Viewpoint

Cognizant computing + transformative marketing: an intelligent solution for sustainable business development

1. Introduction and background

Cognizant computing (CC), a revolutionary computing paradigm, which is still in its nascent stages of development, has heralded tremendous utilities and benefits for several areas of business endeavours. From production and manufacturing through lean practices to advertising and sales by way of consumer behaviour analytics, recent research lends credence to earlier assertions of the transformations that CC is able to bring to modern business practices. Indeed, much of the foundational technological capabilities that are needed to scale the impact and utilities of CC are already in place, such as the ability for devices to act "smart", i.e. receive instructions and take action by setting alarms and reminders, make payments for goods and services, contact particular individuals, open applications and carry out operations, posting and sending information, etc. (Ronkowitz, 2013); all these technologies are based on data that can be collected locally and then provisioned, accessed and processed ubiquitously.

Awodele *et al.* (2014) define CC as a consumer-centred computing paradigm that applies the personalization of services on an individualistic level to meet the specific needs of consumers by enhancing their experience. This definition is in tandem with that given by Volico (2017), and they both present the idea that digital systems, through simple rule-based computational algorithms (The Economic Times, 2014), are able to take decisions that mirror the best choices or preferences of consumers under certain transactional circumstances/situations, typically by analysing their digital footprint (data) to deduce patterns in their decisions from antecedent similar situations.

One of the early research studies that featured the idea of CC was a market research study by Gartner (Ekholm, 2013), although, in a general sense, the concept of "*cognizant*" as a technological term was not particularly new/unheard at the time. This term generally embodies the concept of a system or application being "aware" of a particular operational or behavioural reality and ultimately applies that awareness in taking/enforcing decisions and constraints that are in the best interest of particular subjects.

In the context of CC, this "awareness" is consumer-focused. The utility that CC presents is fundamentally a function of the depth and quality of the digital data that are available for processing about consumers; the available data may be collected, processed and stored locally on the users' device(s) or delocalized in the cloud. Then, these data are fed into larger platforms and operating systems/processes to create an ecosystem of functions, operations and realities that are relevant to particular consumer experiences across a wide range of contexts, devices and utilities (Bremmen, 2013).

This is made possible by two foundational emerging technologies (Awodele *et al.*, 2014): the *Internet of Things* (IoT), which pervasively accumulates client/user data from across

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various interconnected sources, interfaces, devices, systems and applications (Sisinni *et al.*, 2018), and *cloud computing*, which consolidates and provisions this (big) data, so that it can be accessed, processed, manipulated and analysed ubiquitously to avail business intelligence on-demand (ElMalah and Nasr, 2019). Both these technologies provide the backbones for aggregating customer/client data in this manner to be applied for various data-driven utilities towards improving business processes, enhancing administrative tasks and powering development. These technologies feature capabilities for automated decision-making, innovation, market research, customer insights and management and enterprise resource planning, to mention a few.

Today, as was predicted in the early days (Nigeria Communications Week, 2014), this emerging technology has revolutionized the mobile computing industry, through a transformative strategy that enables the design of mobile applications that are more consumer-/user-aware (Bolkan, 2014) across their entire spectrum and routine of operations. Beyond this, existing research has further conceptualized the utilities that this paradigm is able to bring to particular fields of human endeavour, such as in manufacturing, for informing lean thinking/practices to cut down wastage in production operations, while at the same time scaling system-wide Industry 4.0 digital transformations (Ogu *et al.*, 2018).

Similarly, transformative marketing (TM) is another innovative paradigm that has helped businesses respond effectively to trends and changes in market environments by unifying concepts, strategies, processes, metrics, programs and activities across organization-wide (marketing) apparatuses to deliver value to customers that exceed competing offerings and bring profit to all business stakeholders. It is in this light that (Kumar, 2018, p. 2) defines TM as "the confluence of a firm's marketing activities, concepts, metrics, strategies, and programs that are in response to marketplace changes and future trends to leapfrog customers with superior value offerings over competition in exchange for profits for the firm and benefits to all stakeholders." In essence, the goal of TM is to create a superior strategy that unites business functions across departments, processes and operations in response to marketplace trends (Kumar, 2018).

