Women's Exploits in Innovations in ICT, Education and Telecommunication: An Entrepreneurial Perspective

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ABSTRACT

Not only can innovation introduce new products and services that enrich the lives of individuals nationally and internationally; it can also contribute significantly to economic growth. The process of innovation also increases the amount of economic growth by providing cost competitiveness within a nation and attracting investment by organizations that establish bases there. Women involvement still remain a viable measure for national economy to develop through the innovation and manufacturing abilities of their organizations and from selling the resulting innovative products in the global market. These activities do not only bring increased revenue streams into the economy, but also increase the gross domestic product, and provide employment opportunities. This paper reveals that women involvement in innovation has ushered freedom through a far-reaching education reform program that raise the government's investment in public education. Also, Information and communication technologies (ICTs) are emerging as increasingly valuable business tools for women entrepreneurs in developing countries. Finally, the advancement of telecommunication has brought new opportunities for both knowledge sharing and knowledge gathering for women. One the recommendations made was that since women are significant members of the society, we must strengthen the integration of women in different fields in order to foster proper innovation as well as developmental growth and advancement.

KEYWORDS: Women exploits, Innovations, ICT, Telecommunication and Education

Introduction

Innovation has been and continues to be an important topic of study for a number of different disciplines, such as economics, engineering, agriculture, business, medicine, automobile, science and technology etc. despite the fact that innovation has been studied in variety of disciplines, the term is poorly understood and can be sometimes confused with related terms such as change, inventions, design, and creativity. Schumpeter (2007), described innovation as "creative destruction" that is essential for economic growth. Innovation is essential for helping organizations grow. Innovation is about helping organizations grow. Growth is often measured in terms of turnover and profit, but can also occur in knowledge, in human experience, and in efficiency and quality. Innovation is the process of making changes to something established by introducing something new. As such, it can be radical or incremental, and it can be applied to products, processes, or services and

in any organization. It can happen at all levels in an organization, from management teams to departments and even to the level of the individual. An innovation must add value to customers to make them purchase or consume the product or service or perceive an improvement. An important part of the exploitation process is ensuring that the innovation adequately fulfills prospective customers' needs. The better the innovation fulfills customer needs, the more likely customers are to adopt it.

Current Innovations in Research and Development

Research and development constitutes the first stage of development of a potential new service or the production process. It is the set of innovative activities undertaken by corporations or governments in developing new services or products and improving existing ones (Staff, Investopedia 2014). R&D activities differ from institution to institution, with two primary models of an R&D department either staffed by engineers and tasked with directly developing new products, or staffed with industrial scientists and tasked with applied research in scientific or technological fields, which may facilitate future product development. R&D differs from the vast majority of corporate activities in that it is not intended to yield immediate profit, and generally carries greater risk and an uncertain return on investment (Yiu, Lam; Yeung; and Cheng, 2020). However, R&D is crucial for acquiring larger shares of the market through the marketing of new products. However, the following top 7 current innovations in research and development cannot be over emphasized:

Juggad Innovation: *Jugaad* has its seeds in the Indian countryside. In these rural regions, farmers build their own vehicles for daily work and for transportation of their goods. The users themselves usually do the inventive work. Thus, such *jugaad* solutions are typically based on imaginative problem solving rather than on technological inventions (Kingsnorth et al. 2011). This manner of self-help can be seen all over India, because the scarcity of all kinds of resources leads people to become self-reliant (Radjou et al. 2011). Over time, the *jugaad* paradigm merged into the 'DNA' of the Indian people and became a tradition. '*Kabaad se jugaad*' is a Hindi slang expression, referring to the conversion of waste (*kabaad*) into something useful and beautiful. As a result of *jugaad*, new businesses grew out of creative ideas, and inventive slum dwellers became small entrepreneurs. These businesses use an improvised approach to solve problems and satisfy needs (Saraf, 2009).The most important fact of *jugaad* is to start with the problem that needs to be solved - not with a product. For example, if you want to produce a refrigerator in the USA for Indian people, it will cost hundreds of dollars, and the Indian people cannot afford such an expensive machine. For them to buy it, the cost has to be less than US$75. Thus, you cannot begin with the idea of a refrigerator; you have to begin with thinking about the customers' problem (Govindarajan 2011).

