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The impact of non-value added Activities (wastes) in Higher Education on Student Satisfaction

Abstract

Purpose–There have been many applications concerning the use and importance of the waste elimination concept in different fields of industry, however, not introduced in service. Furthermore, previous work on inefficiencies in higher education process has rarely been studied. And how the waste can be identified and measured to improve and gain efficiency has rarely been studied. Hence, the purpose of this exploratory research is to identify major wastes that contribute to student satisfaction within higher education institutions (HEI).

Design/methodology/approach

–The research has been conducted in Postgraduate Program within One University in Egypt, using cross-sectional study through questionnaire to assess students' perception about the extent to which each of the statements representing non-value added activities (wastes) has existed in Higher Education Process, and to measure students' overall satisfaction within institution. SPSS has been used to identify satisfying and dissatisfying factors in customers of higher education through general service indicators like teaching, management, leadership, campus life, academic services and infrastructure.

Findings – A finalized set of nine non-value added activities (wastes) had been identified, founding that only four of the non-value added activities had significant association with student satisfaction; namely: waiting (waiting for excessive signatures or approvals, depe-ndency on others to complete tasks, and delays in receiving information); incorrect processing (duplicative reports or information, repetitive data entry, incorrect information being shared, and duplicative documentation); defects (data entry errors, forwarding incomplete documentation, lost files or records, incorrect information on documents, inefficient file system on desktop PC or in cupboard, and assigning inappropriate staff to serve customer); and knowledge disconnection (people in the process are disconnected from one another).

Originality/value –The analytical contribution of this work is a new framework of 4 non-value added activities (wastes) for HEI. The managerial contribution is identifying the typical operational inefficiencies (four wastes in HEI) that give HEI insight into where the main potential for improvements is found and a point of departure for making HE processes more efficient and thereby diminishing long-term inefficiencies.

Limitations– This research is a cross-sectional study, and thus its design is a limitation as it may not provide any conclusions on the causal associations between variables. Nevertheless, the study involved only one university; so, the results cannot be generalized to the student population in Egypt as a whole. Furthermore, root cause analysis of waste in HEI as well as exploring organizational culture in the context of Lean in HEI remains unexplored.

Key words–students' satisfaction, higher education, non-value added activities, waste

Paper type – Research paper

1. Introduction

Management in private or public production and/or service companies must constantly demonstrate the best possible competitive position (Arlbjørn and Freytag, 2013). Despite the fact that the service industry has got some attention in recent years, there are significant differences between manufactured products and services. Unlike a manufactured product which is a tangible object that can be created, sold and used later, services are intangible, i.e. cannot be stored and are forever lost if not immediately used. Furthermore, services are created and consumed simultaneously (Sternberg *et al*., 2013).This is can be seen in the higher education (HE) process. Historically, the purpose of the higher education sector has been to teach and to conduct research, and for centuries this has held true (Comm and Mathaisel, 2005).

However, higher education institutions have to be concerned with not only what society values in terms of the skills and abilities of their graduates, but also with how their students feel about their educational experience since student satisfaction can be considered as an outcome measure of the education process (Munteanu *et al*., 2010).

However, there are no commonly agreed upon metrics for institutional efficiency, and especially lacking is a metric for student learning and teaching effectiveness (Comm and Mathaisel, 2005). Right now, cost-per-student is the most generally accepted measure of efficiency, because it is easily measured not because it measures the true output of the university (Johnstone, 1997).

These traditional financial measures are often used to evaluate the success of process improvement initiatives. Unfortunately, traditional financial measures are ill-equipped to represent the effects of process improvements and may even prevent process improvements (Schonberger, 2008; Swank, 2003).

The typical approach taken in the past when studying improvement opportunities has been to focus on the value-added process steps (Conner, 2001). All types of non-value added activities are waste, and consequently, must be consistently and thoroughly eliminated (Hines *et al*., 2004; Womack and Jones, 2003; Carlborg *et al*., 2013) in order to maximize value for the customer and minimize the operational waste (Sternberg *et al*., 2013). According to Blücher and Öjmertz (2008), waste is often used instead of the term – inefficiency. Inefficient is defined as "*not producing desired results; wasteful*," and ineffective is defined as "*lacking the ability or skill to perform effectively; inadequate*" (Miller *et al*., 2009).

There have been many applications concerning the use and importance of the waste elimination concept in different fields of industry, however, not introduced in service. Furthermore, previous work on inefficiencies in higher education process has rarely been studied. And how the waste can be identified and measured to improve and gain efficiency has rarely been studied. Hence, this paper sets out to tackle the challenge: *How can the classical seven wastes from a Lean approach be adapted to and tested in higher education institutions in order to achieve student satisfaction*?

Against this background this paper contributes to the emerging field of research on the classical seven wastes from a Lean approach, by developing and quantitatively validating an instrument for identifying and measuring the different types of wastes for HE process.