Essentially, this is aimed at helping businesses reach their intended audiences with superior competitive offerings aimed at satisfying customers (Farooq and Raju, 2019a) with better precision, while avoiding the risks and ethical challenges of overconsumption (Carrington *et al.*, 2012) and overproduction/wastage (Termeer *et al.*, 2019). While, at the same time, applying procedures that consolidate the best interests of all stakeholders within a social process of co-responsibility (Manoharan *et al.*, 2021) and sustainability (Varey, 2010).

Several cutting-edge technologies and tools have helped to scale the utility that TM has brought to companies (Mikalef *et al.*, 2018), with an impact that has been felt across multiple business domains and sub-domains, like services operation, supplier management, process optimization, customer experience, production efficiency, etc (Kumar *et al.*, 2021). These technologies include cloud computing, the IoT, machine learning, artificial intelligence, blockchain, among others. Recent research has equally explored contemporary issues of TM in the digital era, even across various business and organization contexts spanning the telecommunications (Farooq and Raju, 2019b), education (Tijjani, 2019; Dixon-Todd *et al.*, 2017) and e-commerce (Farooq *et al.*, 2020; Farooq and Qureshi, 2020) sectors.

The big question thus arises: Where do CC and TM meet? In coordination, what prospects do they present for businesses? How can businesses be better positioned to harness these twin paradigms for enhanced sustainability? Until now, the existing research landscape has studied these two paradigms in isolation, fundamentally segregating the utilities that they present independently for particular business models, processes and operations, from customer management in e-commerce to lean practices in manufacturing and production, and consumer analytics for effective advertising and improving sales, to mention a few. But then, this paper consolidates existing knowledge to interrogate the nexus between these revolutionary paradigms, in light of the converging utilities that they present for *amplifying productivity*,

minimizing risk, increasing returns on investment (RoI), optimizing business processes, enhancing competitive advantage and *scaling market impact and business value proposition*, even sustainably for businesses and organizations in the age of digitalization.

2. Cognizant computing + transformative marketing: an intelligent solution for effective business administration

Janiesch *et al.* (2017) discuss critical points that are to be considered for a smooth integration and deployment of digital information and computing technologies for Business Process Modelling (BPM). Here, these critical points (combining some of them) are adapted by interposing and infusing the concepts of TM and CC to reflect a necessary balance between business process modelling and customer-facing technological innovation/digital transformation. Then, this adaptation is applied towards elucidating the nexus between CC and TM as a unified intelligent solution for sustainable business administration and development in the 21st Century. These critical points include:

(1) Ensuring that data aggregated from different sources reflect the realities of underlying processes: The integrated frameworks and technologies that power CC allow data to be collected and aggregated in such a form that is not only relevant for ongoing business processes but also reflective of the underlying realities from which such data were generated (Sisinni *et al.*, 2018). To the extent that TM is able to model these realities correctly, CC is able to accumulate data based on these models to drive business utility.

(2) Synchronizing manually executed, physical processes: Within the context of technology-enabled firms and business processes, business process management systems integrate with digital solutions that are often powered by mobile applications to automate physical processes that would otherwise have needed to be executed manually by business stakeholders (employees, vendors and customers) in operational circumstances. CC allows data to be synchronized across these processes with insights (ElMalah and Nasr, 2019) that relevantly support the goals of management in adding and preserving value for all participating stakeholders.

(3) Integrating analytical processes: Within the paradigm of CC, cloud computing provides the backbone environment within which analytical processes and operations could be executed on business-related data that are accumulated from diverse sources. These data are not only relevant in terms of history and origin but are also provisioned in a current and up-to-date manner that is useful for generating insights in real time to inform the tasks and responsibilities of business administration, management and decision-making.

(4) Integrating process correctness checks: The emerging paradigm of blockchain of things (BCoT) (Dai *et al.*, 2019) portends great prospects for process efficiency and correctness in digital technology-driven business operations. By enabling a collaborative approach to error-checking, security verification and managing concurrency, BCoT brings in efficiency that amplifies the potentials of IoT for business administration, while diminishing existing concerns and apprehensiveness towards the utilities of CC as an intelligent business solution.

