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PRIMARY RESEARCH

The innovation of 5G in on-the-go FMCG's food sector: Manufacturing's sustained competitive advantage

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Abstract

The fluctuating interests of a fast and convenient lifestyle in the 21st century are on the rise, especially Fast Moving Consumer Goods' (FMCG) food sector. Manufacturers are under extreme pressure of squeezed margins due to heightened maintenance costs and complicated procedures of unstable and growing demand. More services and replacement of machine parts increases costs, planned downtime, and disruption to operations. This study presents a way 5G enables factory machines appliances to fulfill demand uncertainty by adapting to the environment and business process through machine-to-machine communication. It is possible by establishing higher flexibility, efficiency, and shorter lead times for factory floor production and layout changes [1]. How does 5G matters for manufacturing in the FMCG food sector for firms to sustain competitive advantage? Two perspectives of stakeholder based competition and resource based promote the maximization of profit. With direct involvement between machines, 5G build up efficiency and error detection ability of manufacturing. The most noticeable advantage of 5G is reliable communication protocols, sensors, accurate detection of machine maintenances, and faults. 5G is the future direction for the modernization of manufacturing; however, massive investment price indicates the commercial success of 5G in manufacturing is not expected in the next several years until the required cost of expenditure reduces. This research shows 5G in food manufacturing with big data application negatively correlate to efficiency for the near future. Later, food manufacturers can continuously enhance the knowledge and technology to acquire the best benefit of 5G at a beneficial cost and returns to a company's sustained competitive advantage.

I. INTRODUCTION

The fluctuating interests of an on-the-go and convenience lifestyle in this 21st century are expanded, especially on food. The growth of quick and easy to cook convenience food of fast-moving consumer goods has increased in its required sup-plies. Recently, consumers expect the delivery of highly personalized products in shorter periods. One of the reasons for expanded consumer demand is due to the trend of urbanization. Living in cities provides fewer opportunities for the self-production of food and increase access to packaged goods [2]. Besides shifting demographics, small towns and mid-density cities will emerge, creating both national and international new FMCG markets [3]. The manufacturing process is one of those that plays a significant role in handling the demand for business competitiveness and sustainability strategy.

An atrocious maintenance strategy in a firm's manufacturing hampers a productive capacity by 5 to 20 percent. Studies have shown that unplanned downtime is costing industrial manufacturers at almost $50 billion each year [4, 5]. Manufacturers are under extreme pressure of squeezed margins due to costly maintenance, complicated procedures, and aging workforces of unstable demand. As a fact, the manufacturing environment is fast paced, and supervisors are facing multiple demands that are continually changing, which prevents them from developing an efficient long term plan.

The choice between maximizing machine use at the risk of downtime (run-to-failure) or to maximize uptime through early replacement of spare parts (time based preventive

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maintenance) demonstrates incompetency for assembly equipment components. The continual services and replacement of parts in manufacturing increase costs over time. Besides, it raises planned downtime a period when a machine stops production and disruption to operations [4]. With appeals on services, advancements in manufacturing technology and communication are to elevate the expectations of food options for consumers moving precocious. The growth leads to a sustained competitive advantage.

5G technology will establish higher flexibility and shorter lead times for factory floor production reconfiguration and layout changes [1, 6]. The aim is to have a flexible and competitive pricing approach. The solution to adopting new practices to improve the sustainability of an FMCG's manufacturing' strategy opens up opportunities. Favorable circumstances help a firm in the sector gain dominance in the fast growing market. It is achievable by the creation of improved and efficient production. The new trend, which creates an increased competition due to a globalized market forces organization, is to design sustainable strategies to outsmart their competitors and thrive in the market. The tendency is for consumers to make smaller but persistent purchases while producers take advantage of the enlarging demand for goods.

5G is a fifth generation of connectivity that presents refined, faster, and stable connections. The networks offer manufacturers the advantage of technologies from big data's automation, augmented reality for troubleshooting as a smart factory [7]. 5G will then be able to attain the volatile demand by adapting to human's behavior, environment, as well as a business process [8]. It enables firms to generate new revenue streams from the increase of efficiency, predictive maintenance, the saving of energy, and utility. There are two perspectives; these are stakeholderbased competition and Resource Based View (RBV). The stakeholder based competition is a strategy that attempts to make beneficial decisions to stakeholders without hurting the other. The responsibility is to maximize profits accumulating to its stakeholders. Meanwhile, the RBV helps to establish a firm's competitive advantage from firm specific resources that are valuable, rare, imperfectly imitable, and non substitutable [9, 10]. Big data application in advanced machine-to-machine communication alterations of the food machinery helps to establish the two theories.

Minimizing waste is seen as an effective way of improving sustainability through an update to machinery and equipment. 5G expected to potentially reduce energy consumption by reducing faults that lead to the speeding up of the whole production line. Though there is an upfront cost for switching to greener options, the technology to embracing sustainable manufacturing usually has a relatively short payback period [11].

Therefore, how does the use of 5G influences the manufacturing of an FMCG industry in the food sector for firms to sustain competitive advantage? Followed by a subquestion of do the investments in 5G for food manufacturing culminate the benefit to sustain competitiveness?