The rationale is that the research on HE would greatly benefit from identifying and measuring the different types of wastes at HEI. But the instrument is also intended for use by managers in HEI, who are interested in understanding how the waste can be identified to improve and gain efficiency.

This paper is structured as follows. Author starts by reviewing literature on higher education and the classical seven wastes from a Lean approach.Out of this review, author developed a number of desirable characteristics for a measurement instrument, against which existing waste assessment instruments are compared. Then go on to describe how the instrument was developed and validated at postgraduate program in private university. After this, author described the actual assessment instrument, which was based on the previously developed characteristics and an emergent consensus definition of waste at service sector.The paper ends with a discussion, conclusions and suggestions for further work.

2. Literature Review

The literature on customer satisfaction is based on various definitions revolving around concepts such as experience or quality of service, expectations, perceived value and consequent evaluation of service (Ali and Amin, 20-

14). In the context of higher education, students are the primary customers (Sultan and Wong, 2013). According to Sapri *et al*. (2009), student satisfaction plays an important role in determining the accuracy and authenticity of the services being provided. This is further supported by Barnett (2011) who states that satisfaction of students is important as it is the only performance indicator of service quality for service providers of higher education.

The literature on customer satisfaction in higher education research has been often focusing on assessing the link between teaching quality/learning outcomes and student satisfaction. Most HEIs issue feedback/evaluation questionnaires to students, the results of which are often taken as a substitution for student satisfaction (Wilkins and Balakrishnan, 2013). However, student satisfaction is not determined only by the students' teaching and learning experiences but rather by their overall experiences as a customer of a particular institution. For example, Campus support services; Concern for the individual; Registration effectiveness; Service excellence (Elliott and Shin, 2002). Also, a study conducted in Poland, Sojkin *et al*. (2012) identified social conditions, educational facilities, and institutional ability to provide a good intellectual environment; are among the key determinants of student satisfaction in higher education.

A considerable number of studies have examined factors that affect student satisfaction in college (Alves and Raposo, 2007; Annamdevula and Bellamkonda, 2016; Arambewela *et al*., 20-05; Chahal and Devi, 2013; Douglas *et*

al., 2008; Petruzzellis et al., 2006; For-rester, 2006; Gruber et al. 2010; Harvey, 2003; Mai, 2005; Martirosyan, 2015; Mavondo et al., 2004; Munteanu et al., 2010; Pop et al., 2008; Postema and Markham, 2001; Thomas and Galambos, 2004; Umbach and Porter, 20-02; Wiers-Jensenn et al., 2002; Yusoff et al., 2015). Most of these variables were included in the questionnaire of this study. Some commonly identified factors used to measure the general satisfaction with the university include:

1. Learning Experiences (teaching, courses...)
2. Lecture and tutorial facilitating supplies
3. Staff helpfulness
4. Relationship with teaching staff
5. Academic advising
6. Student assessments
7. Classroom environment (size, equipment...)
8. Administrative services
9. Registration process
10. Campus infrastructure (buildings)
11. Support services (IT, library, labs, Textbooks...)
12. Campus safety and security
13. Campus life, social integration
14. Reputation of the university
15. International activities promoted by university
16. Tuition fees

Therefore, in order to achieve students' satisfaction, universities must m-anage every aspect of the student's interaction with all of their service offer-ings, and in particular those involving its people, as services are delivered by people to people (Douglas *et al*., 2006).

Antony *et al*. (2012) stated that the lack of resources (time, budget, etc.) is a huge challenge in many public sector organisations including the HEI. Employees quite often do not get enough time to execute continuous improve-ment projects which result in improved process performance or increased cus-tomer satisfaction. This is due to the lack of conceptual clarification and at-tendant definition of operational me-asures (Pilkington and Fitzgerald, 20-06). Until the higher education sector develops a way of measuring institu-tional contributions to student learning, it will be difficult to properly assess the effect of any particular effort on the quality of learning (Comm and Math-aisel, 2005). Hence, the potential of ad-apting a framework for identifying the different types of waste to higher edu-cation process appears to be essential in order to achieve student satisfaction.

In this paper the higher education is the main focus and value creation is to identify major wastes that contribute to student satisfaction within HE process. The classical 7 waste framework has been used in this work as a point of de-parture for developing a waste frame-work for higher education. This higher education waste framework is based on the same principles as the classical 7 waste framework, i.e. defining waste types related to operational areas that fit higher education institutions. The clas-sical 7 waste framework has become an important tool within the Lean field and despite it being an evolving philosophy, thinking and made out of a constantly expanding set of tools (Hines *et al*., 2004), proper definitions and under-standing of these tools are needed (Åhl-

ström, 2004) to adapt these tools to higher education process.

