executive cognition *about* technology. There are substantive distinctions between these prepositions (about, as).

In Swanson and Ramiller's study of the IS executive's response to organizing visions (which are technology-related), their main argument is that the IS executive senses and responds to technological change and organizing visions. But in ours, executive cognition integrates ICT media in addition to sensemaking and response. In ours, the material cause of integration is ICT media which is the independent variable (the final causes are service innovation and executive functions which are moderating variables, and the efficient cause is the combination of the material and final causes). But in their explanation of executive response, ICT integration is not included. In it, technology remains external to the cognition of the IS executive before, during and after their sensemaking and response. Thus, the absence of ICT integration in their theory leaves us with a dyadic view of the relationship between ICT and executive cognition. Hence, they explain executive cognition *about* technology.

Similarly, in Kaplan's study, ICT plays the contextual or contingent role in "cognitive explanation of firm response to technical change" (p.673), meaning that ICT integration is also absent in her theory. The focus of her study is how CEO cognition, organizational capabilities and organizational incentives interact to shape firm strategy, also in response to the fiber-optic revolution. Her study indeed "focuses on the cognition of CEO's especially and examines the influences of CEO attention ... in shaping firm response to technical change" (p.672). But the findings of her study are similar to Swanson and Ramiller because of her emphases on CEO attention and fiber-optic patenting, the latter being an executive function. Her findings duly refer to CEO cognition and interpretations made of technical change, but they are not technology-integrated as this paper's explanation does to explain executive cognition *as* technology. Hence, she also explains executive cognition *about* technology.

Therefore, in the first place, the platform executive *as* technology and ecology discloses the technological enrichment of the ontology of executive cognition, and it presents a technological extension of the epistemology of executive. Furthermore, our explanation is broader and more focused, and more integrated than previous ones. The breadth and focus due to the ecology and materiality of ICT media with which we approached this research. The integration is due to service innovation driven internalizations of ICT media functions by the executive. The paper's contribution of an extended

explanation stems from how and why it highlights the executive manager as a mediating platform for internalizing and externalizing ICT innovation and problem solving. Previous studies on ICT media and the executive have focused on the two concepts (internalization and externalization) in a direct (one way) adoption or use dependent relationship. Findings from this study position the manager as a mediator between internalizing ICT media and externalizing executive functions in respect of ICT service innovation.

In terms of the process dimension of our extended explanation, our research contributes theoretically to the current IS literature by juxtaposing media ecology and materiality of ICT with contemporary leadership executive who are being driven by technology service innovation endeavors. By ascribing executive cognition (moderated by service innovation and executive functions) to insightful processes such as assembling, exploiting, totalizing, technologizing, liberating, and creating, we add to the conceptual vocabulary that demonstrates technology shaping of executive cognition in service innovation contexts. These additions are substantive because they underpin the processual rendition of our explanation; they are also distinctive because they are overlooked in previous explanations of the relationship between ICT media and executive cognition. Hence, on the whole, this research is different from previous ones not only in terms of approach (material and ecological), but also in terms of the process and outcome dimensions of our explanation.

6.2 Research and Practical Implications

One research implication from this study is the need for IS research on SMEs and the executive to extend research focus and design from the existing limited, dyadic explanations towards triadic ones. Existing dyadic relationships are between the SME executive and the organization, between ICT media and the executive, and between ICT media and the organization on the other. This should be done in order to provide fresh explanations on the more complex, triadic link between ICT media, the executive and the organization. As the findings and the discussion show, the relationship between ICT and the organization in relation to digital innovation and problem solving is not solely based on a direct relationship where the ICT impacts the organization without the mediating role of the executive. Thus, using the existing direct, dyadic relationships limits the complex nature of the SME executive research phenomenon in contemporary digital innovation research for SMEs.