The digitalization of manufacturing is to build up an improved procedure for machine-to-machine communication. 5G with big data application is to meet the viable demand, minimize downtime, and maximize efficiency. Producers and manufacturers are to include 5G technology in the manufacturing process. In hope, FMCG businesses drive progress in their organizations by escalating supplies to end customers.

II. LITERATURE REVIEW

A considerable amount of joint researches previously done on the impact of 5G to telecommunication and connectivity, yet, a limited amount of studies available on the effect of 5G to manufacturing. Thus, what is the relationship between sustained competitive advantage and 5G in manufacturing?

A. FMCG Food

FMCG are products that are sold quickly at a low cost. FMCG's sector represents one of the most important of any economy and the largest industries in the world [12]. The profit margin of the fast moving products is relatively slim; thus, companies operating in the FMCG sector implement strategies accurately to generate topline sales. Nestle and Unilever are among the top players in the food market. The existence of a large market is a crucial success to FMCG firms [13]. Tremendous consumer demand or fast deterioration results in the short shelf life of most FMCG products. It is subject to more considerable uncertainty in several industries [14]. Globalization, technology, and innovations drive the development of transition turmoil. The environment changes rapidly, leaving room for different strategic adjustments. Specifically, for the preference of on-the-go quick and easy to cook food at a relatively low price such as packaged noodles and canned food. Volume is regarded as an indication of actual demand. The overall market grew 9% by volume in 2017, an unusual number from the usual 5-7% growth in 2011-2016 [15].

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TABLE 1
FMCG OVERALL DEMAND GROWTH ((NIELSEN, 2018))

Growth%	Moving Annual Total in December		October	December
	2017	2018	2017	2018
Value	14	13.8	10.4	15.9
Volume	9	10.7	5.9	12
Price Led	5	3.1	4.5	3.9

One of FMCG's model to success is the cost reduction operating layout. Design for manufacturing's floor plan aiming for efficiency is a process layout. It assures the production's centralization to pushing costs down. However, depending solely on costcutting is arguably not sufficient for the food sector as one of the largest business industries. Further cultivation is obligatory to sustain the business' success. Food is the most challenging sector of FMCG subsegments [14]. Packaged food players are racing to keep up as consumers are increasing in pressure on the consumption of packaged goods subsectors by eating more fresh food [14]. As a result, enhancements on the internal and management of the company is obligatory to build further sustained asset and competition in the business battle market.

A report claims the millennial effect as a threat [16]. Millennials prefer new brands in food products and avoid buying products from large companies. Still, despite the young adults' threatening buying behavior, they are not the only market FMCG producers have. Developing markets other than millennials will remain a great source of value creation. Thus, in managing stable competition, firms are forced to focus relentlessly on innovation. The implementation of 5G in manufacturing is one of the examples. It is to meet the demand of the core mass and up-per-mass markets while still keeping in touch with the threat to the millennial's effect.

B. Manufacturing to FMCG

Manufacturing is responsible for producing goods. It is capital intensive and comes on the classification of three groups; continuous, discrete, and batch, specifically for FMCG [17]. In designing factory layouts to food manufacturing, ongoing change in volume, type, and mix of products is a must. The continually changing market is the main reason for these prerequisites. In previous findings, maintenance professionals gather techniques to anticipate looming deficiencies and mitigate downtime to a manufacturing facility. Several arguments discuss the development of proprietary processes and equipment as a forefront to a competitive advantage. These include the support to employees' skills, the competence of processes and technologies, and the routines enacted by manufacturing management [18, 19]. The outcome is yielding to performance advantage where analyses are focused on optimizing production processes from forecasting, planning, efficiency, and risk exposure [20]. The proper application of the proposed manufacturing helps sustain efficiencies.

Past manufacturing program research on a research based view investigates the adoption of specific manufacturing practices and their relationship to the most recent performance [21]. Unfortunately, the findings do not explicitly address the effects of competitors imitating a successful innovation. Instead, previous research explores the characteristics of successful innovations' impact on performance while pointing out the critical role of experiences, learning, and organizational factor. The proprietary processes and equipment to manufacturing are a potential to causal ambiguity if originating from an iterative process within the plant [19, 22]. The percentage of annual growth to the general value added of manufacturing has been less than 4 percent since it rose to more than 8 percent in 2010 [23].

Nonetheless, it is time for the number to rise again to how it was at around 6 percent annually before the downturn and world crises in 2008. Manufacturing resources are difficult to imitate in the short term [21]. The introduction of 5G connectivity to a manufacturing activity is in the hope of boosting the number of a value added plant of manufacturing in the future.

Fig. 1. Value added of manufacturing 2010-2018 (annual % growth)(Source: [23])

C. 5G Networks

5G, known as the next generation of mobile coverage, promises instant and lightning speeds connection. It offers a speed of up to twenty times the streaming speed of 4G [24]. The release of the commercial systems is in 2020

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and 2022 for the full systems [25]. 5G revolves around realworld mobility, virtual mobility, high performance infrastructure, and fourth industrial revolution. One of the considerations for 5G is the ability to build machine communication of a wide range of sensors and actuators. It is an immense challenge for companies wanting to modernize their manufacture strategy due to the complexity and cost of implementation. Some key features of 5G include lower latency, ten years machine-to-machine battery life, and low mobility.

