AC 2011-983: USE OF BUZZWORDS IN INDUSTRIAL ENGINEERING EDUCATION

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Use of Buzzwords in Industrial Engineering Education

Abstract

Buzzwords or buzz phrases have been used in the content of numerous industrial engineering courses for several years now. Buzzwords have a finite life, which can last from five to ten years or even more. Many buzzwords that are popular today were not in existence a decade or two ago, while buzzwords that were popular about twenty years back are not in use anymore. Some buzzwords that are currently popular are lean, supply chain management, cellular manufacturing, and quick response manufacturing. Some buzzwords that were popular in the 1980s but are less popular now include total quality management, flexible manufacturing, and group technology. While some educators wholeheartedly embrace the buzzword of the day, some refuse to use them, insisting on sticking to the basics of the science. Many adopt a middle path which means using them but only occasionally. The use of buzzwords in teaching raises numerous questions. Are buzzwords unique to our profession, i.e., industrial engineering? Does a new buzzword in industrial engineering fundamentally alter the content of what we teach or should teach in our courses?

In this paper, we will first attempt to answer questions such as the ones posed above. We believe that answering such questions and studying these issues can significantly benefit our community. Coming up with these answers may also help an instructor uncertain of whether the use of buzzwords is appropriate in teaching. We will make every attempt to develop an objective understanding of the numerous issues surrounding this topic. In particular, we will characterize the roots and origins of several buzzwords that are being used or have been used in industrial engineering. Thereafter, we will study whether their use has impacted industrial engineering education. We will also examine some commonly used websites to determine how important the knowledge of buzzwords is for potential employers of industrial engineering graduates. Finally, we will attempt to determine whether buzzwords confuse students or help them gain a clear vision of industrial engineering. Based on our analysis, we will formulate our own recommendations for use of buzzwords in industrial engineering curriculum. While we have used the word “buzzword” we realize that this word has emotive overtones, and we continue to search for a replacement.

Introduction

Buzzwords or buzz phrases within the scientific and management community can be loosely defined as words containing technical jargon that often convey a principle or describe a method in a catchy manner devised to attract attention. As the name suggests, these are words that are supposed to generate a “buzz,” and hence carry importance and weight during a relatively short period of time. Buzzwords are hence often called fashion words, and sometimes describing a term as a “buzzword” implies that the term is being used to impress listeners and that the user has little understanding of its actual meaning. However, this viewpoint is not universally accepted, since there are many who use

buzzwords regularly and do not believe that use of buzzwords harms communication in any way. In this paper, we will not attempt to take either side, but rather strive to present facts in an objective manner to the best of our abilities. Further, in this paper, our interest is limited to buzzwords used within the industrial engineering community and especially to their use in education.

The rest of this paper is organized as follows. We begin with the issue of whether buzzwords are unique to the industrial engineering discipline. Then, we name some commonly used buzzwords in our discipline and analyze the origins and usage of some of these, including how widespread their usage is. Then, we attempt to answer the question: are there buzzwords that have fundamentally altered the content of what we teach in our courses? Finally, we study students' perspective on buzzwords, i.e., how useful are they in getting them jobs and in particular, if students get confused by the plethora of buzzwords in some courses.

Buzzwords and Other Disciplines in Engineering

The computer science community has recognized that the use of buzzwords is widespread especially in the teaching of computer programming (see Haug-Warberg[7]). Interestingly, however, there seems to considerable literature pointing out to the need for *avoiding* buzzwords in computer science education (Parnas[13]; Zobel[17]). Although a simple google search with "buzzwords mechanical engineering" (or searches with "mechanical" replaced by "electrical" or "civil") does not seem to yield anything specific to mechanical engineering, several websites appear to contain related content when one conducts a search with "buzzwords management," "buzzwords industrial engineering," or "buzzwords computer science." While one must not rely too heavily on google searches, one indication of this is that buzzwords are less popular in the engineering disciplines, such as mechanical, electrical, and civil engineering, whereas they seem to be thriving in management, computer science, computer engineering, and industrial engineering. Perhaps one reason for this could be that buzzwords are popular in the *younger* disciplines of engineering. In any case, we can safely conclude that buzzwords are not limited to industrial engineering.

