Balancing service productivity by the means of digital technologies

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Abstract

This research builds on the theory of service productivity by Rust and Huang (2012). Specifically, this two-phase research assesses internal and external service productivity and evaluates how the use of digital technologies would impact the optimal productivity levels. This conference paper presents the results of the first research phase where through the course of qualitative investigation a range service producer and service consumer inputs/ outputs as well as technologies used during inputs/outputs transformation processes were identified. The study reveals the need to balance the use of technologies in service provision as they may have negative impact on external productivity outputs.

Keywords: productivity, service, technology

Introduction

The productivity concept refers to the economic performance of a firm (Ismo et al, 1998). The productivity therefore is a strategic decision variable for many firms and service providing firms are not an exception (Rust and Huang, 2012). This is because while well-managed service productivity can maximise firm's profit, badly managed service productivity can jeopardise its future. The management of the service productivity is a complex and challenging task (Curtis et al, 1990; Johnston and Jones,

2004), and has long been deemed as a critical issue in the business setting (Harker, 1995). This task is even more complex to accomplish for service providing firms, which have to manage not only internal productivity (i.e. service provider's perspective) but they must also consider external productivity (i.e. consumer's perspective) (Gronroos and Ojasalo, 2002; Parasuraman, 2002).

To date, most research attention has been focused on the service productivity; its definition and measurement, assessed from the perspective of service provider (Johnston and Jones, 2004; Rust and Huang, 2012). Based on this assessment Rust and Huang (2012) developed a theory of optimal service productivity, which ought to help firms to manage their productivity levels in consideration of profit maximisation. Rust and Huang's (2012) theory however presents only one perspective on the service productivity - internal service productivity. Research by Johnston and Jones (2004) suggests that firms while assessing their service productivity levels have to consider not only internal productivity but they must take into account external productivity. This is because during the service provision the consumer plays dual role: a consumer of the service and a service co-producer (Parasuraman, 2002; Johnston and Jones, 2004). As external productivity is interrelated to internal productivity, such association has a significant impact on firm's overall service productivity levels. With this in mind productivity measures must include both producer-oriented and customer-oriented perspectives as only this way higher service productivity levels can be truly gained (Johnston and Jones, 2004).

This research aims to build on the theory of Rust and Huang (2012) and address both internal and external productivity when evaluating how the use of digital technologies would impact the optimal productivity levels of service providing firms. In order to reach this objective the study is organised as follows. First, the literature concerning productivity is reviewed on the basis of which the research model is developed. Next, the context of the research as well as two-phase research methodology is discussed. This is followed by discussion of research findings emerging from the first phase of the research. The study finishes with the conclusion, which links to the second research phase.

Theoretical foundation

Productivity is defined as a ratio of what is produced (output) to what is needed to produce it (input) (Ismo et al, 1998; Johnston and Jones, 2004). Producer's inputs/outputs differ from consumer's inputs/outputs. For example, producer's inputs refer to people (e.g. their skills, working hours, wages etc.) and materials (e.g. resources, equipment, facilities etc.). Consumer's inputs on the other hand, refer to time, effort and financial cost related to service consumption. Likewise, producer's outputs differ from consumer's outputs. While outputs of service producer refer mainly to a service, consumer's outputs are assessed not only on the basis of service outcomes (e.g. perception of value for money, repurchase intention etc.) but consumer's outputs also refer to psychological outcomes deriving from the experience of service consumption.

The transformation of producer's inputs into outputs and consumer's inputs into outputs undergo a number of different processes which can be categorised as (Grönroos and Ojasalo, 2004; Yalley and Sekhon, 2014):

(i)   Producer-only processes (producer converts inputs into outputs in isolation from customer)

(ii)   Consumer-only processes (consumer converts inputs into outputs in isolation from producer)

(iii)   Producer-and-consumer processes (consumer and producer jointly convert inputs into outputs) and

(iv)   Consumer-and-consumer processes (consumer converts inputs into outputs by interacting with other customers).