Fig. 2. The evolution of wireless technology (Source: [26])

D. 5G in Food Manufacturing: M2M Communication

The impact of 5G in the realm of smartphones is prospective, but not on machine-to-machine communication. M2M communication is the technology that connects machines using the help of the internet, mostly controlled by software[27]. It does not always require human interaction or intervention. Instead, M2M uses remote monitoring and real-time control of a wide variety of devices with low data rates, stringent costs, and energy efficiency requirements [28]. The features include location specific trigger and low power consumption. Industries that use electronic machinery or equipment stand to benefit from the M2M applications in manufacturing.

A factory consisting of M2M technology is considered smart. It is in tandem with analytical and cognitive technologies where decisions must be correct and on time [20]. The element to widespread utilization of M2M technology across industries is ultralow power consumption and long term reliability [29]. Faster radio interfaces of a device is a technological modernization that contributes to the growth in user demand for communication [30]. Another specification of 5G connectivity involves speed for the kind of devices used in M2M ultralow cost. The procedure of connecting machinery and equipment to high volume industrial networks will come in handy soon [29].

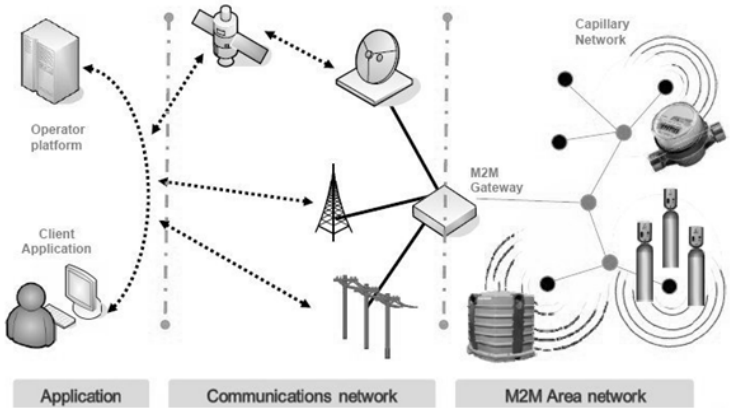

Fig. 3. The architecture of the M2M system (Source: [31])

E. 5G in Food Manufacturing: Big Data

Big data is an asset that process information in high volume, velocity, and variety. It enables enhanced insight, process automation, and decision making to cost effectiveness [32]. To optimize efficiency, the daily data flow of the production lines require to access discrepancies and real time opportunities. Real time data tracking allows data exchange between employee badges and production line units [33]. The analytics solution uses data for pattern recognition, fault detection, and visualization. Engineers will be able to see the tendencies for immediate attention and actions necessary to prevent severe break downs on the machine production

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layout. The predictive maintenance cut costs by reducing reaction time from 4 hours to 30 seconds. In 2017, the application of big data predicted Intel's saving of up to $100 million [34].

F. Sustained Competitive Advantage

Managing assets and skills is the key to sustainability to a sustained competitive advantage on the difficulty in transferability, durability, and replicability. Four aspects encourage competitiveness in business. These are the requirement of customers' knowledge and market deal to use the products, as well as research development and significant economies of scale to maximize value benefit [35]. The factors provide full potentials to sustainable competitive advantage compared to firms that operate in industries without such attributes. Eventually, this reasoning suggests firms that aim to simply improve the company's financial performance, in the long run, will only generate reasonable economic returns [36]. Instead, to achieve maximum returns, further refinement besides financial is commended. The modifications to sustainability, communication, and specialty in machinery are some examples to meet competitiveness according to the stakeholder based and RBV.

G. Stakeholder based Competition as a Sustained Competitive Advantage

Stakeholders are groups and individuals that are affected or can affect the strategic outcome of a corporation [37]. The stakeholder as persons or groups have or declare ownership, rights, or interests in a firm and its activities, past, present, or future [38]. Owners, shareholders, employees, suppliers, and other individuals or groups contributing to the firm are some of the examples. Allegedly, besides the interests in the performance or appreciation of a business, they also appeal for long term success. The view of stakeholder based competition indicates firms that apply commitments to an expansive group of stakeholders enjoy tremendous levels of achievement [38, 39]. Stakeholders are capable of revealing factors and weightings that comprise their utility function to a firm. The corporation will either present a value proposition that stakeholders are unaware of or build a new, innovative offer that improves the stakeholder's welfare [40].

In examining how a firm creates its wealth, a stakeholder view is a comprehensive approach. Stakeholders are the primary providers of resources to firms [41]. Besides, they are stimulants promoting the generation of valued resources such as reputations or trusts for a firm. The resources cocreated by the firm and its stakeholders are a source of sustainability [42]. 5G is undeniably unique, but it is not limited to manufacturing. The beginning of 5G will trigger industries to include it in their operation, communication, and other sources of production that will help industries to compete. Thus, in terms of obtaining valued resources, the stakeholder view is consistent with the RBV. Stakeholderbased competition deals with the inclusivity of various relevant communities and individuals while addressing ethical issues while innovating.