Waste is a central term in classical Lean literature (Ohno, 1988; Imai, 2001). The use of waste (or muda in Japanese) elimination to drive competitive advantage inside organizations was pioneered by Toyota's chief engineers, Taiichi Ohno and Sensei Shigeo Shingo (Hines *et al*., 2004), and was focused principally on productivity gains rather than improved quality.

The rationale is that improved productivity leads to leaner operations that, in turn, expose further waste and quality problems in the system. In terms of cost, waste refers to any incurred costs such as inventory, set-up, scrap, and rework that do not add to the value of the product (Svensson, 2001).

From the perception of end users, waste is internal and external resources that are consumed without adding value to the customers (Emiliani, 2001), i.e. if a customer is not willing to pay for them, then their existence is considered a waste. This means that the different types of wastes threaten many aspects of performance of the company that customers may value.

Thus the systematic elimination of waste is a systematic attack on the factors underlying poor quality and fundamental managerial problems. From a practical perspective, waste can be categorized into seven categories (as shown in Table I): waste from overproducing; time waiting; incorrect processing; unnecessary movement (motion waste); transportation; excess inventory; and producing defects (Ohno,

1988; Shingo, 1992; Emiliani, 2001; Flinchbaugh, 2001; Slack *et al*., 2009). In addition to these seven types of waste, some researchers have included an additional form of waste such as *unused employee creativity* (Liker, 2004). It is the failure to make good use of all employees. Without the involvement and loyalty of all employees, company will fail to compete as effectively as it could do with their help. Also, Doman (2011) mentioned another waste named *knowledge disconnection* – people in the process are disconnected from one another. The key players in the process don't know what/who is doing what in the process and, in many cases, don't care. These different types of waste are not equal in status or effect (Shingo, 1989).

Moreover, Tapping and Dunn (2006) gave description to the seven wastes in service sector (as shown in Table I). Finally, it is essential to have the original idea "*that it is all about removing waste*!" in mind (Arlbjørn and Freytag, 2013). A systematic and continuous identification and elimination of waste can lead to increased efficiency, improved productivity and enhanced competitiveness. Generally, companies that work towards the elimination of waste in their manufacturing processes realize the following benefits: lower raw material stock and associated holding cost, reduced work-in-process, and lower finished goods inventories; higher levels of product quality; increased flexibility and ability to meet customer demands; lower overall manufacturing costs; and increased employees' involvement (Canel *et al*., 2000). Emiliani (2001) reported that, fundamentally, poor competitiveness is caused by

the existence of large amounts of waste. Reduction of these non-productive activities (waste) eventually saves time and allows more resources to be allocated to improve profitability. Moreover, the principle of continuous improvement by waste elimination has been applied as an approach to improve the performance of production system (Ramaswamy *et al*., 2002). However, Rawabdeh (2005) affirmed that by adopting the principle of systematic waste elimination, this requires thinking and talking in the language of waste. The literature has not addressed the strength of relationships among all types of waste. There is little empirical work of a quantitative nature that adequately defines a comprehensive tool for waste elimination, and which will reduce types of wastes without negatively affecting other causes of waste (Rawabdeh, 2005).

Table I. Types of non-value added activities (wastes)

Waste	Description – production	Description – service
Overproduction	• Producing items for which there are no orders, which generates such waste as oversta-ffing and storage and transp-ortation costs because of excess inventory	• Producing reports no one reads or needs, • Making extra copies, • E-mailing/faxing the same docume-nt/information multiple times, • Asking repetitive information on mu-ltiple documents, and • Asking to attend ineffective meet-ings
Waiting	• Workers merely serving to watch an automated machine or having to stand around wa-iting for the next process step, tool, supply, part, etc. or just having no work because of stock outs, lot processing delays, equipment down time and capacity bottlenecks	• Excessive signatures or approvals, • Dependency on others to complete tasks, • Delays in receiving information, and • Cross-departmental resource commitments
Incorrect Processing	• Taking unneeded steps to pr-ocess the parts. Inefficient processing due to poor tool and product design, causing unnec-essary motion and producing defects. Waste is generated when providing higher-quality products than necessary	• Duplicative reports or information, • Repetitive data entry, • Incorrect information being shared, and • Duplicative documentation,
Unnecessary Movement (mo-tion)	• Any wasted motion employees have to perform during the course of their work, such as looking for, reaching for, or stacking parts, tools, etc. Also, walking is waste	• Movement of people that created by poor layout or design, ineffective eq-uipment or supplies located afar, • Movement of paper that created by poor layout or design, ineffective, and equipment or supplies located afar