Johnston and Jones (2004) and Yalley and Sekhon (2014) both state that the above transformation can be evaluated on the basis of efficiency and effectiveness. Efficiency, used to measure internal productivity, is about 'doing things right', while effectiveness, which measures external productivity, is about 'doing the right things'. Efficiency is defined as the degree to which an activity generates a given quality of outputs within a minimum consumption of inputs (Ismo et al, 1998). This may be assessed by a service producer, which can measure inputs used to generate a service (output). A service consumer, in turn, can assess effectiveness, which is the degree to which end results are achieved to the required standard (Johnston and Jones, 2012). According to Rust and Huang (2012), the effectiveness of service can be realised in terms of perceived service quality and satisfaction. The service quality can be evaluated on the basis of technical (physical) quality (i.e. the quality of the service delivered to the consumer) and functional (interactive) quality (i.e. the quality of the process of service delivery). Previous research (see in Rust and Huang, 2012) notes direct relationship between perceived service quality and satisfaction and some other factors such as service demand, improvement of consumer relationship and loyalty, consumer intention to purchase, re-purchase as well as service recommendation. It is therefore not a surprise that service effectiveness is directly associated with firm's profitability, while service efficiency is linked to economic performance of the firm.

Firms ought to obtain the optimum interrelationship of both efficiency and effectiveness, which results in 'effective efficiency', and satisfaction of consumers' needs at low costs (Sheth and Sisodia, 2002). Despite the importance of 'effective efficiency' to service providing firms, many researchers and service providers (and in particular large firms) tend to focus solely on firm's internal productivity and hence efficiency of service provision ignoring service effectiveness (Rust and Huang, 2012). In the effort to improve efficiency those firms tend to adopt service automation technologies including hardware (e.g. machines) as well as other innovative systems (e.g. digital technologies) (Fitzsimmons, 1985; Johnston and Jones, 2004). The introduction of those technologies allows firms to speed up the process of service provision and, hence, reduce cost related to internal productivity. Parasuraman (2002) notes however that in service productivity 'improvement in only type of productivity is invariably accompanied by deterioration in another'. As a result, the introduction of technologies in service provision while improving internal productivity can have a fatal impact on external productivity (Walker et al, 2002; Xue and Harker, 2002). This is further confirmed by Rust and Huang (2012) who acknowledge that technologies can have a negative impact on consumers' perception of service quality and satisfaction (effectiveness). In spite of researchers' concern about the role of technologies in service provision, service providing firms have been always endeavoured to improve the internal productivity via the adoption of the latest technology (Charles, 1993). Hence, more labours are being replaced with technologies, which on the one hand increase

efficiency by cost reduction, but on the other hand they can decrease effectiveness due to consumers' lower perception of service quality and satisfaction.

The negative effect of technologies on external productivity may indicate that in order to achieve 'effective efficiency' service providers should not implement any technologies in service provision in order to maintain high perception of service quality and consumer satisfaction. However, considering the latest technological advances, which increasingly become indispensible part of consumer daily life, the introduction of technologies in service provision seems to be inevitable. Service providing firms therefore should not ask the question if they should adopt technologies but rather the extent to which they should use those technologies to balance their optimal productivity levels.