***Frugal innovation*:** Unlike Gupta (2011), many authors focus (merely) on the product perspective. With regard to frugal innovation, products typically do not have sophisticated technological features but meet customers' basic needs at a low cost by providing a comparably high value (Zeschky et al. 2011). Gupta and Wang (2009) see frugal innovation as the development of simple and ecological products, processes, services, and business models with a low input of resources, low cost, and little environmental intervention. Due to the emerging market potential, frugal innovation - a derived management approach based on *jugaad* - has developed in the last decade. Gupta (2011) states that 'frugal innovation is a new management philosophy, which integrates specific needs of the BoP markets as a starting point and works backward to develop appropriate solutions that may be significantly different from existing solutions designed to address needs of upmarket segments. First, frugal

innovation is basically focused on the investigation of the poor classes in (emerging) markets as target groups and as co-developers of appropriate products (Zeschky et al. 2011; Woodward 2011). Second, as a management philosophy, it refers to the extensive approach of adapting product management, production, and development to achieve a sufficient level of taxonomy but without high R&D investments (Bhattacharyay 2012). Third, the resulting solutions are able to satisfy upmarket demand (Immelt et al. 2009; Lifland 2010).

***Frugal engineering/constraint-based innovation*:** Moore (2011) and Woodward et al. (2011) contend that the above explained term frugal innovation arises from the process perspective when innovation is done in a frugal way. However, this is known as frugal engineering or constraint-based innovation. In this context, it is considered the 'ability to absorb, adapt, and build upon the technologies imported from abroad rather than produce completely novel technologies' (Kumar 2008) to reduce total cost, accelerate product development (Reddy 2011), and deliver value for money (Kumar 2008). Frugal engineering or constraint-based innovation focuses on awareness and a cognitive approach in developing new products, services, and businesses in constrictive conditions (Sharma and Gopalkrishnan 2012).

***Gandhian innovation*:** Prahalad and Mashelkar (2010) investigated how companies (in India) innovate and identified three types of what they called Gandhian innovations. The first type is the technology-driven innovation, in which EMFs take advantage of Western technology by creating new business models based on it - with an impact on the industry's dynamics (e.g., partitioning work in the IT sector that leads to the outsourcing of assignments from DMFs to Indian engineers or EMFs). The second type is the capability-driven innovation, which involves creating or obtaining new internal capabilities (i.e., technical expertise) to solve problems; collaborations with other companies and R&D are common practices. Tata Motors, for instance, cooperates with numerous technologically advanced companies (Bosch, Johnson Controls, Toyo, Behr, etc.) to develop the appropriate components for their $2,500 car. The third type combines external technology with the internal capability approach by merging different standard technologies to get advanced products requiring lower production costs. For example, in 2007, Computational Research Laboratories (CRL) developed the fourth fastest computer in the world at a cost reduction of more than 20% compared to other supercomputers, by designing a holistic new design and using off-the-shelf technology.

Catalytic innovation: A comparison of Gandhian innovation and other traditional approaches reveals the former's stronger focus on the relevance of both external and internal sources (technology, capabilities) of the developer (particularly companies). Prahalad and Mashelkar (2010) extend the Ghandian innovation approaches - focusing either on technology (products) or on processes - by pointing out the different ways of using the source's technology and capability. Further, the authors emphasize the social claim behind the phenomenon: 'Learning to do more with less for more people, we believe, should be the innovator's dream' (Prahalad and Mashelkar 2010). This is done by switching from premium pricing and abundance to affordability and sustainability to make products and services accessible to the world's populace. Christensen et al. (2006) call these novel practices 'catalytic innovations,' which are based primarily on social change rather than on maintaining the status quo through the development of new products by existing players and partners (Munshi 2010).

Grassroots innovation: The consideration of businesses' social responsibility is also a significant issue in grassroots innovation, which is characterized by social integrity and poor people being considered inventors. The inventions are primarily designed to reduce or eliminate drudgery and are created by local people with the available resources (Gupta 2008). Thus, grassroots innovation is similar to *jugaad*. However, the additional aspects of

networking and ecological comprehension, as being an important factor in grassroots innovation, are missing in the concept of *jugaad*.

***Indigenous innovation*:** The little research that has been undertaken on indigenous innovation focuses on the macro-economic level and addresses the inherent difficulty of increasing benefits from international trade for developing countries. In the context of international R&D activities, indigenous innovation research considers technology transfer between enterprises in advanced and developing countries as well as the resulting effects for the domestic economies in developing countries, or spillover effects (Fu and Gong 2011; Schwaag Serger and Breidne 2007). Fu and Pietrobelli (2011) identify a congruent level of indigenous knowledge (absorptive capacity) based on local R&D in the developing country as necessary for gaining economic benefits from foreign technology transfer.