Some Common Buzzwords in Industrial Engineering

Currently, industrial engineering and the related discipline of operations management jargon appear to be using buzzwords liberally; see Heizer *et al*.[8] for a recent article on operations management. Three of the commonest ones in current usage are: supply chains (or supply chain management), lean manufacturing (or lean), and Six Sigma. Some buzzwords have originated from abbreviations (acronyms) for phrases with three terms: MRP (Materials Requirement Planning), JIT (Just In Time), MTO (Make to Order), MTS (Make to Stock), TQM (Total Quality Management), TPM (Total Productive Maintenance), FMS (Flexible Manufacturing Systems), DFT (Demand Flow Technology), and TOC (Theory of Constraints) to name only a few. Some buzzwords are

terms with two words or just one word: push, pull, group technology, cellular layouts, lean, supply chains, six sigma, takt time, and 5S. We will now attempt to analyze the roots and origins of some of these words.

Lean

There is a great deal of evidence (see e.g., Womack *et al*. [16]) to indicate that the buzzword "lean" originated from Toyota Production Systems (see Taiichi[11]). This buzzword has been used widely in magazine articles, e.g., articles in the *Industrial Engineer*. The word "lean" has even entered the title of a relatively new undergraduate textbook on production planning (see Askin and Goldberg[1]), although this book, like many other textbooks in industrial engineering (see Pinedo[14]; Heragu[9]), tends to use buzzwords very sparingly in its content. Journal papers in industrial engineering appear to use the word somewhat more liberally than textbooks, while the use in conference articles is even more widespread. Many industrial engineering departments have renamed old courses by using the word "lean" in the new names.

Principles found in the Toyota Production System differ significantly from those in traditional production planning texts used in the US in the 1980s and 1990s (see Elsayed and Boucher [4]). In particular, the emphasis of "lean manufacturing" appears to be on minimizing inventory, reducing cycle times and set-up times, and striving for a lower dependence on sales forecasts. This is in contrast to the old production planning of the 1970s where set-up time of one shift was acceptable, long lead times and huge amounts of inventory were common, and manufacturing was carried out primarily on a make-to-stock (MTS) basis. Widespread application of the so-called "lean" principles have led to shorter led times, an emphasis on reduced inventory, and, wherever possible, the use of make-to-order (MTO) or delayed differentiation. Thus, on the basis of the clear change in context of textbooks, it appears that the buzzword "lean" has had a significant impact on how production planning is now taught.

Supply Chains and Supply Chain Management

The phrase "supply chain management" originated in the 1980s (see e.g., Handfield and Nichols[5]). Buzzwords like MRP and logistics were replaced by supply chain management (SCM). It seems like this is yet another buzzword that has not shown any signs of disappearing. Rather, its usage continues to increase. Once again, like in the case of lean, SCM represents a new way of doing business; SCM requires the manager to look at costs not just within the manufacturing plant but in the supply of raw materials (from suppliers) to distribution of finished products (to distributors and customers). In other words, the emergence of SCM was responsible for firms looking at outside of the shop floor for sources of cutting costs. It is hence reasonable to conclude that SCM has led to new emphasis in management, e.g., lead time reduction and inventory control. Books used in business schools (Browne *et al*.[2]; Russell and Taylor[15]) tend to use this buzzword liberally.

Six Sigma

Reducing defects in quality control is not a new concept. Deming popularized it in the 1950s in Japan (see Deming[3]); he also stressed reducing variability and the *immediate* correction of a process that went out of control. The importance was on reducing defects while the process was running (online process control). However, the name "six sigma," and the notion of measuring and then reducing variability in various processes, including manufacturing processes, seems to have gained popularity in Motorola and other firms (e.g., General Electric) in the 1980s (see Pande *et al*.[12]). It is important to note that the principle goal underlying the six sigma philosophy has always been to reduce defects in the process while the process is on. It turns out that a more modern usage of this buzzword is lean six sigma. It is somewhat unclear how TQM, the quality principles of Deming, and the principles of statistical quality control, e.g., designed experiments, process capability analysis, and control charting (see Montgomery[10]) , are different than those espoused in the six sigma philosophy; see however Hambleton[6], which seeks to present six sigma as an independent and new science.

