

QUANTITATIVE METHODS FOR MEASURING IMPACT OF SELF-SERVICE INNOVATIONS

Beatrice Wanjiku Gichohi

Tana and Athi Rivers Development Authority (TARDA)

Nairobi, Kenya

bettygichohi@gmail.com

ABSTRACT

With recent technological advancement, more and more service providers are adopting self-service innovations in service delivery. Self-service provides benefits to consumers, adopting organizations, and the economy as a whole. Benefits of self-service include providing customers with cheaper, accessible, convenient and higher quality services, while the organizations benefit from increased efficiency, lower costs of production and which eventually translate into high return and higher wages. Productivity leads to economic growth. Despite the benefits, adoption of Self-Service has attracted criticism. Some organizations have advocated for legislation against self-service with opponents raising concerns that self-service leads to loss of jobs, shifts work from the service providers' agent to the consumer and eliminates human contact. Workers unions in some developing countries have opposed adoption of innovations for fear of job losses. It is therefore necessary to quantify the benefits and costs of innovations. Innovation rarely gets measured since it is hard to measure. Corporations are dedicating a lot of resources in developing and adopting innovations and yet, they aren't measuring its impact. There is need to develop statistical models that give value proposition of every innovation developed and adopted. This will enable policy makers make informed policies, provide organizations tools to analyze their innovations and enable customers make informed choices. This paper proposes quantitative methods for measuring the impact of self-service innovations from the perspective of the consumers, adopting organizations and economy. It focuses on developing statistical methods of measuring benefits and costs of self-service innovations. Cost- Benefit analysis techniques are developed to evaluate the extent to which the expected benefits outweigh the costs. This is the basis on which investors make decisions on whether to adopt innovations. Government will also use the Cost- Benefit analysis to draw up relevant policies.

Key words; Cost-Benefit, Customer, Organization, Economy

1.0 INTRODUCTION

1.1 Background

Innovation is a process of translating new ideas or inventions into new solutions that meet new requirements or existing market needs. This is achieved through availing more effective services, goods, processes, technologies or ideas to the market. Innovation drives productivity and performance. Businesses that innovate experience better productivity performance, faster growth, pay better and produce higher quality services and products. Some organizations take deliberate initiatives to develop innovations. Organizations are continuously working towards developing strategies to instill an innovative culture in their work force.

Self-service innovations fall into three major categories; Electronic Kiosks, Online services, and Mobile Phone services. Depending on the nature of the service being provided, self-service may vary from the customer getting minimal assistance from an agent to agent free self-service. The self-service economy has grown because Self-Service provides benefits to consumers, organizations, and the economy as a whole (Daniel Castrol, et al, 2010). Consumers benefit from service innovations by accessing cheaper, variety, convenient, high quality and standardized services. Increased productivity, cost reduction through freeing workers to be engaged in other forms of productivity and ability to provide high quality and standardized service are some of the benefits enjoyed by corporations adopting Self-Service technology. At a national level innovation increases productivity which is one of the most important indicator of economic growth. However critics of innovations have asserted that Self-Service innovations have had negative impacts such as loss of jobs, increases cost of production due to increased spending on research and decreases human contact. In recent years it has been a common refrain of many, particularly those on the left, that productivity increases no longer benefit average workers (Peg Bost 2008).

This paper proposes quantitative methods for measuring the costs and benefits of adopting service delivery. It is important to develop statistical methods including models that can be used to measure the cost and impact of developing and adopting self-service innovations given their evident potential to turn around consumers' experiences, organizations performance, and economic growth.

1.2 Rationale

All over the world, many organizations have prioritized adoption of innovations as a strategy in realizing their goals. Innovation is a core value in many modern organizations. According to <http://en.m.wikipedia.org/wiki/McKinsey>, 70% of corporate leaders consider innovation as a top three business priority but only 22% set innovation performance metrics. This then means that much as corporations are spending a lot on adopting innovations, they aren't measuring it. Innovation is hard to measure. This obvious gap is an indication of challenges in that measuring innovation. It is important to develop statistical models that can be used to measure the cost and impact of developing and adopting Self-Service innovation given its evident potential to turn around consumers' experiences, organizations performance, and economic growth. There is need to develop a model that gives value proposition of every innovation developed and adopted. Some organizations have pushed governments to legislate against Self-Service innovations despite the benefits accrued form their adoption. Service innovations are threatening existence of middleman ship

It is therefore important to develop models which can be used measure the benefits of innovations against perceived negative impacts and costs. This will enable policy makers make informed policies as well as provide organizations a tool to analyze their innovations for decision making.

1.3 Research Objectives

To develop a tool that measures the impact of adopting self-service innovations with focus on the customer, the organization and the national economy.