This research aims to address this question. Specifically, through the course of this research internal service productivity and external service productivity will be considered to evaluate firms' overall service productivity levels. Furthermore, through the course of this study, it is intended to assess how technologies can balance the optimal level of external and internal productivity, while improving both efficiency of service provision and consumer' perception of service quality and satisfaction (effectiveness). All this will be examined following research framework presented in Figure 1.
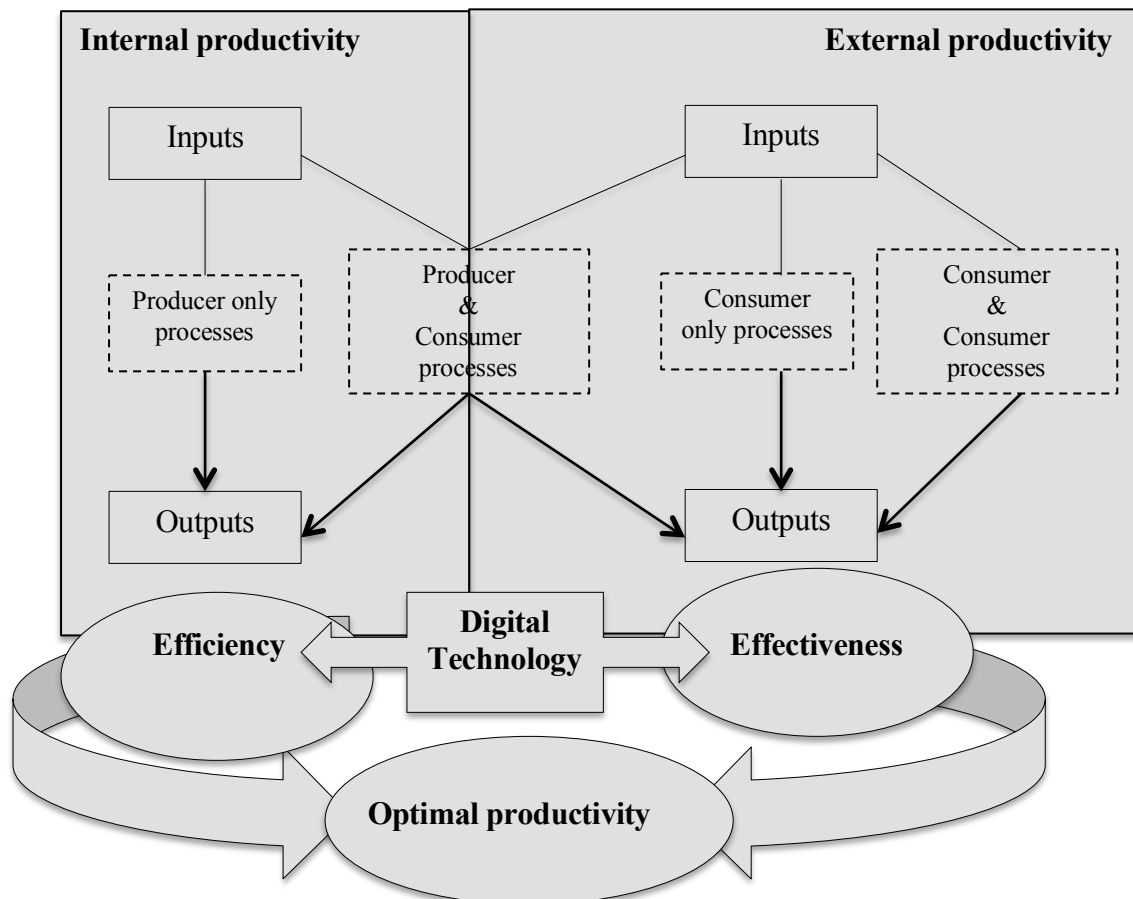

Figure 1. Conceptual framework

Research context and research methodology

According to Curtis et al (1990) prior to assessing service productivity 'the right unit of analysis must be selected'. For the purpose of this study we select educational service as a unit of analysis. The educational services sector comprises of establishments that provide instructions and training in a wide variety of subjects. Those instructions and training are delivered by specialized institutions; including training centres, schools, colleges and universities. Among those institutions, universities play an important role in the UK economy by generating significant income. Their income comes from activities such as research and knowledge exchange, but also from tuition fees. According to a 2013 report by the National Union of Students student spending supports over £80 billion of UK economic output and 830,000 UK jobs. As such, student recruitment and retention is one of the strategic priorities of every UK-based university, which aims to sustain its contribution to the national GDP. Many institutions however find both student recruitment and retention challenging due to continuously growing expectations of students and prospective applicants. The latest HEPI-HEA 2015 Student Academic Experience Survey reports that a majority of students are underwhelmed by their university experience. HEPI-HEA survey further reveals that this is strongly correlated with students' perception of universities prioritising their operational processes (internal productivity) over students' perceived satisfaction and quality (external productivity). Given the importance of the higher education sector to the UK economy, greater research attention has to be put on balancing internal and external productivity of universities, which may be achieved by the means of digital technologies. This research aims to explore this crucial issue by assessing the role of digital technologies in productivity improvement of universities.