Changing Buzzwords

It appears that some buzzwords like FMS (Flexible Manufacturing Systems) have made way for new buzzwords like QRP (Quick Response Manufacturing) and DFT (Demand Flow Technology), although there is remarkable similarity in what these words appear to convey. "Group technology" was popular in the 1980s but it seems to have been replaced by cellular technologies and cellular layouts. The buzzword TQM was very popular in the 1980s, but appears to have been replaced by Six Sigma in recent times. And yet, are there significant differences between what TQM was supposed to embody and what six sigma covers? This raises the following important question: are some of these buzzwords in fact coined by so-called management gurus explicitly in order to increase the sale of their latest book that attempts to sell their buzzword? While we do not have an answer for that question, it is reasonable to state that some buzzwords like "lean manufacturing" indeed represent a *significantly new* way of manufacturing management, while some buzzwords are examples of old wine in new bottles. We would like to add, though, that at times, using a new attractive buzzword for an old principle may bring new people to our discipline. Overall, it seems prudent to examine every new buzzword with caution to determine if it conveys a paradigm shift in the knowledge base of the industrial engineer. Words that do not satisfy these tests should perhaps be avoided or used sparingly, especially if another already exists which conveys the same ideas. Also, using multiple buzzwords for the same principle (e.g., group technology and cellular technology) can cause great confusion amongst students.

An important question that we believe should be addressed is: Are all newly coined terms buzzwords? The word "sustainable" is being used frequently in the context of manufacturing nowadays. The popularity of this word has a lot to do with the fact that

all over the world there is now a realization that activities of one generation can adversely affect the earth and what is left of this earth for future generations. Hence, whether "sustainable" is a buzzword is debatable; it appears to convey a new idea that was not considered important only a few years back. Similarly, words that become integral part of our lingo for years to come, in our opinion, should not be called buzzwords. It seems that operations research (OR) is one word that withstood this test of time, and although probably regarded as a buzzword in the 1950s is not considered a buzzword anymore. Only time will tell if words like lean or supply chain management belong to this category.

Students' Perspective

Job recruitment websites appear to pay considerable attention to the presence of key current buzzwords in resumes of applicants. As a result, there is a natural tendency on the part of students to learn the latest buzzwords.

We have found that students are often confused by the excessive use of buzzwords they read in job advertisements and magazines. Usually, a lack of knowledge of the latest buzzword leads to numerous questions about them in the class. For instance, one of the authors has faced repeated questions about the differences between "cycle times" and "takt times," and between "cellular layouts" and "group technologies." What is interesting is that sometimes the two phrases are related, and sometimes they are not. It is our belief that an *excessive* use of buzzwords in the classroom can indeed confuse students and prevent them from understanding the basic principles of the science of manufacturing management, many of which have not changed over the years.

Students rarely recognize the fact that many a popular buzzword of today was called something else only a few years back. Relating buzzwords from different generations together, hence, can often lead to clarity and reduced confusion in students' minds. It also helps reinforce the underlying principle. Definitions of buzzwords, e.g., definition of supply chain management from the Institute for Supply Chain Management, are sometimes challenging for the instructor and students, because they tend to be very long. At the same time, buzzwords are usually, by design, opaque and mysterious sounding. Hence, the instructor has to adopt the middle path by making the meaning transparent and at the same time using only a few words for defining it.

Survey questions: The following survey was given to students after they are made familiar with the definition of a buzzword.

1. Do you use buzzwords in your resume?
2. Do you believe that knowledge of buzzwords is essential in securing a paid job?
3. Where did you first hear an industrial engineering buzzword? In a classroom setting, industry, or other?
4. Do you believe buzzwords help strengthen your understanding of the concept or the principle underlying them?

5. Have you ever been confused by the meanings of buzzwords? If yes, could you name some?

The survey was conducted at two different universities. In one university, it was conducted in two different courses, and in the other university, it was conducted in one course. Students surveyed included juniors and seniors. A total number of 47 students were surveyed. Table 1 shows results of questions 1, 2, 4 and 5, while Table 2 shows results from question 3.