Current Innovations in Information and Communication Technology by Women

Innovation and technology provide unprecedented opportunities to break trends and reach those who are the most likely to be left behind. This is why women have prioritized innovation technology as one of the "drivers of change" within the telecommunication industry. There is no doubt that women make the technological world go round. According to Austin & McKinney (2016), women's economic status can directly impact disaster vulnerabilities with the help of information technology. They can respond more effectively through telecommunication when disasters strike. Information and communication technologies permeate every aspect of our lives; from community radios in the most rural parts of the globe to cellular phones in the hands of women in every community on earth, to computers in almost every medium to large organization. The advancement of ICTs has brought new opportunities for both knowledge sharing and knowledge gathering for women. To the extent that the global community can reach heretofore unconnected individuals, families, and populations to better understand their needs and challenges, ICTs can provide unlimited opportunities for economic development and social engagement through new, innovative thinking and tools whereby women are well known for strategical liberation. However, a basic assumption is that all members of our global community benefit from and are part of the growing knowledge society.

ICTs have been compared to a double-edged sword—advancing the knowledge society on one hand, and deepening gender and social divides based on pre-existing social divisions on the other. Leaving large portions of the global community both underserved and unengaged remains the largest determinant of success for current development efforts. Specifically, without a thoughtful policy, strategy, and execution plan to ensure women's full engagement in the knowledge society, the places in which they work, the families for whom they care, and the communities in which they live and serve will not thrive.

Information and communication technologies (ICTs) are emerging as increasingly valuable business tools for women entrepreneurs in developing countries. Making sure those women entrepreneurs are equipped to make productive use of such technologies is important from the perspective of achieving Millennium Development Goal (MDG) 3 on Promoting Gender Equality and Empowering Women and MDG 8 on a Global Partnership for Development to make available the benefits of ICTs. The rapidly changing ICT landscape, the influx of new innovations, infrastructure challenges and their interface with persisting age-long barriers relating to socio-cultural norms, and institutional, systemic and legal gender inequalities which have impeded women's potential to start and grow their businesses is a complex terrain. Compounded by the scarcity of data on women's entrepreneurship and ICTs, gaining

a clear picture of the status of women entrepreneurs and their use of ICTs is often difficult for policymaking purposes.

The Association for Progressive Communication (APC 2011) notes that 80% percent of states have ratified four or more of the core human rights treaties and all states have ratified at least one. However, this is not always a sign of government's' commitment to make women's rights a reality. The reality of a gender digital divide globally, and particularly in many developing countries, limits the potential for women to critically engage with web-enabled ICTs. As Gurumurthy and Chami (2014) write, "The ubiquity of the mobile phone is bound to make it 'the' access device of the immediate future, but nurturing the potentialities of the larger digital ecosystem – comprising much more than device-based functionalities - is the priority for a sustainable digital future." This would include access to high speed broadband and mobile Internet, as well as to locally relevant and gender sensitive applications and platforms. Indeed, new institutional innovations in public services and conditions that promote bottom-up collaborative innovations should take priority.

Some of the Innovations women can explore in ICT are:

Poverty Reduction: There is a saying that says "Educate one woman, you educate a nation". Women are strategically and antically capable of emancipating the nation from bondage with their instinct character of economy and management. Women can fight for the betterment of the nation if given the opportunity to explore in ICT as well as contribute to

Growing risk-taking behaviour: Companies with the highest representation of women board members outperformed those with the least number of women. Women are not afraid when it comes to risk-taking and in which contributes immensely to organizational growth.

Peace and unity: Women can also promote peace and unity in information and communication technology companies by acting virtuously with communication skills that will promote information and communication technology now and hereafter.

Current Innovations in Education by Women

In many years of celebrating International Women's Day, GPE Secretariat, (2015) honored 15 women who are using their voices, leadership and influence to make progress for girls' education globally.

Michelle Bachelet, President of Chile, during her second non-consecutive term, President Bachelet in 2014 ushered through a far-reaching education reform program that raised the government's investment in public education. In her prior role as Executive Director of UN Women, she championed the Fund for Gender Equality, which provides grants to support innovative programs by government agencies and civil society groups to promote equal gender access to quality education. "We focus on girls' education," she said, "because it sets them on a path to greater economic opportunities and participation in their societies" (GPE Secretariat, 2015)

Phumzile Mlambo-Ngcuka, Executive Director of UN Women: A former Deputy President of South Africa, responsible for anti-poverty initiatives, Ms. Mlambo-Ngcuka was also the founder of the Umlambo Foundation, which focuses on raising learning outcomes in South African public schools. "We are still a long way from achieving equality between men and women, boys and girls," she said in a recent statement on International Women's Day. "Women need change and humanity needs change. This we can do together; women and girls, men and boys, young and old, rich and poor."