Transportation	• Carrying work in process (W-IP) long distances, creating inefficient transport, or moving materials, parts or finished goods into or out of storage or between processes	• Searching for computer files, • Searching for documents in file cabinets, • Repeatedly reviewing manuals for information, and • Hand-carrying paper to another process
Excess inventory	• Excess raw material,WIP, or finished goods causing longer lead times, obsolescence, damaged goods, transportation and storage costs, and delay. Also, extra inventory hides problems such as production imbalances, late deliveries, defects, equipment downtime and long setup times	• Files awaiting signatures or approvals, • Work awaiting task completion by others, • Obsolete files, and • Obsolete office equipment
Defects	• Production of defective parts or correction.Repair or rework, scrap, replacement production, and inspection means wasteful handling, time, and effort	• Data entry errors, • Forwarding incomplete documentation, • Lost files or records, • Incorrect information on documents, • Inefficient file system on desktop pc or in cupboard, and • Assigning inappropriate staff to serve customer
Knowledge Disconnection	• People in the process are disconnected from one another (Doman, 2011)	
Employee Creativity	• Failure to make good use of all employees (Liker, 2004)	

Source: The production description by Liker (2004) and the service description by Tapping and Dunn (2006)

The original framework has several overlapping areas (Shingo,1989) and so this adapted framework has inherited the same characteristic. Similar to other applications of the classical waste framework, some slight adaptation had to be carried out by adding 2 more wastes mentioned by Liker (2004) "*knowledge disconnection*" and "*unused employee creativity*" mentioned by (Doman, 20-11), while still trying to keep as close to the original framework as possible. Suggesting the following hypothesis (as shown in Figure 1):

- **H1**: There is a negative association between *overproduction* and overall satisfaction
- **H2:** There is a negative association between *waiting* and overall satisfaction
- **H3:** There is a negative association between *incorrect processing* and overall satisfaction
- **H4:** There is a negative association between *unnecessary movement* and overall satisfaction

- **H5:** There is a negative association between *transportation* and overall satisfaction
- **H6:** There is a negative association between *excess inventory* and overall satisfaction
- **H7**: There is a negative association between *defects* and overall satisfaction

- **H8:** There is a negative association between *knowledge disconnection* and overall satisfaction
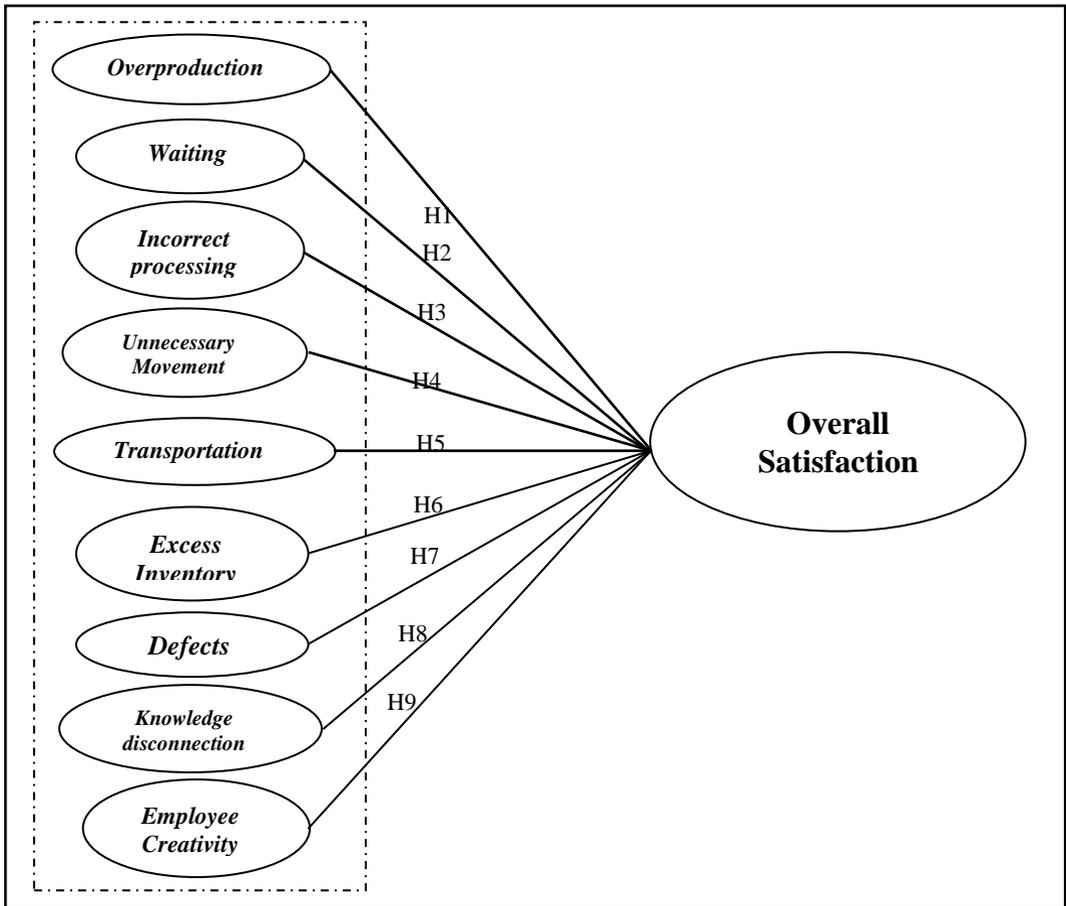- **H9:** There is a negative association between *employee creativity* and overall satisfaction