H. RBV as a Sustained Competitive Advantage

The RBV suggests that a firm's competitive advantage comes from firm specific resources that are valuable, rare, imperfectly imitable, and non substitutable [9, 10]. It represents the successes or failures of an organization in the market place known as inside out [43]. A success occurs only when there is a situation of resource heterogeneity and resource immobility [44]. Therefore, the momentous managerial effort to classify and understand resources to sustainability and competitive advantage is needed for managers to study. The main concern of 5G is that it is a knowledge that can be studied and implemented by many with the proper funding. Previous studies have studied the reasons resources are challenging to achieve in the short term, questioning the sustainability and inimitability of 5G [36, 45, 46]. The application of the concepts for actual business strategies seen to be insufficient [47]. The difficulty level is still high to find firms that use its operations function as a weapon to competitiveness. The complexity to operationalize the content of operations or manufacturing strategy is one of the main reasons [48].

For organizations to face the growing commotion in the external business environment, FMCG companies call for a focus on internal resources [49]. 5G can be a source of a firm's internal and capabilities as well as the principal source for strength to survive and gain competitive advantage. The strategy to a RBV is a balance between the exploitation of existing resources and the development of new ones [50]. The ability of firms to obtain a sustainable competitive advantage almost entirely depends upon the firms' capacity to innovate by bringing out new and powerful manufacturing procedures [51]. The process of conquering competitive advantage resources must contribute positively to performance. A contiguous relationship with stakeholders encourages the transfer of vital information, allowing a firm to predict significant trends better and establish valuecreating strategies in claiming advantages.

Finally, fast moving consumer goods need to encourage the building and innovation of 5G to manufacturing. Therefore,

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how does 5G add value to an FMCG's competitive advantage in the long run?

III. RESEARCH DESIGN

The purpose of this study is to research 5G and sustaining a competitive advantage in Fast Moving Goods' food sector manufacturing. It focuses on whether 5G in manufacturing builds a positive relationship to an FMCG's sustainable competitive advantage in both national and international levels of operation. The interpretivism philosophy is to interpret and justify the research. The assessment of the phenomenon in an FMCG industry differs on people's culture, and participation in social life depends on an individual's interpretation of what a sustained competitive advantage is.

This study uses an inductive approach in an attempt to achieve competitiveness from the operation of manufacturing by drawing hypotheses. The level of analysis of the resourcebased perspective is the company and its resources. The existence of company specific resources determines profitability differences at any time [52]. An inductive approach is the aim to contribute to the literature by (1) developing and testing the resource based perspectives relationships among innovation specifically with 5G and manufacturing, (2) testing and finding support for the theory with measures if manufacturing performance in FMCG industry's food sector, and (3) advancing and testing an improved process model of these relationships that includes firm's efficiency performance.

The strategies in the research consist of archival research methods using a literature review with some support on figures of surveys from experts. Archival research methods involve the investigation of documents and texts, often emanating from a different sociohistorical context [53]. The literature review and analysis are from the finding of books, journals, articles, and dissertations. The study uses one type of method, which is a mono method and is a cross sectional study of qualitative research. This research examines the performance of an FMCG's manufacturing through the influence of 5G innovation to improve the benefit that leads to a sustained competitive advantage to the industry. Cross sectional research compares the findings at a single point in time.

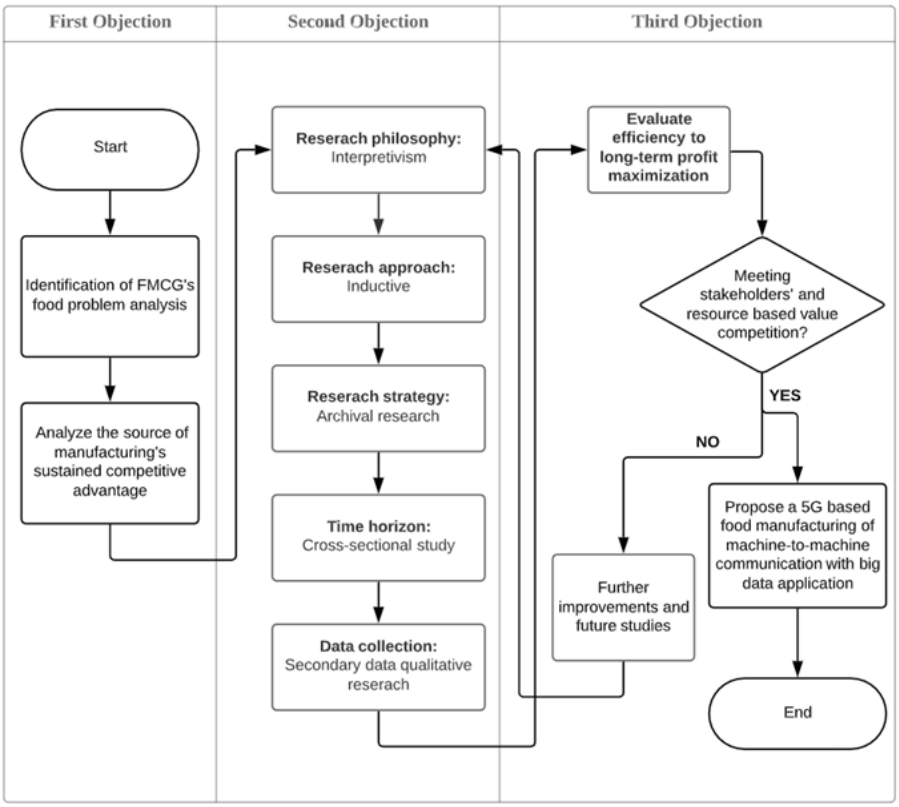

Fig. 4. Research design framework

The collection of data is according to existing perspectives, opinions, models, and knowledge of experts and researchers. The findings are secondary data of literature review and past interviews of experts. The basis of the sources and details are the existing research journal articles, reviews, news, website, reports, and thesis. Search en-