Julia Gillard, former Prime Minister of Australia and Chair of the Board of the Global Partnership for Education in her long champion of education, her career as an elected official and currently a Distinguished Fellow at the Brookings Institution's Center for Universal Education, Ms. Gillard is one of the leading global advocates for strengthening education systems around the world, especially for girls. "The education of girls has to be at the center of any nation's effort to transition from poverty to prosperity," she wrote. "…Educating the world's poorest girls can only be done with the firm commitment of many stakeholders – both domestic and international – to plan, fund and build strong, sustainable and equitable education systems."

Graça Machel, activist and philanthropist, through her philanthropy and advocacy at the Graça Machel Trust, she has been a lifelong champion of girls' education and children's rights, and raised awareness about the scourge of early child marriage, female genital mutilation and other practices that keep girls from reaching their full potential. "In childhood and adolescence, too many girls are undernourished, stunted, denied education and forced into early marriages," she and Norwegian Prime Minister Erna Solberg co-wrote in an Op-Ed article. "This creates a gender disparity that threatens to undermine stability in future generations and must be addressed by policymakers" (GPE Secretariat, 2015).

The former president of the United State of America, **Barack Obama** in his June 4, 2009, address at Cairo University underscored the wisdom of investing in women's education and acknowledged the importance of the advancement of women as a global issue. He recognized that women's rights are a central part of the foreign policy of his administration. And it is no coincidence that countries where women are well educated are far more likely to be prosperous. Our common prosperity will be advanced by allowing all humanity—men and women—to reach their full potential. We must recognize that education and innovation will be the currency of the 21st century (Jackson, 2009).

Current Innovations in Telecommunication by Women

Catherine Moyer is chief executive officer of Pioneer Communications, a rural telecommunication company headquartered in Ulysses. She grew up in Ulysses and went to college in Vermont. Her first job was at Pioneer Communications, where she worked as a frontline customer service representative. Catherine went to law school at Washburn University and worked at a firm in Topeka. In 2002, the Pioneer Communications Board of Directors offered her the position of director of legal and regulatory affairs. "I promised them five years, but here I am," Catherine said. She and her husband live in Ulysses. In 2012, she was promoted to CEO. "Great people work here at Pioneer," she said. "We've changed dramatically through the years," Catherine said. "In the old days, the phone company waited for the customers to come to us. Now we have to go earn their business." In response, Pioneer Communications has expanded and modernized its network while serving its customers' growing and varied needs. The company's website says it's committed to being the best internet-, TV- and phone provider in southwest Kansas. In 2019, the company made the transition from traditional cable television delivery to streaming services. In addition to Ulysses, Pioneer Communications has office locations in Hugoton, Johnson, Lakin, Satanta, and Syracuse. The company serves a 5,000-square-mile region of southwest Kansas. In addition to the larger towns, that territory includes such rural communities as Coolidge, population 95; Horace, population 70; and Richfield, population 43 people. Now, that's rural.

Women Innovation in Telecommunication focuses on the following

Building market awareness, investment and industry-wide actions to grow an innovation that advances gender equality and empowerment of women and girls.

1. The application of 5G Network & Technology: 5G technology is the next big upgrade for telecommunication networks and devices. It provides a much higher speed, than previous cellular broadband network standards, and, most importantly, has much lower latency. Latency is very important for cloud gaming as well as VR content streaming. Massive machine-type communications (m MTC) that 5G networks provide enable the creation of high-density IoT networks, from IoT to smart homes, such wide-spread applications make 5G one of the most important upcoming technology trends for the telecommunication sector. Aarna Networks creates a Multi-Cluster Orchestration Platform US-based startup Aarna Networks provides a multi-cluster orchestration platform – AMCOP. AMCOP automatically manages cloud infrastructure and connected networks, such as Edge networks. AMCOP supports 5G radio access networks (RAN), and 5G Core (5GC) orchestration, as well as network slicing, data analytics, and self-organizing networks (SON). Also, AMCOP is built on vendor-agnostic open-source software, helping businesses optimize their expenditures on network infrastructure and increase security. Simnovus provides a Cost-Effective User Equipment (UE) Simulator Simnovus is an Indian startup, building efficient UE simulators for 5G networks. Based on software-defined radio (SDR) technology, the startup allows transforming traditional x86 hardware into a UE simulator. This agile and cost-effective solution is suitable for testing telecommunication equipment and developers of such equipment. The UE simulator provides testing with realistic patterns of traffic for different network technologies, extensive logging, and elaborate statistics. Further, the simulator's licensing supports up to 1000 devices.