Figure 1: Suggested Conceptual Framework

3.Methodology for the study

This paper proceeds from the empirical need of new theory and methods to reduce waste in HEI and derives new theories from both empirical data from HE and existing theory on Lean adaptations, where the data are collected at one point in time during September-October 2016. Hence, an Exploratory (Bless *et al*., 2006; Saunders *et al*., 20-00) and Cross-Sectional study (Cohen *et al*., 2013; Gray, 2013) are used to assess the validity and reliability of the instrument.The research behind this paper consists of three parts: a literature study, interview, and questionnaire study. Table II shows the different steps in the methodical approach, the purpose of each step, the data source and the outcome.

Table II. The different steps in the methodical approach

Steps	Literature review	Interview	Questionnaire study
Purpose	To identify the non-value added activities (wastes) within service industry. To identify the factors that affects the students' satisfaction.	To develop further the suggested wastes and the overall students' satisfaction.	To identify the non-value added activities (wastes) that affects the student satisfaction.
Data source	Literature review on relevant literature to higher education and Lean approach in various industries.	Semi-structured Interview with 10 Lecturers at 3 faculties and 7 administrative at 3 faculties to support the internal validity, by removing inappropriate and unsuitable questions, and asking only those questions that are applicable to the objective of this study.	Questionnaire submitted to 320 students at postgraduate program.
Outcome	Classification of the non-value added activities (wastes) in higher education. Identification of the 16 factor that are measuring the student overall satisfaction.	A finalized set of Nine non-value added activities (wastes) to indicate to what extent it exists within the HE process. A finalized set of 16 factor that are measuring the student overall satisfaction.	How can different types of waste be adapted to and tested in higher education institutions? And how it affects student satisfaction?

3.1 The literature study

The literature study focussed on various issues related to efficiency of business operations but also inefficiency, as waste is associated with inefficient operations.The purpose of the work is to investigate how the classical 7 wastes from a Lean approach can be adapted and tested in higher education institutions? And how it affects student satisfaction? Hence, the classical Lean framework from the Toyota Production System design has been studied in the literature.

The research employs the concept of systematic literature review while reviewing the extant research papers (Tranfield *et al*., 2003). Specific management data sources, such as Emerald Insight and Science Direct, were analyzed to identify articles dealing with non-value added activities. Papers written in other languages rather than English are also excluded.

As the purpose of this research is to identify the non-value added activities (wastes) that affect the student satisfaction, this research could be categorized as an exploratory and deductive research. The experimental unit of analysis is the postgraduate student as they are considered the major source of information to achieve the research purpose. Survey research was selected for analytical validation out of the exploratory nature of this research.

2.2Interview study

The aim of the interview study was to develop further the suggested non-value added activities (wastes) and the overall students' satisfaction factors. Due to the novelty of the research area and the exploratory nature of the research, interviews were carried out where interviewees were encouraged to speak freely about the subject of waste in higher education. According to Yin (2-015), this type of qualitative method is appropriate since such approach studies both meanings as well as causes. The interviewee selection was limited to one University at Alexandria, Egypt. All interviews were carried out in person. Meeting notes were sent back to the interviewees for verification in order to increase reliability of the collected empirical data (Yin, 2015). Altogether the 10 lecturers who have good experience in managing and delivering postgraduate educational programs and 7 administrative represented the postgraduate program at one university. They recommended some modifications that were examined and resulted in the final version of the questionnaire. The literature review and the interview study resulted in a finalized adapted waste framework for HEI that was then validated in a validation study.

2.3 Questionnaire study

The key concept in this study is to identify the non-value added activities (wastes) that affect the student satisfaction factors. The questionnaire was used to gather data regarding attitudes of students about the existence of non-value added activities within their institution and their overall satisfaction toward university. The questionnaire consists of three parts: The *first part* seeks the demographic data including participant name (optional), gender, age, and the length of her/his period of study. The *second part* of the questionnaire is designed to assess students' perception about the extent to which each of the