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gines such as EBSCO, Science Direct, and free web service search engines of Google, Google Scholar, and ProQuest provide access to online resources. In the process of the research, keywords such as 5G, big data, manufacturing, M2M, sustained competitive advantage, FMCG, and food sector dominates.

IV. ANALYSIS

A. Structural Determinants of Efficiency

Efficiency is to have more for less cost. The way to calculate efficiency is by dividing the standard output by an actual output. The task of building efficiency over entire manufacturing requires the support of several parts of machine-to-machine communication technology—the use of strategic elements to the outcomes of 5G influence the likelihood of achieving manufacturing competence. The use of equipment, the workforce, and cellular connectivity helps to maximize data collection and provide actionable insights from different workflow processes connecting infrastructure [54].

B. Advanced Radio Interfaces

A crucial change of 5G lies in the management of the network or radio interfaces. Examples of advanced radio interfaces include New Radio. Similar to LTE, NR is a radio frame consists of 10 subframes, each of 1ms. Different from 4G's LTE, NR supports scalable numerology for more flexible deployments covering a wide range of services and carrier frequencies [55]. As a result, NR of 5G allows the simultaneous management of different types of access networks. From wired, wireless, and technologies such as ethernet and wireless, protocols such as real time, best effort, and lastly, the equipment products from different equipment. In obtaining benefits, manufacturers entail building a private 5G network by managing legacy and other future networks, such as the evolution of Wi-Fi [56]. To cater and presents M2M communications efficiently, an advanced radio interface is a requirement. The associated signaling overhead and the diversity in quality-of-service targets allow M2M devices to spot warning signs and relay problems almost instantly, and this yields to efficiency in M2M communication.

H1: Advanced radio interfaces promote the relationship between food manufacturing and efficiency.

C. Asset Tracking Technology

Asset tracking is a method to track physical assets. An example is a barcode label attached to the assets or by tags using GPS, which broadcasts its location. 5G is ideal for sensor communication where technology tracking requires higher frequency networks broadcast in a directional pattern. 5G speeds in asset tracking applications are the aftereffect of everyday stream data fringe applications, a composition of sensors and cameras with 4K resolutions [24]. It enormously improves the ability of machines to realize precise and real time localization, ensuring the accuracy and timeliness of delivery. In consideration, the local management system helps monitor and manage end-to-end connectivity [7]. These include local network infrastructure and connected devices.

Besides the high level of complexity, the addition of experts and engineers to the team is a compulsion in ensuring the success of 5G. It in creases initial costs of expenditure as long as the technology is still in its infancy before stipulating stability. It is expensive, yet, FMCG manufacturers typically work in quantities reaching the upper hundreds of thousands. Tracking and automation allocate bugs in a machine. Optimizing production and making failure detection immediate yields multiple benefits. Decreasing rework rates from 25% to 15% equals a cost reduction per product. Reduction in manufacture time decreases electricity consumption while optimizing quality construction also increases efficiency [56]. Seemingly, the initial cost of asset tracking technology, such as replacing several uneducated labors for highly educated engineers, is scarce.

H2: Asset tracking technology moderates the relationship between food manufacturing and efficiency.

D. Determinants of Predictive Maintenance to Efficiency

1) Real-time remote monitoring: Real-time monitoring refers to the allocation of predictive maintenance. The RBV reflects the successes or failures of an organization in the marketplace through the process of inside out. A report shows that 5G enables equipment providers to perform fault early warning and remote debugging by constantly monitoring equipment [20]. It supports a continuous collection of data from vast numbers of sensors, thus, increasing the possibility of real time remote monitoring. M2M technologies use chips to monitor a machine's overall state and performance. Low latency communication enables real time processes. The effects include vibrations, temperature, pressure changes, and other signs of mechanical failure to be detected. The system automatically communicates data to other connected devices, allowing workers to spot and resolve problems faster [57].

Instant spot warning signs and problems allow food manufacturers to deliver preventative maintenance tasks in pre-

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serving a machine's longevity and ensuring efficient performance. Real time monitoring allows the determination of what is happening on the candidate's side during the assessment grant to predictive data of the machine. The efficiency leading to sustainable machine practices help manufacturers become more efficient with materials and wastes.

H3: Real-time remote monitoring leads to predictive maintenances of food manufacturing machines.

5G authorize low latency communication of real-time remote monitoring that reflects reliability and ease of operation in manufacturing. Real-time remote monitoring assists the accuracy of learning in a machine-to-machine communication through alarm escalation, notification by email or text message and securing facilities. First, access to data acquisition connects equipment to the internet or intranet with smart internet gateways. Data is archived and formatted in a log and made available to web services through data processing. Finally, gathered data from the gateways are pooled, formatted, saved through the process of data centralization where real-time monitoring sends an FMCG company's information systems via fixed or mobile communication networks based on standard internet and Web services protocols [58]. Alarms escalate a person in charge of possible damages, errors, and other possible mistakes of the machine. Speed and accuracy of delivery boost manufacturing performance as a result.