(5) Dealing with unstructured environments: The pursuit of TM helps firms to better interpret and understand peculiarities within their business environment(s). In the age of digitalization, the integration of digital marketing concepts and utilities in modelling the firms' interpretation and understanding of these peculiarities would help firms to give structure to the stochastic realities of the business domain.

However, this is not without inherent risks posed by device and system faults and failures. BCoT provides tolerance to such faults and failures (whenever they arise); while also ensuring that the on-boarding of new processes, systems and devices does not create new errors or perpetuate existing one. This is pursued through resilient collaboration (Dempsey and Kelliher, 2018) that has minimal impact on the dependent business processes and operations that are currently taking place.

(6) Managing the links between micro-processes: Cloud computing allows data-driven digital processes to be inter-linked in ways that can be easily understood and interpreted. By organizing processes and the data that pertains to them into objects through the principles of self-organizing mapping, it becomes possible to (perpetually or dynamically) link micro-processes into hierarchical multi-dimensional patterns and structures that can be managed, manipulated and analysed in a top-down or bottom-up coordinated manner.

(7) Breaking down end-to-end processes: In the pursuit of transformation, Melkonyan *et al.*, (2019) advocate for an approach that features an integrated assessment of production and consumption systems, also taking into consideration the interests of key stakeholders at the macro-economic level.

Such an integrated approach allows event-driven micro-processes to model the intricacies and behaviours of the underlying data frameworks that drive these individual processes, even in such a way that aligns with the interests of stakeholders at the higher level. Effective TM provides a means for structuring these micro-processes across business functions with minimal complexity, while CC would provide a way to manage and organize these processes in a way that reflects an awareness of the semantics and relationships in the underlying data frameworks.

(8) Detecting new processes from data: Essentially, the role of analytics is to represent, forecast or predict future/alternative outcomes based on insights from data that provide knowledge about current situations and realities. However, within the context of CC, the results of such analytics are further applied to initiate new consumer-facing, profit-yielding transactions, processes and actions that meet the needs of business stakeholders with minimal errors based on prospective knowledge that is informed by data and driven by computational rules that are goal-based and interest-oriented.

(9) Dealing with the autonomous capabilities of digital information technologies in business applications: The autonomous capabilities of the digital information systems and technologies that pervade modern business context continue to pose concerns for stakeholders (Subramanian and Jeyaraj, 2018; Arora *et al.*, 2019). However, through a collaborative approach to building consensus at critical points when autonomous action is desired, it becomes possible to avert outcomes that could bring about unpalatable consequences in the long run by co-creating value (Parsons *et al.*, 2021) through transformative innovation (Parkinson *et al.*, 2019). Indeed, the utility that BCoT provides in this context, as an emerging integration for CC, can be extended to check the autonomous capabilities of digital information technologies in this way.

(10) Specifying and aligning roles with goals: When TM succeeds in helping firms to better interpret and understand peculiarities within their business environment(s), it becomes possible to model these realities to reflect the various participant/stakeholder roles, as well as the organizational goals that the functions of each role contributes to. In a multi-factorial business context, CC provides a means of synchronizing and reconciling these

roles from across various data-driven sources and business functions and then flexibly aligning these roles with specific organizational goals. So that each role is treated with a uniqueness that is reflective of its peculiarities, and conflicts with other roles and functions are minimized.

(11) Concretizing abstract process models: TM helps businesses to better understand certain realities of their domain of operation, thus making it possible to design such realities as abstract process models that are not concerned with the specific details of implementation and execution. But then, in concretizing such models, it is important that contextual intricacies (data, devices, location, transactions, etc.) are not excluded, if such models are expected to hold any practical relevance for the domain of application. Digital information technologies make it possible to capture these contextual intricacies, so that abstract process models remain valid and can be concretely applied to practical business situations.

In the context of CC, these digital information technologies avail even much more. They are able to not only preserve the context of abstract process models but also integrate analytics and forecasting utilities to deduce when the context being preserved begins to vary from the context in reality.

(12) Dealing with new situations: Dealing with new situations in a business context can be complex. Often requiring that decision-making is structured and reflects foresight, so that quality is improved while saving time and cost (Sorescu, 2017; Chen *et al.*, 2017). CC makes it possible for best-choice processes and tasks to be recommended, triggered through automation and event-based computational rules and monitored while in execution (so that auditing is made possible through logs). This is based on robust analytics that is data-driven and adequately captures the intricate functions and realities of the operating context (Zhang and Yue, 2020).