This integrated perspective being proffered in this paper also provides fresh insights towards future research in digital service innovation (see, for example, Barrett et al., 2015; Chew, 2014; Williams, Chatterjee, & Rossi, 2008). Having explained executive cognition *as* technology here as an epistemological link in the translation of ICT media into service innovation capabilities and products, we encourage future researchers to delve deeper into how aspects of executive cognition relate to diverse digital service innovation types. If the executive is viewed as a platform because of service innovation driven internalization of ICT media functions, then both forward and reverse causal relationships are plausible explanations yet to be made by researchers. These implied future research endeavors will contribute refined explanations of the relationship between ICT media, executive cognition, executive functions and digital service innovations.

Practically, the study records its presence in the management literature by accounting for the intense application of technology for providing innovative IS service solutions in the interest of both strategic and short term growth of an organization, specifically, an SME. The study also contributes to the growing management literature by demonstrating, in graphic detail, the extent to which ICT becomes so instrumental in forming and shaping the executive cognitive orientation towards diverse service offering in tailored solutions to unique customer demands. For instance, ICT executives of service innovation firms can draw from this paper to enrich their cognitions by diversifying the ICT media used for production. This research suggests that such diversification is not entirely open. Rather, it suggests that it must be guided by the service innovation and related executive functions. Thus, the diversification of ICT media use may be open but only to customer demands that determine the range of service innovations provided.

Technology shaping, as this research has explained through processes of assembling, exploiting, totalizing, technologizing, liberating and creating processes, implies that executive cognition can experience technology growth or decay. Growth occurs through more learning by doing, knowing and becoming; and decay occurs through less learning. For the composite executive (composed of two or more individuals) where individuals have specialized functions such as CEO, CTO, and CIO, the

cognitive growth may not be possible for each individual at the same time. In such an instance, those who engage with the core production technologies such as platforms and frameworks must intensify and extend their embracing and use of ICT media to compensate for the decay which the others may experience. Otherwise, the cognition of each individual must be consciously enhanced to different degrees through continuous embracing and use in order to remain responsive to customer demands for technology services innovation.