statements representing non-value added activities (wastes) has existed in Higher Education Process (Sternberg *et al*., 2013; Liker, 2004; Doman, 2011), using the following scale (1) Not existed at all and (5) Existed at all activities. The *third part* of the instrument was designed for measuring student's satisfaction with the services offered by a university using a five-point Likert scale ranging from (1) Strongly Disagree, to (5) Strongly Agree. The before mentioned 16 dimensions, covering most aspects to student life, were developed based on an extensive literature review (e.g. Alves and Raposo, 2007; Annamdevula and Bellamkonda, 2016; Arambewela *et al*., 2005; Chahal and Devi, 2013; Douglas *et al*., 2008; Petruzzellis *et al*., 2006; Forrester, 2006; Gruber *et al*. 2010; Harvey, 2003; Mai, 2005; Martirosyan, 2015; Mavondo *et al*., 2004; Munteanu *et al*., 2010; Pop *et al*., 2008; Postema and Markham, 2001; Thomas and Galambos, 2004; Umbach and Porter, 2002; Wiers-Jensenn *et al*., 2002;Yusoff *et al*., 2015).

3.4 Sampling and Data Collection

To achieve the objective of this research, postgraduate students were considered as targeted respondents since student satisfaction is defined as the student experience based on the suggested waste.

Regarding the sample size appropriateness, the sample size calculated by margin of error 10% taken from total population 2100 students. Thus, the sample size of 157 for this research is considered appropriate. For conducting the empirical study, data was chosen from postgraduate students who are stud-

ying at 3 different postgraduate programs within one Egyptian higher education university.

Questionnaire was utilized for collecting data from 320 postgraduate students during the period from August to October 2016. Finally, a total of 157 questionnaires were returned and found to be fit and in handy. Out of 157 respondents, 75 (47.8%) were male and 79 (50.3%) were female. And out of 157 respondents, 156 (99.4%) replied to semester question; 38 (24.2%) were at semester 1, 39 (24.8%) were at semester 2, 47 were at semester 3 (29.9%), and 32 (20.4%) were at semester 4.

3. Validation study

The aim of the validation study was twofold. First, to assess the relevance of the adapted framework to higher education and by that, this this research validate if the nine suggested waste categories fit HEI. Second, to identify major wastes that contributes to student satisfaction with their experience in University.

4.1 Reliability Analysis

Reliability is the assessment instrument property that assures producing consistent results if assessment measures are repeated (Brochado, 2009). Reliability analysis is accomplished through the internal consistent reliability concept which is assessed by calculating Cronbach's alpha (α) for each of the established dimensions. According to Sekaran (2003), the Cronbach's alpha (α) of 0.60 or higher explains a reasonable degree of internal consistency of dimensions. And the inter-item correlations should range between 0.30 and 0.70 for a good scale (Cohen *et al*., 2013).

The value of Cronbach's alpha coefficient for the overall questionnaire (46 items) is 0. 901 and the item-to-total correlations for all of the items are more than 0.30 and significant at 0.05 level. Consequently, no item out of the 46 items had to be removed (30 items for the non- value added activities and 16 items for the general satisfaction with the institution). Table III demonstrates the Cronbach's alpha coefficient for each dimension, as well as the overall reliability of the questionnaire.

Table III. Cronbach's alpha coefficient

Factor	No. of questions	Cronbach's alpha
Overproduction	5	0.853
Waiting	3	0.791
Incorrect Processing	4	0.618
Unnecessary Movement	2	0.807
Transportation	4	0.695
Excess inventory	4	0.780
Defects	6	0.863
Knowledge Disconnection	1	-
Employee Creativity	1	-
Satisfaction	16	0.914
Overall reliability	**46**	**0.901**

4.2 Validity Analysis

It is also important to examine whether the validity of the measurement in this study is acceptable. The non-significant (p-value > 0.05) χ^2 statistic value indicates a good fit because it signifies that the covariance predicted by the design are not significantly different than the sample covariance (MacKenzie *et al*., 2011).

The data collected comprised an interval scale and cross-section. Follow ing the suggestion of some studies (Hair *et al*., 2010); this research tested the correlation between each factor: Overproduction, Waiting, Incorrect Processing, Unnecessary Movement, Transportation, Transportation, Excess inventory, Defects, and Satisfaction – and its related items. The results indicate that there are significant correlations between each factor and their related items (as shown in Table IV), since all significance levels are less than 0.05.

Table IV. Correlation between each items and its factor

Variable	Item	Correlation	Significance level
Overpro-duction	• Producing reports no one reads or needs	0.843	0
	• Making extra copies	0.790	0
	• E-mailing/faxing the same document/information multiple times	0.827	0
	• Asking repetitive information on multiple documents	0.790	0
	• Asking to attend ineffective meetings	0.736	0
Waiting	• Excessive signatures or approvals	0.889	0
	• Dependency on others to complete tasks	0.864	0
	• Delays in receiving information	0.763	0
Incorrect Pro-cessing	• Duplicative reports or information	.729	0
	• Repetitive data entry	0.800	0
	• Incorrect information being shared	0.591	0
	• Duplicative documentation	0.766	0
Unneces-sary Move-ment	• Movement of people that created by poor layout or design, ineffective equipment or supplies located afar	0.911	0
	• Movement of paper that created by poor layout or design, ineffective equipment or supplies located afar	0.921	0
Transpor-tation	• Searching for computer files	0.715	0
	• Searching for documents in file cabinets	0.767	0
	• Repeatedly reviewing manuals for information	0.744	0
	• Hand-carrying paper to another process	0.669	0
Excess inventory	• Files awaiting signatures or approvals	0.755	0
	• Work awaiting task completion by others	0.795	0
	• Obsolete files	0.855	0
	• Obsolete office equipment	0.694	0
Defects	• Data entry errors,	0.770	0

