Title: Use of ICT in Manufacturing to Achieve Vision 2030

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Abstract—Information & Communication Technology (ICT) may be defined as computer hardware and software and telecommunications technology. ICT is the World's fastest growing economic activity; the sector has turned the globe into an increasingly interconnected network of individuals, firms, schools and governments communicating and interacting with each other through a variety of channels and providing economic opportunities transcending borders, languages and cultures. ICT has opened new channels for service delivery in areas such as e-government, education, e-health and information dissemination. Information and communication technologies (ICT), as well, play a vital role in the manufacturing industries' competence, competitiveness, and processes and jobs the world over. ICT forms the basis for most advances in almost all aspects in modern world including manufacturing technologies; it is considered to be key for an advanced manufacturing strategy. Here in Kenya it has not been fully embraced which we would say can slow the process to achieving Vision 2030.

This paper aims at sensitizing Kenyan manufacturers on the use of ICT to increase their productivity which is a key factor in achieving vision 2030. ICT can be used from the stage of acquiring materials to selling the finished products. Through its capacity to integrate and blend a number of knowledge intensive technologies, ICT can enable traditional manufacturing base to be competitive in a global environment. Innovative use of ICT can result in new sales channels, new product capabilities and product differentiation. ICT can also reduce costs, increase productivity and improve the base for strategic decision-making and risk management. These results should be reflected in enhanced business performance. When properly combined, the components of ICT (technologies and applications) can yield synergetic results. An organization can have more flexible and integrated operations, be better equipped to manage complex operations, and exercise better controls.

The staff from the information systems functions does not work in isolation and therefore needs to integrate engineering, manufacturing, and business databases into a cross functional decision support system. Once accomplished, the flexibility to respond to customer demands with low cost, high quality specialized products becomes a powerful competitive advantage not leaving behind the speed at which all the processes take place. This includes obtaining materials, processing and supplying the products at high speed which is of essence in the modern world. If embraced then achieving the 2030 vision can be done with a lot of ease.

Keywords—ICT, manufacturing, organization.

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INTRODUCTION

HE The Economic Pillar of vision 2030 aimed at Moving The Economy up the Value Chain identified six key sectors have been to deliver the 10 per cent economic growth rate per annum. The sectors include: manufacturing agriculture, tourism, wholesale and retail trade and telecommunications as well as the social Sectors [1].

Kenya aims to have a robust, diversified, and competitive manufacturing sector. This will be achieved through the implementation of the following strategies: (i) restructuring key local industries that use local raw materials but are currently uncompetitive (e.g. sugar and paper manufacturing); (ii) exploiting opportunities in value addition to local agricultural produce; (iii) adding value to

intermediate imports and capturing the "last step" of value addition (e.g. in metals and plastics). (Kenya vision 2030)

Notably are the factors have contributed to the lack of competitiveness in the sector according to the vision 2030 report including: high input costs, low productivity levels: Inefficient flows of goods and services, and unfavorable business environment.

Interestingly, deliberate and smart adoption of ICT into key areas in manufacturing (directly and indirectly) will not only reduce if not eliminate the factors that reduce competition, but also ensure the implemented strategies are effective to yield the desired results.

According to a World Bank report, the resurgence of productivity growth in the US in recent years can be attributed to the adoption and diffusion of new technologies and to the accelerating pace of product and process innovations. In particular, the diffusion of ICT has been fundamental [2].

All dimensions of manufacturing (e.g., products, markets, processes) are becoming more complex, diverse, and international. Indeed, common products such as automobiles can have thousands of parts, and modern aircraft and integrated circuits include millions of parts or active elements. Each of these products takes years to design, requiring the effort of hundreds or even thousands of people worldwide.
 Complex new products based on information content and their accompanying information-dominated design and manufacturing methods already require us to deal with entirely new scales of complexity.

Some products require such levels of precision, delicacy, or cleanliness that people can no longer make or assemble the parts; in some cases, they cannot even see them.
To realize these and other products, manufacturing firms must cope with design processes (e.g., converting customer requirements and expectations into engineering specifications, converting specifications into subsystems), production processes (e.g., moving materials, converting material properties or shapes, assembling products or subsystems, verifying process results), and business practices (e.g., converting a customer order into a list of required parts, cost accounting, and documentation of procedures) [1].
This is where ICT comes in, by providing ways to facilitate and manage the complexity of these information-intensive processes, as well as to achieve integration of manufacturing activities within and among manufacturing enterprises; information technology will play an increasingly indispensable role in supporting and even enabling the completion of the complex processes.
     Computer based control systems can be combined with manufacturing technology, such as robots, machine tools, automated guided vehicles, to improve manufacturing

operations. In this role, the computer can assist integrating these technologies into a lean and efficient factory capable of competing in world markets. Organizations such as Boeing have used information technology and factory automation to improve manufacturing operations.

The Role of ICT
The role of ICT in manufacturing can be categorized into two broad categories; technologies and applications.

Technologies
Wireless Networks and Satellite Technology
These have evolved to the point where wireless access is generally available.
Use of wireless networks has been made attractive by the emergence of standards (e.g. Bluetooth and WAP), inexpensive standards-based devices, and a wide array of digital programmable devices, many of them portable.