2. *Connectivity Technologies*; Connectivity technologies are constantly evolving and include both wired and wireless communications. The development of communications technology is critical in today's IT-environment, with increasing data volumes, IoT devices, and people using the internet. Further, users increasingly share high-quality digital data, such as videos, photos, and music. All of these factors, along with the increasing use of satellite communications, contribute to the emerging telecom trends with innovation in connectivity technologies. The startup leverages the FBG effect, which allows creating chains without breaking fiber optics for data transmission. FiSens embeds sensors in the fiber optics, allowing up to 30 sensors in a single fiber. The startup produces FBGs for almost all possible spectral configurations. Additionally, these sensors are immune to electromagnetic interference and are safe in environments that involve radiation or explosions. Satellite connects IoT Devices using Satellites. Satellite is a Spanish satellite telecom operator for global continuous IoT connectivity, merging satellite and terrestrial networks under 5G protocols. Their hardware does not require any customization on the device side since satellite constellations act as a cell tower for IoT devices. Moreover, satellites handle messages in a secure and transparent way, ensuring customers' data is safe. Satellite's connectivity solutions find applications in a wide range of industries, including utilities, maritime, oil & gas, and agriculture.

***3. Application of Internet of Things devices*;** IoT devices and sensors influence almost all industries of the technology economy. It improves people's quality of life, allows businesses to increase their profits, and improves management. IoT is also beneficial for governments looking to decrease their information technology (IT)-related expenses. Interconnection between devices, sensors, infrastructure, and computing elements further enables new ways

for management. For example, decentralized operations, condition-based monitoring, and predictive maintenance ensure efficient communications between various IoT devices. In this way, IoT automates production processes and allows the implementation of Industry 4.0 concepts in the telecom sector. N3uron builds a Web-based SCADA Software Spanish startup N3uron develops highly customizable Industrial IoT and supervisory control and data acquisition (SCADA) software solutions to empower organizations to efficiently collect data. One of the startup's multiple integrated software modules, MQTT, uses special data-transfer protocols to connect thousands of field devices to any cloud or SCADA system. N3uron software runs on multiple operating systems and hardware without affecting performance. Moreover, the software's built-in networking security and data integrity checks follow industry standards of data formats. All of this allows companies to efficiently create and operate IIoT device networks. Iothic develops a Decentralised IoT Standard**.** British startup Iothic creates a communication protocol for the internet of things. The main benefit of the startup's solution is interoperability. The communication protocol enables companies to work on different devices and operating systems that are compatible with existing infrastructure. Further, a high level of security, with support for real-time low-latency operations, suits next-gen IoT applications, together with resistance to quantum decoding. The IoT standard helps manufacturers and customers by helping them reduce production and operational expenses.

4. Artificial Intelligence (AI); Artificial intelligence (AI) and machine learning (ML) are other big telecom trends impacting the industry. Digital transformation requires the extraction of meaningful information from data, gathered by IoT sensors and devices. At the same time, the expansion and complication of the internet create the need for high speeds and low latencies, prompting new solutions for internet connection management. To this end, startups develop AI solutions that resolve numerous problems related to network performance. Netop develops Autonomous solutions for Critical Networks NetOp is a startup from Israel, creating a critical network health utility tool using proprietary machine learning algorithms. The solution automatically analyzes the network, searching for any vulnerability. Using AI-powered advanced automation, NetOp proactively predicts and remediates network issues as they arise, which is beneficial for businesses wanting to improve their security and reduce operating costs. IoT/AI creates an Advanced Sensor Platform. The US-based startup IoT/AI offers an IoT platform that combines network connectivity, cybersecurity, and analytics operating in Edge networks. The platform analyzes the data from the mesh network locally using ML algorithms. In addition to military-grade cybersecurity, IoT/AI's sensor platform is suitable for the industrial, healthcare, defense, energy industries (StartUs Insights, 2020).