Specific objectives and research questions

The objective of the study is to develop quantitative methods for measuring;

1. Benefits of using self-service innovations from a customer's perspective.
2. Benefits of adopting self-service innovations from an organizations' perspective.
3. Impact of self-service innovations to the economy.
4. Cost of self-service innovations
5. Cost- Benefit analysis of self-service innovations

2.0 LITERATURE REVIEW

2.1 Benefits to the Consumer

Self-service technology provides consumers convenient, accessible, easy to use, variety and cheaper services. Self-Service offers convenience to the consumer of a service since it is available throughout (24 hours a day, seven days a week). Consumers are able to use the service at their convenient time and speed. With the conventional agent-customer service provision, the customer experience may be influenced by the personal traits of the service provider. However with self-service technology customers experience is standardized and only depends on the efficiency of the machine / tool being used to dispense the service which is also standardized. In a 2009 consumer survey, 44 percent of respondents indicated that they would prefer to use a hotel kiosk so that they would have no interaction with the clerk (NCR, 2009).

2.2 Benefits to the Organization

The IT revolution has led to a significant growth in productivity, and the firms with the highest level of IT investments show the highest levels of productivity per worker (Robert D. Atkinson, 2007). At a corporate level benefits accrued from investing in self-service include cost reduction, since using self-service frees up workers that can either be reassigned other jobs or, increases in operational efficiency and offers the organization an opportunity to offer standardized services.

2.3 Benefits to the Economy

From a macro perspective self-service technology increases productivity (the amount of output per hour of work) which leads to Per-capita income growth and hence nation's economic wellbeing. Self-service increases efficiency which translated into higher salaries, less working hours and thus higher living standards. According to U.S. Bureau of Economic Analysis, the potential economic benefits of more use of self-service technology are substantial with estimation that the self-service economy would create \$1,100 in additional Income per U.S. household. While short-run productivity growth and unemployment are weakly positively correlated, in the moderate- and long-run productivity growth is strongly negatively correlated with unemployment (Chen, Rezai, and Semmler, 2008). Innovation thus leads to long term economic growth.

2.4 Issues with Self-Service Technology

Rather than have a conversation with a person, people are being forced to interact with cold, impersonal machines. Indeed, one particularly strident critic argued that self-service involves "the sacrifice of our inherent humanity" (Thomas B. Cavanagh 2008). There are four major concerns that have been raised: self-service simply shifts work to the consumer with only the company benefiting; self-service eliminates

consumer choice and robs individuals of human contact; self-service eliminates jobs; and finally, the economic benefits of self-service will not go to workers.

3.0 METHODOLOGY

3.1 Variables of Study, Data Collection and Analysis

The variables of this study include customer experience, employment trends, wages, and economic growth, and corporate performance, quality of services, productivity, and efficiency and production indicators. Sources of data include customer surveys, employee surveys, study organizations' data bank, and national economic data. This paper recommends use of descriptive statistics to quantify benefits and cost of use of innovations, and statistical tests that draw inferences. Linear Regression models, factor analysis, Chi-Square and ANOVA tests will be used to test hypothesis.

3.2 Quantitative Methods for Measuring Innovations

3.2.1 Benefits of Self-Service to Adopting Organizations'

Indicators that measure benefits of innovation to the organization are;

X₁- increase in productivity.

X₂- increase in efficiency

X₃- extent of standardization of products

X₄- Quality of products

Let $X_{i(1,2,3,4,5...n)}$ be the measures of productivity, efficiency, standardization and quality of products for n firms before adopting self-service and $X_{j(1,2,3,4,5...n)}$ be measure of the same after adoption .

To quantify Impact of innovations from an organizations perspective, T-test measures significant difference in the measures before and after adopting innovations. ANOVA and Chi Square tests determine association of the benefits of the different innovations to the different types of organizations.

3.2.2 Benefits of Self-Service to Consumers

This paper identifies the following indicators to measure Consumer benefits

X₁- Perception on convenience

X₂- Price of service /products cheaper?

X₃- Perception on availability of variety

X₄- Perception of standardized services

X₅- Quality of products

Let $X_{i(1,2,3,4,5...n)}$ be the measure perception on convenience, prices, availability of variety, standardization and quality of products from n customers of self-service and $X_{j(1,2,3,4,5...n)}$ be a measure of the same from n customers of similar conventional services

To measure benefit of innovation from customers' perspective, T-Test measures difference in perception between the two sets of customers. ANOVA and Chi Square Test determine different types of customers' perception of benefits as well as benefits using the different innovations.

3.2.3 Benefits of Self-Service to Economy

National Economy benefits are measured by using the following indicators;

X₁- Increased efficiency

X₂- Increased productivity

X₃- increased wages

From a national economic perspective, T-test measures significant difference in efficiency, productivity and wages between n firms which have adopted self-service technology $X_{i(1,2,3,4,5\dots n)}$ and n similar firms which have not adopted technology $X_{j(1,2,3,4,5\dots n)}$. ANOVA and Chi Square tests determine significant difference in benefits from the different innovations.