H4: The predictive maintenance or downtime of machines moderate the relationship between machine efficiency and cost reduction.

E. Determinants of Cost Reduction from Efficiency

1) Cloud computing: 5G creates wireless factories and production sites to enable local edge cloud computing. Cloud computing connects in real time to artificial intelligence services while intelligently analyze and visualize large volumes of data. An edge cloud puts the data storing and processing capability close to the sensors and other devices. Machine data do not need to be sent to a remote cloud to be processed. Therefore, acquiring cost reduction is possible from what is cheaper and smaller robot controllers [59]. The robots deploy and control real time intelligent processing in the edge cloud. Speed results from faster response rates of processing capabilities resulting in latency have quicker response time between manufacturers and the machines or robots. Latency helps reduced losses as a result of equipment downtime, lower management, and maintenance costs [56]. The use of data gathering from real-time stock by FMCG manufacturers is to improve services or promote a firm as a sustained competitive advantage to consumer habits and conditions of services used.

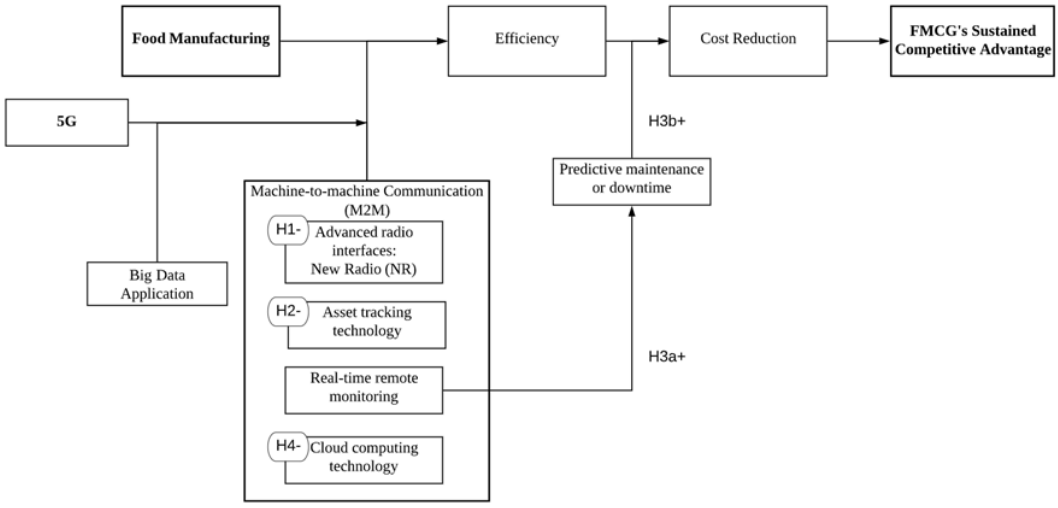

Fig. 5. Food manufacturing to a sustained competitive advantage model

With the cloud, connected machines and devices become a flexible production. The access is virtually available in any location; this makes it easier to stay on top of a company's systems, maintain connected machines, and apply necessary software updates. However, the most significant benefit of cloud M2M services is the option of cost effective data storage for manufacturing companies. Cloud services terminate the necessity to purchase, store, and maintain in house servers [57]. In the end, manufacturers can apply control over costly server maintenance tasks or software updates.

H5: Cloud computing technology moderates the relationship between food manufacturing and efficiency.

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V. CONCLUSION

The proposed framework discloses 5G in manufacturing ranging from solving efficiency, waste, and technical machine costs for demanding food markets. In an attempt to counter an FMCG's stakeholders' based competition and RBV, 5G of big data applications influences the manufacturing of an FMCG industry to firms' sustained competitive advantage. How does the use of 5G influences the manufacturing of an FMCG industry in the food sector for firms to sustain competitive advantage? Several typical applications served as guidelines for the design of successful end-to-end machines in manufacturing.

First is reliable communication protocols with advanced radio interfaces. Second, the weara bility of sensor devices with asset tracking technology that guarantees the prompt and successful delivery of data between machines at a wide range of services. Third, real-time remote monitoring of accurate detection of faults to ensure timely intervention in machine errors and maintenance cases. Lastly, cloud computing for flexible production in purpose to cost control and minimization. Assuring the four applications run smoothly, the use of resources is the essential performance to support a stakeholder approach that suggests managers formulate processes to satisfy stakeholders' needs for a firm's long-term success.

The finding of this research shows 5G in food manufacturing with big data application negatively correlate to efficiency for the near future. Lamentably, an obsession with efficiency impacts privacy and online security. Dependency on efficient systems leads people towards a monoculture. Nevertheless, reality and its circumstances are always changing. The condition for a search, even though in one sense, efficiency will be acquired, it is also less efficient or effective in finding the best results that are being searched for [60]. Cloud providers and experts are selling cloud computing as an operational cost savings technology; however, the reality is that the cloud can be more expensive due to the cost of talent needed, of migration, and of cloud operations [61]. It recalls the subquestion of whether the investments in 5G for food manufacturing culminate grater benefits to sustain competitiveness. Unless costs of implementation significantly decrease, the efficiency received from the application of 5G in food manufacturing would not meet stakeholders based competition and resourced based view in maximizing profit.