Monitoring and Sensing Technology
Monitoring and sensing devices are prevalent in a wide range of applications. For example, they are used extensively in cars and other vehicles, where they continuously monitor component performance. They are appearing in personal medical devices, consumer packaging (including clothing labels) and as part of smart-highway infrastructure. The list of uses expands daily. Coupled with wireless networks, this technology is a key foundation of rapidly increasing telematics, telemedicine and similar network-based solutions [3].

Geospatial Technology (including remote sensing)
This is being used in a wide range of applications, from sub-surface mineral analysis to land-use monitoring and vehicle location tracking. Improvements in sensor technology, especially in the spatial, spectral, radiometric and temporal resolution, have allowed the proliferation of feasible applications. Geospatial technology provides the mapping support required for navigation systems that form a key part of the rapidly evolving telematics market.

E-commerce
This is defined as sales or purchases over the Internet, with or without on-line payment, excluding private networks. Dramatically increased computing power, the rapid growth of broadband networks and out-of-the-box software solutions are the key drivers behind the rapid growth of e-commerce across all sectors of the economy [4].

Automation and Control Technologies
Essentially, an automation and control system combines a number of supporting technologies, coupled with 'intelligent' ICT. (ICT is now advancing as the most basic technology for automation.)
With more powerful processors and smarter lower-cost sensors, robot systems are becoming more intelligent. They have long been used in manufacturing applications and new

uses are starting to emerge in entertainment, and the social and environmental fields, amongst others.

CAD/CAM and Rapid Prototyping Software
3D modeling in particular has long been integral to industrial manufacturing businesses.
With the increased availability of affordable, off-the-shelf software and improved 3D modeling capabilities, the use of CAD/CAM is growing in a variety of industries, including clothing and textiles, mining exploration and production, and building estimation and construction scheduling.

Engineering design through Computer aided design (CAD) allows an organization to make high quality specialized designs rapidly. The design can be tailored to meet individual customer needs.

Decision-Support Systems (Smart Systems)
These are computer-based advisory systems to assist decision-makers in product and process design, tooling and equipment selection, production scheduling and control, materials management and other areas.

Simulation and modeling are becoming the accepted norm for product and process design and implementation.
Decision-making "cockpits" and "dashboards" will provide an unprecedented ability to evaluate the impact of options, alternatives and issues regarding product and operational performance, based on up-to-the-moment status data from across the business.

Voice/Speech Recognition
Major advances in speech and voice recognition have tremendously improved the human-computer interface. These advances, coupled with inference capability, have allowed the development of intelligent machines driven by a human talking to a machine and telling it what to do. Current research activities are focusing on making this type of technology available at low cost.

Computer- integrated manufacturing (CIM); (combination of information technology and factory automation), blends development in manufacturing with information technology to achieve competitive advantage. When properly organized, CIM offers the opportunity to automate design, manufacturing and production planning and control [5]. They include but not limited to:

- Flexibility manufacturing systems (FMSs) can quickly produce a variety of high quality product efficiently. An (FMSs) also allow an organization to produce high specialized designs.

- Computer based production planning and control systems allow an organization to cope with the complexity of managing facilities that produce a wide variety of specialized products without losing

efficiency [2].

Applications
Customer Relationship Management
It is the applications software that allows enterprises to deepen their relationships with customers through more effective sales management and customer service.
The software includes inbound e-mail management, outbound e-mail marketing campaign management, call centres, chat groups, voice-over IP (VOIP), knowledge-based searching, and customer self-service and interactive selling software. ECRM is becoming a cornerstone of e-business implementations.

Enterprise Resource Planning (ERP)
This refers to an integrated suite of business applications that typically includes a variety of financial and HR management products. At present, most ERP vendors are actively pursuing e-business integration strategies that include web-enabling ERP business functions, linking e-business servers to ERP business functions, and integrating ERP business functions with their business partners.
Convergence between ERP and supply chain management (SCM) applications is also under way.

Multimedia, Virtual Reality and Augmented Reality Technologies
These technologies combine sound, video, text and graphics into a set of systems, products and services that are essentially interactive in nature. Multimedia standards, storage and interface technologies, tools and applications are evolving at a frenetic pace. Thus, the content side of the information revolution is now in a position to take advantage of the rapid growth of broadband networks that are making a wide range of new business applications possible. Such applications are starting to emerge in all of the targeted sectors.

Knowledge Management
This is a business concept that includes concerted, coordinated and deliberate efforts to maximize an organization's performance by creating, capturing, sharing and leveraging knowledge from internal and external sources.
Extensible Markup Language (XML) is a metadata language widely used as the basis for knowledge management in a variety of business applications. A growing set of XML-based languages is being developed to meet the particular needs of specific business sectors (e.g. automotive sector, financial reporting) [3].

CONCLUSION

ICT is very important in almost all aspects of our lives. From the time it was embraced so many things have changed as far as human nature is concerned. In the manufacturing industry there has been increased production volumes and speed. The future of manufacturing is expected to be fully automated such that all the processes can be controlled from

one place. This can be achieved if there will be advancement in the individual manufacturing sections in terms of ICT. The advancement is evident in the field of artificial intelligence where most of the operations are done by use of robots.

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