	• Forwarding incomplete documentation,	0.766	0
	• Lost files or records,	0.805	0
	• Incorrect information on documents,	0.813	0
	• Inefficient file system on desktop PC or in cupboard,	0.808	0
	• Assigning inappropriate staff to serve customer	0.674	0
Satisfaction	• Learning Experiences (teaching, courses...)	0.689	0
	• Lecture and tutorial facilitating supplies	0.696	0
	• Staff helpfulness	0.728	0
	• Relationship with teaching staff	0.697	0
	• Academic advising	0.754	0
	• Student assessments	0.695	0
	• Classroom environment (size, equipment...)	0.675	0
	• Administrative services	0.729	0
	• Registration process	0.742	0
	• Campus infrastructure (buildings)	0.671	0
	• Support services (IT, library, labs, Textbooks...)	0.665	0
	• Campus safety and security	0.624	0
	• Campus life, social integration	0.578	0
	• Reputation of the university	0.634	0
	• International activities promoted by university	0.589	0
	• Tuition fees	0.474	0

4.3 Testing Hypotheses

Correlation analysis had been done to test the correlation between non-value-adding activities and the overall satisfaction (as shown in Table V).The results indicate that there are negative significant correlations (significance level less than 0.05) between the overall satisfaction and four non-value added activities dimensions, which are: *waiting* (waiting for excessive signatures or approvals , dependency on others to complete tasks, and delays in receiving information), *incorrect processing* (duplicative reports or information, repetitive data entry, incorrect information being shared, and duplicative documentation), *defects* (data entry errors, forwarding incomplete documentation, lost files or records, incorrect information on documents, inefficient file system on desktop PC or in cupboard, and assigning inappropriate staff to serve custom-

er), and *knowledge disconnection* (people in the process are disconnected from one another) (as sh-own in Figure 2).

Also, there are negative insignificant correlations (significance level greater than 0.05) between the overall satisfaction and five non-value added activities dimensions, which are: Overproduction, Unnecessary Movement, Transportation, Excess inventory, and Employee Creativity.

Table V. Correlation between Non-Value Added Activities and Satisfaction

Non-Value-Adding Activities	Overall Satisfaction	Significance level
Overproduction	-0.120	0.136
Waiting	-0.160*	0.047
Incorrect Processing	-0.191*	0.017
Unnecessary Movement	-0.120	0.137
Transportation	-0.140	0.082
Excess inventory	-0.139	0.085
Defects	-0.177*	0.029
Knowledge Disconnection	-0.179*	0.025
Employee Creativity	-0.66	0.415

*significant at 0.05 significance level

Waiting
- Excessive signatures or approvals,
- dependency on others to complete tasks,
- delays in receiving information

Incorrect Processing
- Duplicative reports or information,
- Repetitive data entry,
- Incorrect information being shared,
- Duplicative documentation,

Defects
- Data entry errors,
- Forwarding incomplete documentation,
- Lost files or records,
- Incorrect information on documents,
- Inefficient file system on desktop pc or in cupboard,
- Assigning inappropriate staff to serve customer