(13) Bridging the gap between event-based and process-based systems and optimizing resource utilization: In process-based business systems, the need to bridge the gap between data that is aggregated from multiple points and the mining of process events from log files presents a non-trivial problem, especially because such data could emerge from interleaved operations and activities, which must be tracked at micro- and macro-levels and processed/analysed to generate relevant high-level knowledge.

The cloud computing feature of CC not only brings together multi-point data from across diverse business functions and operations but can also integrate robust mining and analytics functions to discover events of interest in these data, with remarkable accuracy. Hence, underlying interactions can be identified as processes, and time and resources can be conserved through optimization.

Further, with effective organizational governance structures, the analytics insights that are availed by CC with its associated technologies can increase the efficiency of decision-making through administrative and management processes that are proactive and reflect foresight (Ogu *et al.*, 2014) rather than being reactive and limited. This way, the resources that would otherwise have been expended or wasted in retracting management missteps, rolling back uninformed administrative decisions or abruptly terminating organizational processes that have already gone into execution, are preserved.

(14) Improving conformance checking, resource monitoring and quality of task execution: It is important that beyond formulating and designing robust process

models for various transformative business functions and operations, actual organizational systems in execution conform to the specifications of this model. In traditional business settings, such conformance verification tasks can be lengthy and arduous even when the imperative of monitoring resource consumptions of processes in execution and the quality of actual execution operations are added to such mandates.

Digital information systems and technologies, like CC, provide effective approaches to keep pace with such tasks, even in real time. So that incidents could be forestalled to avert consequences that might prove inimical to business interests and goals.

Thus, it is easier to understand how CC and TM can unite to help firms in intelligently and effectively tackling some of the most crucial challenges to sustainable business administration in the modern business environment. By providing a repertoire of solutions and utilities, firms could tap into to amplify productivity, minimize risk, increase RoI, optimize business processes, enhance competitive advantage (Ajah and Nweke, 2019), optimize resource allocation and consumption, and scale market impact through business value proposition.

However, without shrewd entrepreneurship, businesses could miss out on these promises that CC and TM present. Whereas individual entrepreneurs are crucial sub-systems within the total entrepreneurial eco-system (Maas and Jones, 2015), the broader society and industry are equally important elements of the equation that determines a well-balanced entrepreneurship support system (Lenihan, 2011), maintains that entrepreneurial support be tailored to the needs of smaller firms or SMEs, allowing them to develop capabilities to operate successfully within a knowledge-driven environment characterized by accelerated innovation. In this regard, a dynamic approach that necessitates the building of innovation networks is needed. It is herein that TM and CC provide the entrepreneurial leverage for developing new skills and engaging in active collaboration among all components of the entrepreneurship eco-system where an optimal balance is required to facilitate the economic, cultural, social and public support that businesses need to thrive.

3. Conclusion

In conclusion, Meyer, (2018) opines that successful organizations, such as Apple, Amazon and Walmart, do not just observe their internal and external business environment and immediately copy their rivals' marketing processes. But they develop a deep understanding of the factors or forces that drive change and use that as a basis for formulating informed speculations about where the best returns on investment will ultimately come from. Such that through routine and periodic modifications to business processes, supported by innovative entrepreneurship, significant improvements emerge (Watanabe and Tou, 2019). Indeed, success in such a dynamic and unpredictable business environment is dependent upon firms continuously engaging in data-driven research and innovations (Mikalef *et al.*, 2018) in order to stay relevant and profitable.

This paper has presented CC and TM as mutually-complementary paradigms that, when supported by shrewd and innovative entrepreneurship, provide an intelligent solution to many of the challenges to sustainable business administration and development in the modern business environment of the 21st century (Ogu *et al.*, 2014a, b). In contributing to the essential literature and knowledge in this emerging scope, we hope that the discussions of this research helps to foster progressive dialogues and engagement between business process managers, corporate executives and administrators, and digital development

professionals and engineers. Ultimately, leapfrogging the adoption of this twin paradigm meets complex challenges in modern business contexts.

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