References

- Archer, M., Bhaskar, R., Collier, A., Lawson, T., & Norrie, A. (1998). *Critical Realism: Essential Readings*. New York: Routledge.
- Arendt, H. (1958). *The Human Condition*. Chicago, IL: University of Chicago Press.
- Arthur, W. B. (2009). *The Nature of Technology: What It Is and How It Evolves*. New York: Free Press.
- Ballantine, J., Levy, M., & Powell, P. (1998). Evaluating Information Systems in Small and Medium-Sized Enterprises: Issues and Evidence. *European Journal of Information Systems*, 7, 241–251.
- Barnard, C. I. (1938). *The Functions of the Executive*. Cambridge, MA: Harvard University Press.
- Barrett, M., Davidson, E., Prabhu, J., & Vargo, S. L. (2015). Service Innovation in the Digital Age: Key Contribution and Future Directions. *MIS Quarterly*, 39(1), 135–154.
- Bell, D. (1976). *The Coming of Post-Industrial Society: A Venture in Social Forecasting*. New York: Basic Books.
- Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The Case Research Strategy in Studies of Information Systems. *MIS Quarterly*, 11(3), 369–386.
- Bettencourt, L. (2010). *Service Innovation: How to Go from Customer Needs to Breakthrough Services*. New York: McGraw Hill.
- Bonoma, T. V. (1985). *A Case Study in Case Research: Marketing Implementation*. Boston, MA: Working Paper #9, Harvard University Graduate School of Business Administration.
- Burns, P. (2001). *Entrepreneurship and Small Business*. Hampshire: Palgrave Macmillan.
- Chesbrough, H. W. (2011). *Open Services Innovation: Rethinking Your Business to Grow and Compete in a New Era*. San Francisco, CA: Jossey Bass.
- Chew, E. K. (2014). Service Innovation for the Digital World. *Enterprise Modelling and Information Systems Architectures*, 9(1), 70–89.
- Ellul, J. (1964). *The Technological Society*. New York: Vintage Books.
- Emerson, R. W. (1883). *The Conduct of Life and Society and Solitude*. London: Macmillan.
- Faraj, S., & Azad, B. (2012). The Materiality of Technology: An Affordance Perspective. In P M Leonardi, B. M. Nardi, & J. Kallinikos (Eds.), *Materiality and Organizing: Social Interaction in a Technological World*. Oxford: Oxford University Press.
- Fuller, R. B., & Applewhite, E. J. (1975). *Synergetics* (Macmillan). New York.
- Geertz, C. (1974). “From the Native’s Point of View”: On the Nature of Anthropological Understanding. *Bulletin of the American Academy of Arts and Sciences*, 28(1), 26–45.
- Godfrey, P. C., & Mahoney, J. T. (2014). The Functions of the Executive at 75: An Invitation to Reconsider a Timeless Classic. *Journal of Management Inquiry*, 23(4), 360–372.
- Henry, W. E. (1949). The Business Executive: The Psycho-Dynamics of A Social Role. *American Journal of Sociology*, 54(4), 286–291.
- Herrmann, P., & Nadkarni, S. (2014). Managing Strategic Change: The Duality of CEO Personality. *Strategic Management Journal*, 35(9), 1318–1342.
- Igbaria, M., Zinatelli, N., & Cavaye, A. (1998). Analysis of Information Technology Success in Small Firms in New Zealand. *International Journal of Information Management*, 18(2), 103–119.
- Jarvenpaa, S. L., & Ives, B. (1991). Executive Involvement and Participation in the Management of Information Technology. *MIS Quarterly*, 15(2), 205–227.
- Kallinikos, J. (2004). Farewell to Constructivism: Technology and Context-Embedded Action. In C. Avgerou, C. U. Ciborra, & F. Land (Eds.), *The Social Study of Information and Communication Technology: Innovation, Actors, and Contexts*. Oxford: Oxford University Press.
- Kallinikos, J. (2012). Form, Function, and Matter: Crossing the Border of Materiality. In P M Leonardi, B. M. Nardi, & J. Kallinikos (Eds.), *Materiality and Organizing: Social Interaction in a Technological World*. Oxford: Oxford University Press.
- Kallinikos, J., Aaltonen, A., & Marton, A. (2013). The Ambivalent Ontology of Digital Artifacts. *MIS Quarterly*, 37(2), 357–370.
- Kaplan, S. (2008). Cognition, Capabilities, and Incentives: Assessing Firm Response to the Fiber-optic Revolution. *Academy of Management Journal*, 51(4), 672–695.
- Katzan Jr, H. (2008). *Service Science: Concepts, Technology, Management*. Bloomington, IN: iUniverse.