Knowledge Disconnection
- People in the process are disconnected from one another
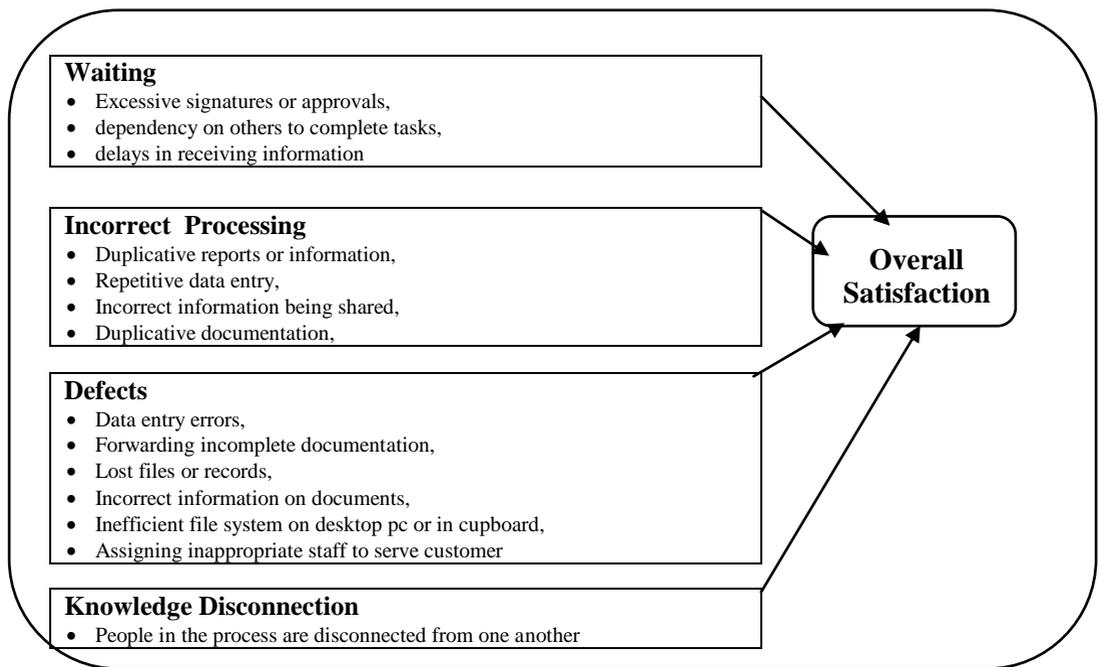
Overall Satisfaction

Figure 2: Supported Framework

4. Conclusion and Discussion

The literature study carried out for this paper reveals extensive evidences of inefficiency at HEI. Furthermore, it indicates a lack of frameworks to describe and analyse inefficiency or waste in a structured way for the higher education. Given that waste in production processes has been described successfully with the well-known seven waste framework and similar frameworks can be found for the service industry. This work attempts to investigate how the classical 7 wastes from a Lean approach can be adapted and tested in higher education institutions? And how it affects student satisfaction?

An in-depth interviews with academics and administrative were carried out to find that the seven classical waste types exist in the HEI. Moreover, two new waste types are needed to complete the description of waste in HEI: "*knowledge disconnection*" (Liker, 2004) and "*unused employee creativity"* (Doman, 2011). Adding these two new types, an adapted framework of seven wastes for HEI was created.

The new framework of 9 wastes in HEI was tested by gathering data regarding attitudes of students about the existence of non-value added activities within their institution and their overall satisfaction toward university, at post-graduate program in One University in Egypt.

The results of this research support the assumption that students' satisfaction with their university is based on inefficiency at HEI. Furthermore, it identified the non-value added activities (waste) in a structured way for the higher education.

Thus, the satisfaction of students seems to be affected by the existence of four non-value added activities (as shown in Table VI), namely: *waiting* (waiting for excessive signatures or approvals, dependency on others to complete tasks, and delays in receiving information), *incorrect processing* (duplicative reports or information, repetitive data entry, incorrect information being shared, and duplicative documentation), *defects* (data entry errors, forwarding incomplete documentation, lost files or records, incorrect information on documents, inefficient file system on desktop PC or in cupboard, and assigning inappropriate staff to serve customer), and *knowledge disconnection* (people in the process are disconnected from one another).

Table VI: Supported /not supported Hypothesis

Hypothesis	Supported / Not supported
H1: There is a negative association between *overproduction* and overall satisfaction	Not supported
H2: There is a negative association between *waiting* and overall satisfaction	Supported
H3: There is a negative association between *incorrect processing* and overall satisfaction	Supported
H4: There is a negative association between *unnecessary movement* and overall satisfaction	Not supported

H5: There is a negative association between *transportation* and overall satisfaction	Not supported
H6: There is a negative association between *excess inventory* and overall satisfaction	Not supported
H7: There is a negative association between *defects* and overall satisfaction	Supported
H8: There is a negative association between *knowledge disconnection* and overall satisfaction	Supported
H9: There is a negative association between *employee creativity* and overall satisfaction	Not supported

As a consequence, this Egyptian university have to monitor their students' satisfaction with the services they offer more closely and the non-value added activities presented in this study that covers most aspects of student life can support institutions in achieving this important goal. Therefore, this university should be more service oriented and treat their students more as customers and keep them satisfied as they otherwise may want to switch to another university.

The *analytical contribution* of this work is a new framework of 4 non-value added activities (wastes) for HEI. The *managerial contribution* is identifying the typical operational inefficiencies (four wastes in HEI) that give HEI insight into where the main potential for improvements is found and a point of departure for making HE processes more efficient and thereby diminishing long-term inefficiencies.

This paper has focused on the issue of the existence of non-value added activities and student satisfaction in higher education. It has hopefully opened up an area of research and methodology that could reap considerable further benefits for researchers interested in this topic.

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