A. Implication and Innovation

M2M communications over advanced cellular infrastructures, New Radio, opens up a wide range of new applications beneficial to machine productions from a design of efficient schemes of machines [62]. For recent years, FMCG companies' motivations are by the diversity of applications, the promising benefits, and the potential market opportunities of 5G applications in manufacturing [63]. While effectiveness is key to growth, efficiency is for profitability. As a practical implication, managers of an FMCG can first implicate a change to a manufacturing evolution by shifting mass production to mass customization or flexible manufacturing. Shifting centralized assembly to network based distributed collaboration (decentralization). Finally, the deep integration of informatization of physical with the inclusion of virtual factories. All of these while considering the initial cost of change and installation required to meet a break even point.

VI. LIMITATION

The limitation of this study includes the cost, the creation, and the management of 5G in acquiring new base stations and networks. The high end of the connectivity will get manufacturers to have expensive handsets and significantly higher access fees for unlimited data plans [64]. These impediments pose a significant challenge in the business model of running a 5G network [8]. Moreover, intelligent manufacturing requires not only cloud computing but also the application of technology throughout the manufacturing process from design to production, management, and service. Currently, there are only a few implementations of sophisticated types of machinery, while most are still at the development stage [20]. M2M devices typically operate independently; the software is subject to security threats, such as hacking and unauthorized monitoring [65]. Several M2M types of equipment have to be small, inexpensive, able to operate unattended by humans for extended periods while being able to communicate over the wireless area network. Ultimately, the study consists only of qualitative research consisting of secondary data.

VII. ASSUMPTIONS AND FUTURE RESEARCH

The rapid growth of 5G requires significant efforts to provide scalable solutions supporting the increasing number of devices with diverse characteristics and requirements [66]. Gaps and further research directions are possible through quantitative research and case studies to study the impact of 5G in machine communication. It is not how a company places itself in the competitive external business environment, but, the seeking of core competitive advantage inside the organization's people and their knowledge [67]. The possibility of future case studies and quantitative research

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is a chance to prove better results and conclusions. A statement such as what software, developer tools, and hardware to execute now in purpose to accelerate 5G and protect expenditures in the future is a way to start.

VIII. EXPERTS PERSPECTIVE AND REFLECTION

The appealing benefits to embracing sustainable manufacturing is the way that it builds efficiency for bottom costs to the business' operation. The advantages are possible mainly due to the reduction of overheads. There is an upfront cost for switching options, but there exists an expectation to a short payback period to the implication 5G. With core competitiveness in 5G capabilities, a better machine utilization environment builds more value. The RBV model sees resources as the initiator performance that enables firms to gain and sustain competitive advantage. A vigorous manufacturing ability allows an FMCG company to produce and meet demand uncertainty that allows them to maximize profit, fulfilling the stakeholdersbased competition approach. However, it is exasperating to accomplish shortly.

IX. RELEVANCE

The finding of this study will benefit FMCG companies and manufacturers in considering the use of 5G to its manufacturing. The need for speed and the reduction of faults or downtime urges manufacturers to innovate. Managers may learn the implementing of innovation for a new procedure does not always yield to positivity. The commercial success of the implementation is not expected in the next several years until the required cost of expenditure reduces. Later, food manufacturers can continuously enhance the knowledge and the 5G technology to acquire the best benefit of 5G at a beneficial cost and returns to a company's sustained competitive advantage. The findings of this study will redound to the benefit of corporations' leaders and managers to reconsider and further the significance of manufacturing in an FMCG's food sector business operation.

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APPENDIX

Acronyms

1G: First Generation
2G: Second Generation
3G: Third Generation
4G: Fourth Generation
5G: Fifth Generation
EBSCO: Elton B. Stephens Co
FMCG: Fast Moving Consumer Goods
GPS: Global Positioning System
KPMG: Klynveld Peat Marwick Goerdeler
LTE: Long Term Evolution of 4G
M2M: Machine-to-machine
NR: New Radio of 5G
PPP Values: Purchasing Power Parity Values
Wi-Fi: Wireless Fidelity

A. Other Figure References

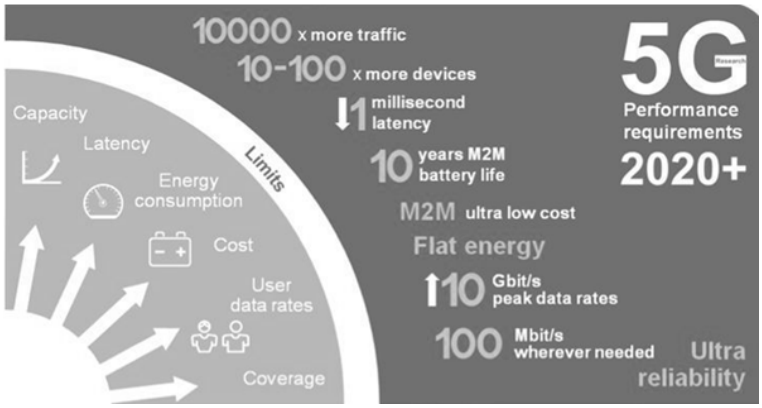

Fig. 6. 5G performance requirements in 2020+ (Source: [68])