- Leonardi, P. M. (2012). Materiality, Sociomateriality, and Socio-Technical Systems: What Do These Terms Mean? How are They Different? Do We Need Them? In P M Leonardi, B. M. Nardi, & J. Kallinikos (Eds.), *Materiality and Organizing: Social Interaction in a Technological World* (pp. 25–48). Oxford: Oxford University Press.
- Leonardi, P. M., Nardi, B. M., & Kallinikos, J. (2012). *Materiality and Organizing: Social Interaction in a Technological World*. Oxford: Oxford University Press.
- Leonardi, Paul M., & Barley, S. R. (2008). Materiality and Change: Challenges to Building Better Theory about Technology and Organizing. *Information and Organization*, 18(3), 159–176. <https://doi.org/10.1016/j.infoandorg.2008.03.001>
- Levy, M., & Powell, P. (2006). *Strategies for Growth in SMEs: The Role of Information and Information Systems*. Amsterdam: Elsevier Butterworth-Heinemann.
- Levy, M., & Powell, P. (2012). SME Flexibility and the Role of Information Systems. *Small Business Economics*, 11(2), 183–196.
- Levy, S., Kafri, M., Carmi, M., & Barkai, N. (2011). The Competitive Advantage of A Dual-Transporter System. *Science*, 334(6061), 1408–1412.
- Lusch, R. F., & Nambisan, S. (2015). Service Innovation: A Service-Dominant Logic Perspective. *MIS Quarterly*, 39(1), 155–175.
- Marcel, J. J., Barr, P. S., & Duhaime, I. M. (2011). The Influence of Executive Cognition on Competitive Dynamics. *Strategic Management Journal*, 32(2), 115–138.
- Mathiassen, L., & Sørensen, C. (2008). Towards a theory of organizational information services. *Journal of Information Technology*, 23(4), 313–329. <https://doi.org/10.1057/jit.2008.10>
- McLuhan, M. (1964). *Understanding Media: The Extensions of Man*. Cambridge, MA: MIT Press.
- Mumford, L. (1961). *The City in History*. New York: Harcourt Brace and World.
- Myers, M. D., & Newman, M. (2007). The Qualitative Interview in IS Research: Examining the Craft. *Information and Organization*, 17, 2–26.
- Orlikowski, W. J. (2007). Sociomaterial Practices: Exploring Technology at Work. *Organization Studies*, 28(9), 1435–1448.
- Orlikowski, W. J. (2010). The Sociomateriality of Organisational Life: Considering Technology in Management Research. *Cambridge Journal of Economics*, 34(1), 125–141.
- Orlikowski, W. J., & Scott, S. V. (2015). The Algorithm and the Crowd: Considering the Materiality of Service Innovation. *MIS Quarterly*, 39(1), 201–216.
- Pickering, A. (1995). *The Mangle of Practice: Time Agency and Science*. Chicago: University of Chicago Press.
- Postman, N. (1992). *Technopoly: The Surrender of Culture to Technology*. New York: Vintage.
- Qu, S. Q., & Dumay, J. (2011). The Qualitative Research Interview. *Qualitative Research in Accounting and Management*, 8(3), 238–264.
- Ramiller, N. C., & Swanson, E. B. (2003). Organizing Visions for Information Technology and the Information Systems Executive Response. *Journal of Management Information Systems*, 20(1), 13–50.
- Reuver, M. de, Sørensen, C., & Basole, R. C. (2018). The Digital Platform: A Research Agenda. *Journal of Information Technology*, 33(2), 124–135.
- Soon-Yau, F. (1999). Effect of End-User Personal and Systems Attributes on Computer-Based Information System Success in Malaysian SMEs. *Journal of Small Business Management*.
- Strate, L. (1999). Understanding MEA. *In Media Res*, 1(1), 1.
- Strate, L. (2017). *Media Ecology: An Approach to Understanding the Human Condition*. New York: Peter Lang.
- Swanson, E. B., & Ramiller, N. C. (1997). The Organizing Vision in Information Systems Innovation. *Organization Science*, 8(5), 458–474.
- Tallon, P. P., Kraemer, K. K., & Gurbaxani, V. (2000). Executives' Perceptions of the Business Value of Information Technology: A Process-Oriented Approach. *Journal of Management Information Systems*, 16(4), 145–173.
- Tsoukas, H. (1989). The Validity of Idiographic Research Explanations. *Academy of Management Review*, 14(4), 551–561.
- Vargo, S. L., & Lusch, R. F. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing*, 68(1), 1–17.

- Walsham, G. (2006). Doing interpretive research. *European Journal of Information Systems*, 15(3), 320–330. <https://doi.org/10.1057/palgrave.ejis.3000589>
- Weber, M. (1947). *The Theory of Social and Economic Organization*. London: Free Press.
- Webster, F. (2014). *Theories of the Information Society*. Oxon: Routledge.
- White, L. T., & White, L. (1962). *Medieval Technology and Social Change*. Oxford: Oxford University Press.
- Williams, K., Chatterjee, S., & Rossi, M. (2008). Design of emerging digital services: a taxonomy. *European Journal of Information Systems*, 17(5), 505–517. <https://doi.org/10.1057/ejis.2008.38>
- Yadav, M. S., Prabhu, J. C., & Chandy, R. K. (2007). Managing the Future: CEO Attention and Innovation Outcomes. *Journal of Marketing*, 71(4), 84–101.
- Yin, R. K. (2003). *Case Study Research - Design and Methods*. London: Sage.
- Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, 21(4), 724–735.