To achieve this goal the internal productivity of service producer (university productivity) will be assessed to calculate its efficiency. Next, external productivity will be evaluated (consumer/student productivity) to measure effectiveness and in particular consumer's perception of service quality and satisfaction. Consequently, in the first phase of this research producer and consumer's inputs/outputs will be identified through the course of qualitative research as according to Curtis et al (1990) 'without the right specification of inputs and outputs … productivity measurement in service cannot succeed'.

Curtis et al (1990) further states that 'the inputs and outputs indicators for service must be quantifiable if productivity is to be measured'. As far as producer's inputs/outputs can be directly measured and quantified in for example hours, wages, units etc., the assessment of consumers' inputs/outputs is far more complex. This is because of characteristics of the service, and in particular its intangibility, perishability and heterogeneity which 'place high degree of importance on the psychological outcomes of service experience as much as they do the actual output' (Johnston and Jones, 2004). This is essentially true in case of services such as educational service, which heavily dependents on human interaction (e.g. advice, transition of knowledge or creative activity). To better quantify the outputs some researchers suggest to separate immediate outputs from mediate ones (Gadrey, 1988), or distinguished controllable outputs from those non-controllable ones (Filipo, 1988). Curtis et al (1990) however criticised that this approach is too restricted as while considering consumers' general perceptions it is possible to capture more attributes of service, which are closely linked to consumer's desires. Consequently, the productivity measurement model should deal with multiple inputs/outputs simultaneously regardless whether those are

immediate/mediate or controllable/non-controllable inputs/outputs. Such a model, which includes consumers' perceptions, Curtis et al (1990) argue, is extremely useful in the professional services (e.g. educational service) to improve their productivity levels.

Consequently, following the qualitative phase of the research where inputs/ outputs will be identified to develop a measurement model, the study will proceed to its second phase- quantitative research. Hence, the identified inputs/ outputs of external and internal productivity will be modelled to assess efficiency and effectiveness. Furthermore, during the first-phase of the research, technology used by service providers and service consumers will be identified. This will be used during the quantitative study to evaluate how the digital technologies can improve firms' productivity level.

All this will allow us to extend the existing theory of optimal service productivity while incorporating the external productivity into the equation. Furthermore, this study aims to find an optimal balance of internal and external productivity via the adoption of digital technologies. As such in addition to theoretical contribution this study will also derive practical implications, as it will also help firms, and in the context of this study- universities, enter into a digital age balancing their productivity levels while improving consumers' perception of quality and satisfaction.

Research findings

In order to reach the research objectives, during the first phase of the research project a qualitative research was carried out. Specifically, two sets of semi-structured interviews were conducted; the first set of interviews was carried out with the university operational staff including academic staff, operational staff etc., while the second set of interviews was conducted with students enrolled on courses across faculties of the university. The first set of interviews allowed us to assess operational processes' inputs/outputs as well as a range of digital technologies universities (can) use. The second set of interviews led to a list of inputs/outputs assessed from the consumer (i.e. the student) perspective as well as a list of digital technologies the consumers (are willing to) use.

In total of 25 interviews were conducted. Those interviews were analysed following the principles of content analysis where internal and external inputs/outputs were coded as well as technologies used by service providers and service consumers were identified. The results of the qualitative research are presented in the Table 1 and discussed below.

Table 1. Qualitative research findings

Internal productivity inputs	External productivity inputs
Quantifiable inputs: -Time -Resources (facilities) -Financial resources (funding) -Training	**Quantifiable inputs:** -Time -Recourses (facilities) -Financial resources (money)
Non- quantifiable inputs: -Cognitive inputs (knowledge/ understanding, experience, ideas)	**Non- quantifiable inputs:** -Cognitive inputs (knowledge)