3.2.4 Cost of Innovation

Cost of self-service innovation is measured from the perspective of Customers, organizations and the economy; using the following indicators;

X_{c1} - Cost of developing innovations - Cost of research & development, equipment, training staff, mobilizing customers, drop in sales ()

X_{c21}- cost of shift the burden of service provision to the consumer (Customers' Perspective)

X_{c22}- cost of loss of human contact in service provision (Customers' Perspective)

X_{c3}- Cost of job losses? (Economic Perspective)

Linear models determine short term and long term effect of innovation on jobs creation. Let $Y_{1,2,3,4\dots n}$ be the number of employees in year 1,2,3,4... n and $X_{1,2,3,4\dots n}$ be the number of years since adoption of innovations. The model is $Y = B_0 + B_i X$ ($i = 1,2,3,4,5$ and $i=6,7,8,9,10$,... for a short term and long-term models respectively)

Perception on burden service provision and loss of human contact in service provision for n customers of self-service $X_{i(1, 2, 3, 4, 5\dots n)}$, determine the cost of Self-Service to the customer. Descriptive statistics quantify this cost.

Descriptive statistics quantify the cost of developing and adopting innovation for n organization $X_{i(1, 2, 3, 4, 5\dots n)}$.

Total cost of the innovation is computed as $\sum X_{Ci}$

3.2.5 Cost/Benefit Analysis of Innovation

Cost benefit analyses totals up the equivalent value of benefits and costs of self-service innovations. It quantifies the benefits and costs of innovations and compares them on a similar scale measured from the perspective of the organization, customers and economy. A monetary measure of each of the variables of study should be developed.

Benefit /Cost ratio = $\sum X_{Bi} / \sum X_{Ci}$. Where $\sum X_{Bi}$ is total benefits $\sum X_{Ci}$ is total cost.

The benefit cost ratio should be computed for consumers, organization and the economy. This is an index which gives value proposition of every innovation developed and adopted.

Table: Cost- Befit analysis

Cost	Benefit
Cost / Benefit Analysis from Organizations' perspective	
<u>Organizations cost</u> X _{C1} . Cost of research & development, equipment, training staff, mobilizing customers and loss of business	<u>Organizations Benefit</u> X _{B11} - Increase in Productivity X _{B12} - Increase in efficiency X _{B13} - extent to which products are standardized X _{B14} - Quality of products
Cost / Benefit Analysis from Consumers' perspective	
<u>Cost to the consumer</u> X _{C21} . Cost of shift the burden of service delivery to the consumer? X _{C23} - What is the cost of loss of human contact	<u>Benefit to Consumer</u> X _{B21} - Is self-service more convenient X _{B22} - How much cheaper are services /products X _{B23} - benefit accruing from availability of variety X _{B24} - standardized services X _{B25} - Quality of products
Cost / Benefit Analysis from National Economy Perspective	
<u>Cost to National Economy</u> X _{C3} - Loss of Jobs	<u>Benefits to national economy</u> X _{B31} - Increased efficiency X _{B32} - increased productivity X _{B33} - increased wages
TOTAL COST	Total Benefit

CONCLUSION

The quantitative methods suggested in this paper quantify the impact of self- service innovations. This will informed policy makers make informed policies, provide organizations a tool to analyze their innovations for decision making and enable customers to make informed choices. Apart from the consumer, organizational and economic perspectives, the methods can be adapted to measure the impact from global, competitors, and other perspectives.

Innovations are on the increase with the expanding technological space. Measuring impact of innovations remains an area of interest many stakeholders. A multidisciplinary approach to measuring innovations should be adopted. This will enable measuring different kinds of innovations from the many perspectives.

REFERENCES

- i. Chen, Rezai, and Semmler (2008), *Productivity and Unemployment in the Short and Long Run*.
- ii. Daniel Castro, Robert Atkinson, Stephen Ezell (2010), *Embracing the Self-Service Economy*.
- iii. NCR (2009), "*Self-Service: The Next Generation,*" a supplement to *Hospitality Technology*.
- iv. OECD (2009), *Innovation Micro Data Project Based On CIS 2006*.
- v. Peg Bost. (2008), *US ATM Transactions - The Story Behind the Numbers*.
- vi. Robert D. Atkinson and Andrew S. McKay (2007), *Digital Prosperity: Understanding the Economic Benefits of the Information Technology Revolution*.
- vii. Thomas B. Cavanagh(2008) "*Prosthetic gods: The posthuman threat of self-service technology.*"
- viii. U.S. Bureau of Economic Analysis, <http://www.bls.gov/oes/> 2014
- ix. McKinsey & Co <http://en.m.wikipedia.org/wiki/McKinsey> 2014