Conclusion

Innovation provides unprecedented opportunities to break barriers and reach out to those who are most likely to be left behind. That is why women have prioritized innovation as one of the drivers of change. Many girls are undernourished, stunted, denied education and forced into early marriages. Women innovation has ushered freedom through a far-reaching education reform program that raised the government's investment in public education. Also, Information and communication technologies (ICTs) are emerging as increasingly valuable business tools for women entrepreneurs in developing countries. The advancement of ICTs has brought new opportunities for both knowledge sharing and knowledge gathering for women.

Recommendations

1. Since women are significant members of the society, we must strengthen the integration of women in different fields in order to foster proper innovation as well as developmental growth and advancement.

2. More women should be educated about decision making processes, and awareness should be created on how significantly transformed ICTs, Education, and Telecommunication can be with the efforts of women.

REFERENCES

Austin, Kelly F. and Laura A. McKinney. (2016). "Disaster Devastation in Poor Nations: The Direct and Indirect Effects of Gender Equality, Ecological Losses, and Development." *Social Forces* 95(1):355-80.

Bhattacharyay, B.N. (2012) Estimating Demand for Infrastructure in Energy, Transport, Telecommunications, Water and Sanitation in Asia and the Pacific: 2010-2020.

Christensen, C. M., H. Baumann, R. Ruggles, and T. M. Sadtler (2006): "Disruptive Innovation for Social Change," HarvardBusiness Review 84(12): 94-101.

GPE Secretariat (2015). *15 women leading the way for girls' education*. Retrieved from: https://www.globalpartnership.org/

Gupta, V. P. (2011): *'Frugal Innovation' The new masters of management*: From 'Jugaad' To Frugal Innovation. Retrieved from http://www.indianmba.com/Faculty_Column/ FC1283/fc1283.html.

Immelt, j. R.; Govindarajan, v.; Trimble, C. (2009). How GE is disrupting itself. *Harvard Business Review*, 87(10), p. 56-65.

Jackson, L. W. (2009). *Educate the Women and You Change the World*: Investing in the Education of Women is the Best Investment in a Country's Growth and Development. Published by the Forum on Public Policy.

Kumar, N. (2008). Internationalization of Indian Enterprises: Patterns, Strategies, Ownership Advantages, and Implications. *Asian Economic Policy Review*, 3(2): 242-261.

Moore, K. (2011). The emergent way: how to achieve meaningful growth in an era of flat growth. *Ivey Business Journal*, 75(6): 1-3.

Prahalad, C. K. and R. A. Mashelkar (2010). Innovation's Holy Grail. *Harvard Business Review*, 88(7/8): 132-141.

Radjou, N., J. Prabhu, and S. Ahuja (2011). *Jugaad Innovation*: Think Frugal, Be Flexible, Generate Breakthrough Growth, San Francisco, Jossey-Bass.

Saraf, D. (2009, July 13): *India's Indigenous Genius*: Jugaad. Retrieved from: http://www.wsj.com/articles/SB124745880685131765.

Staff, Investopedia (2014). *Research And Development – R&D*. Investopedia.

StartUs Insights (2020) *Top 10 Telecom Industry Trends &Innovations*. Retrieved from: https://www.startus-insights.com/innovators-guide/top-10-telecom-industry-trends-innovations-in-2020.

Woodward, A. D.; Nielsen, B. D.; Liesman, J.; Lavin, T.; Trottier, N. L. (2011). Protein quality and utilization of timothy, oat-supplemented timothy, and alfalfa at differing harvest maturities in exercised Arabian horses. *J. Agric. Sci.*, 89(12): 4081-4092

Xiaolan Fu and Yundan Gong (2011). Indigenous and Foreign Innovation Efforts and Drivers of Technological Upgrading: Evidence from China *World Development*, 39(7), 1213-1225.

Xiaolan Fu, Carlo Pietrobelli (2011). The Role of Foreign Technology and Indigenous Innovation in the Emerging Economies: Technological Change and Catching-up. *World Development*, 39(7), 1204-1212.

Yiu, L. M. Daphne; Lam, Hugo K. S.; Yeung, Andy C. L.; Cheng, T. C. E. (2020). Enhancing the Financial Returns of R&D Investments through Operations Management. *Production and Operations Management*, 29(7): 1658–1678.

Zeschky, M., Widenmayer, B. and Gassmann, O. (2011). Frugal Innovations in Emerging Markets. *Research Technology Management* 54(4): 38-45.