- Skills (time management, organisation skills, communication skills,) -Support (staff support) -Psychological (motivation, engagement, charisma)	-Skills (time management, organisation skills, work-life balance, social skills, work ethics) -Support (staff support, peer support, family support) -Psychological (motivation, engagement, persistence, enthusiasm, curiosity, critical thinking, effort)
Internal productivity outputs	**Student productivity outputs**
Quantifiable outputs: -Research oriented (research, publications, conference attendance, information, impact case study, funding, innovation) -Teaching oriented (lectures/tutorials, staff/students meetings, assignments, student completion rate, new programmes introduction, student satisfaction index, feedback/guidance, student employability rate) -Knowledge transfer oriented (industrial projects) -Other (accreditation/ recognition)	**Quantifiable outputs**: -Learning oriented (degree/qualifications grades, work portfolio, feedback, employability rate/ career prospects) -Knowledge transfer oriented (internships, industry connections)
Non- quantifiable inputs: -Cognitive outputs (knowledge, experience) -Teaching oriented (student support) -Knowledge transfer oriented (networking, industrial engagement) -Citizenship (committees membership, administration) -Other (career progression)	**Non- quantifiable inputs:** -Cognitive outputs (knowledge/ understanding, experience) -Skills **(**project management, team work/team management, problem solving skills, interpersonal skills, practical skills, presentation skills) -Psychological (confidence, satisfaction, professionalism, effort, patience, enthusiasm, willingness, independence)
Technology	
Hardware/ software: computer/ laptop, software, specialised machinery, MS Office, projector/ smartboard **Digital technologies**: Internet, smartphone, Skype, online forum, emails, , social media (YouTube, Facebook, LinkedIn), virtual learning environment, MOOC	

As evident from the Table 1. in the context of educational service both service producer and service consumer require similar quantifiable inputs in order to produce

outputs. Those are time and resources. Specifically both producer and consumer find service production/ consumption to be time intensive activity. This activity requires specific facilities (i.e. estates) as well as financial resources in order for producer and consumer to transform inputs into outputs. In addition to quantifiable inputs, both service producer and service consumer require a range of non-quantifiable inputs needed to produce outputs. It is interesting to note that although those non-quantifiable inputs are similar from both producer-oriented perspective and consumer-oriented perceptive, consumer requires wider range of non-quantifiable inputs to generate outputs. Specifically, both producer and consumer require prior knowledge in order to be able to achieve desired output. Service producer also requires experience and ideas in order to reach assigned goals. Interestingly service consumer needs significantly more support (e.g. peer support, staff support, family support), skills (time management, organisation skills, work-life balance, social skills, work ethics) and psychological inputs (motivation, engagement, persistence, enthusiasm, curiosity, critical thinking, effort) than service provider in order to achieve outputs of the transformation process.

Despite similar inputs of service provider and service consumer, their outputs differ significantly. From the service producer perspective the outcomes can be divided into three main categories; (1) research oriented outputs such as quantifiable publications and conference presentations, impact case studies, funding attracted and innovations/ patterns; (2) teaching oriented outputs including quantifiable lectures and tutorials delivered, student satisfaction index, student completion rate etc., as well as non-quantifiable student support, and (3) knowledge transfer oriented outputs for example industrial projects and engagement with external stakeholders. In addition to those three main categories of producer's outputs, service producer output also concern institution accreditation, prestige or recognition as well as contribution to so called citizenship activities (e.g. memberships in committees and various administration duties). Finally, apart from outcomes being directly related to the institutional outputs of service provision, service producer (i.e. staff) perceive career progression as an important output of inputs transformation.

As it has been mentioned above, despite similar inputs of service producer and service consumer, their outputs differ significantly. The service consumer outputs include quantifiable degree and employment rate being the result of teaching/ learning activities as well as internships, which can be categorised as knowledge transfer oriented outputs. They also include a wide range of non-quantifiable outputs such as cognitive outputs (i.e. knowledge gained and experience achieved) as well as range of transferable skills and psychological outputs, both of which are not listed as producer outputs.

It is interesting to note that in the context of this study both service producer and service consumer recognise key role technologies (both hardware, software as well as digital technologies) play in service production. Specifically all interviewees taking part in the first phase of this research confirmed the importance of technologies during the process of inputs/outputs transformation. This is confirmed by one of the interviewees who said; *'Technology is massive. I think it is one of the cornerstones for modern education. (...) Technology is absolute necessity now.'*