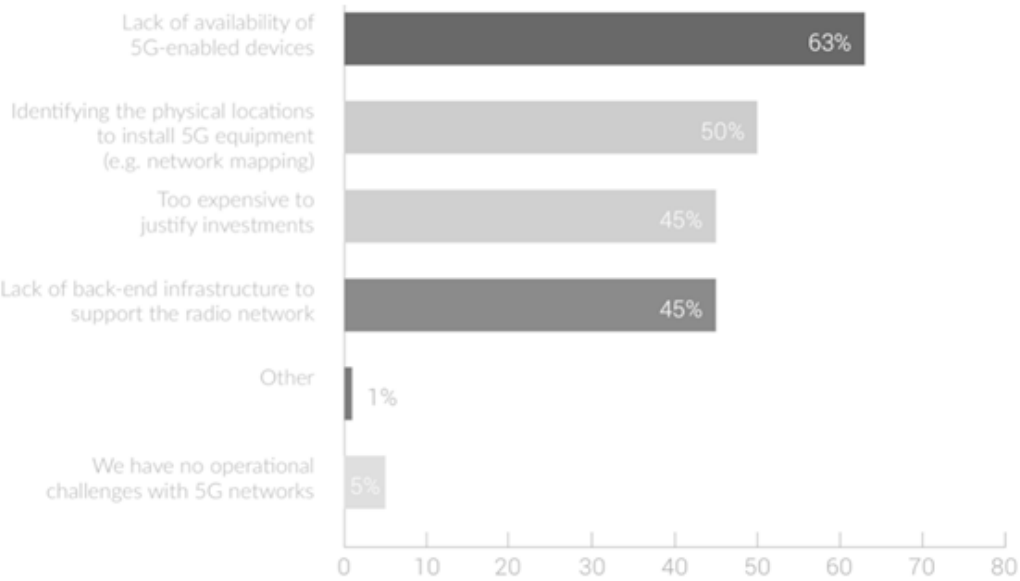

Fig. 7. Survey results in operational challenges in delivering 5G networks (Sorce: [68])

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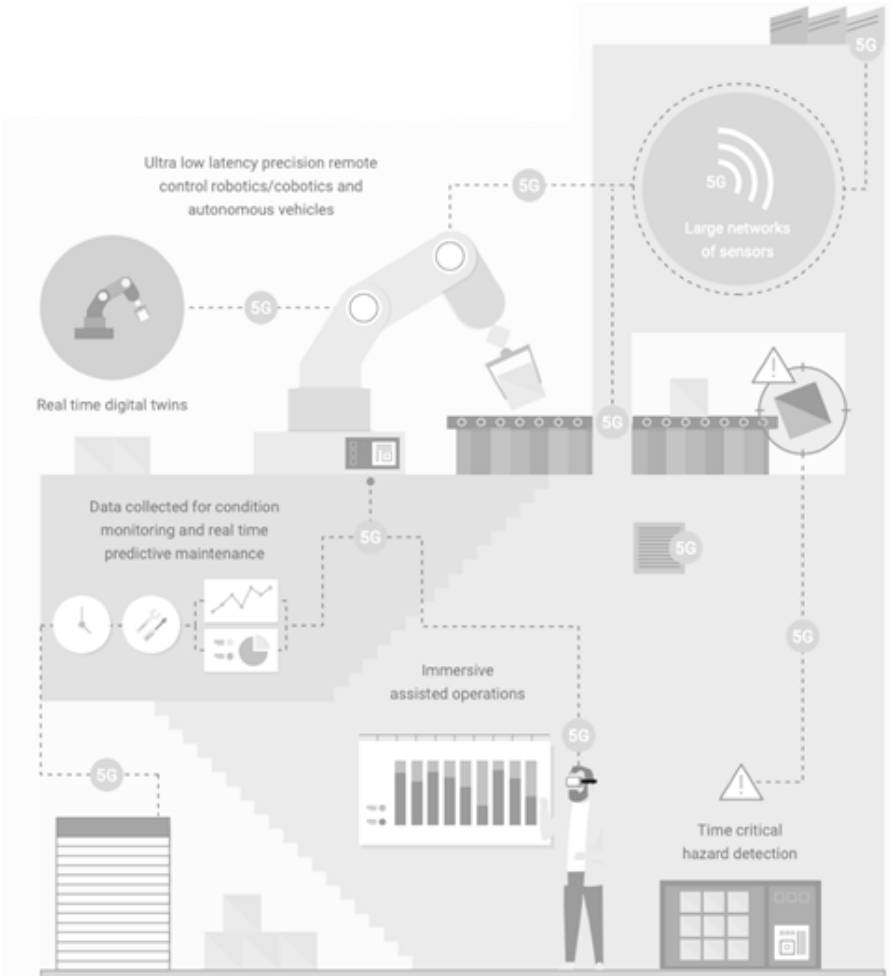

Fig. 8. Production optimization 5G journey (Source: [56])

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