Those technologies include 'old-fashioned' technologies as well as digital technologies which interviewees say *'make life easier'* as they improve communication flow between service producer and service consumer. For example, one of the interviewees recognised the value of telephones saying *'There are old-fashioned technologies such as telephones which can be used in communication between students and staff. They are valuable.'* Another interviewee recognises the importance of online forums remarking *'There is a lecturer who uses forums for students to put their insights*

there but he replies so that's a good way for answering questions.' Yet another interviewee summarises the role of digital technologies in the educational service saying '*Virtual learning environment is key to effective communication'.*

Interviewees seem to recognise the importance of technologies in service provision as it offers (both service producer and service consumer) greater flexibility especially for those who are hard up for time. This is confirmed by the interviewee who said '*Technology in teaching become very important (...) Distance learning MOOCs offer great flexibility not only for students but also for lecturers'*. This is further confirmed by another interviewee who recognises the flexibility modern technology offers saying '*Sometimes when I do not feel like coming, I can read slides online which would not be possible 10-15 years ago, so the Internet makes life easier.'*

Even though interviewees recognise the key role technologies play in service provision, they also acknowledge their limitations. One of the limitations of technologies applied in service provision refers to time needed for human-technology interaction and value deriving from such an interaction, which is evident from the remark made by one of the interviewees; '*Technologies have a big, big role here, but it also has a negative impact. How much time do you spend to make it pretty that adds nothing whatsoever?'*. Another limitation concerning application of digital technologies in service provision refers to lack of service producer and service consumer face-to-face interaction. One interviewee clearly stated '*Technology is very important but face to face meetings cannot be replaced'.*

Based on the qualitative research findings, it became apparent that although technologies play very important role in service provision, not all inputs/outputs transformation processes can be facilitated by the means of technology. This is confirmed by interviewee who said '*Technology is not applied as it should be. You can cover 80% of people needs, but there are 20% you cannot cover.'* This is because while on the one hand technologies can improve internal productivity (i.e. service provider productivity) they can have negative impact on external productivity (i.e. consumer productivity). This is evident by the example concerning PowerPoint given by interviews. Specifically, they say it is '*an expectation'* to use PowerPoint in educational service, however they remark that consumers can be '*dead by PowerPoint'* if it is overused. The interviewee clarifies this phase saying '*I think people can use PowerPoint too much and I think it takes away from the engagement of the class if it is used too much'*. In order to avoid 'death by technologies' balance is needed as noted by another interviewee '*In my lectures I used mindmap. I found that it worked because it was quite fresh, quite different and it kept people engaged. I found that visuals; getting pictures from the Internet, are all great and helpful but can also become a barrier, and hence there is a need to mix those two things.'*

From the above qualitative data it seems to be obvious that technology plays important role in educational service. However, technologies applied in service provision have some limitations, which negatively impact external productivity outputs. Hence as one of interviewees notices there is a need to exploit the use of technologies during service production. One question however reminds open: what is the optimal balance of technologies used in service provision so that 'effective efficiency' and hence optimal productivity levels can be achieved? This question will be examined in the second-phase of this project using quantitative approach with an aim to quantify the correlation between technology and overall productivity level which is a trade-off function of both internal and external productivity.

Conclusion

Traditionally service productivity was measured from firm's internal perspective (i.e. producer perspective), while the external perspective on productivity was ignored. However considering dual role consumer plays in service provision; service consumer and service co-producer, the assessment of service productivity requires not only producer-oriented perspective but also consumer-oriented perspective. Hence this research aims to extend the existing theory of service productivity considering consumer's 'voice' in overall productivity measures. Furthermore, previous research indicates that application of technologies in service sector can increase efficiency of service provision and hence internal productivity, but at the same time it can have negative impact on consumers' perception of service quality and satisfaction (i.e. external productivity). Considering the role technologies play in consumer daily lives, the use of technologies in service provision however seems to be inevitable. Hence, this research aims to evaluate how by the means of digital technologies 'effective efficiency' can be obtained and hence internal and external productivity can be balanced in order to achieve optimal productivity levels.

In order to achieve this goal a two-phase research was carried out in the context of educational service and the results of the first phase (qualitative study) are presented in this paper. The findings reveal a range of inputs/ outputs used by educational service producer and consumer as well as technologies used to transform those inputs into outputs. Furthermore, the results of qualitative investigation confirm previous research findings, which question the excessive use of technologies in service provision.

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