Table 1. Number of responses for questions 1, 2, and 4

	Yes	No	Other
Question 1	27	17	3
Question 2	28	6	13
Question 4	23	10	14
Question 5	14	19	14

Table 2. Number of responses for question 3

	Classroom	Industry	Other
Question 3	37	2	8

The category "other" was used for responses that were neither yes nor no (for questions 1, 2, 4, and 5) and neither classroom nor industry (for question 3). We describe the responses in this category for each individual question.

- Question 1: not applicable; not much; and don't remember.
- Question 2: Maybe (two responses); not essential but helpful (two responses); some of them; not sure; quite likely; employers impressed; depends on the job; and really the intellectual level of a person.
- Question 3: Since I started IE; undergrad class; brother; book in high school; art appreciation class; not classroom or industry; and don't remember.
- Question 4: Not really (six responses); maybe; ambiguous; sometimes (two responses); no, but in some cases yes; not particularly; and if you know a buzzword, it's like knowing the word.
- Question 5: Not really (five responses); am new to IE; don't remember (three responses); no, but I have not been exposed to many buzzwords; sometimes; no answer; and it's all just new words explaining old terms.

The examples provided to question 5 where students indicated that they were confused are: lean, lean six sigma, group technology versus cellular layouts, and ERP versus SAP.

It can be concluded 57.4% of students surveyed do use buzzwords on their resumes and 59.5 % believe that the knowledge of buzzwords is essential in securing a paid job. However, 36.1 % do not use them in their resumes, but only a small minority (12.7%) believes that buzzwords are not essential for getting paid employment. A strong

minority (21 out of 47) answered yes on *both* questions 1 and 2. It thus appears that a strong minority may be using buzzwords on resumes because they believe they are useful in getting jobs. Overall, answers to questions 1 and 2 appear to imply that a large proportion of students uses buzzwords on their resume and believes them to be important in securing a job.

Also, a vast majority (78.7%) have claimed that they first heard a buzzword in a classroom setting. Less than half of the students (48.9%) believe that buzzwords strengthen their understanding of a concept, while 21.2 % actually do not agree with this claim. Also, 29.78 % of students claim that they have been confused by the use of buzzwords, while 40.42% of students claim that they have never been confused. The difference between those confused and not confused is about 10%; the fact that 29.7 % of students, which is not a small proportion, have been confused by the use of buzzwords and that 21.2 % believe that buzzwords do *not* strengthen their understanding of a concept has important implications for how we teach their use in our classroom – which is the setting for a vast majority's first exposure to buzzwords. It is possible that the impression that buzzwords are necessary for obtaining paid employment and should be used in resumes may be originating from instructors because a vast majority is first exposed to buzzwords in the classroom. Overall, it also appears that many students are confused by the use of buzzwords.

Job Websites

Since one important goal we have for our students is that they be able to obtain paid employment, we reviewed the content of job descriptions on a popular website for job openings. On 8 December 2010, a search was performed on www.monster.com for jobs described as "industrial engineer" and 28 jobs were analyzed. Table 3 shows the most frequently used buzzwords.

Other buzzwords or phrases each with one mention are: Six Sigma green belt, JIT, poke yoke, ERP, BOM, root cause analysis, RAMS (reliability, availability, manufacturability and serviceability), concurrent engineering, logistics, ISO, MRP, WCM (web content management), decision support tools, and WIP. The buzzword "lean" clearly dominates in the current job market for industrial engineers; 16 out of the 28 jobs used the word "lean," either alone or with "six sigma." In order to help our students prepare to apply for these jobs, we should be sure they are familiar with lean concepts and probably with all the other concepts in the table. For the other buzz phrases we should, at a minimum, be sure that students can recognize buzz phrases, search appropriately for information, and translate what they find into knowledge they already have.

Table 3. Frequently used buzzwords

Lean	13
Kaizen	5
Value Stream	5
5S/Visual Factory	4
Lean/Six Sigma	3
Six Sigma	2
Kan Ban	2
Key Productivity Indicators	2
Mapping, process mapping	2
Supply chain	2

Summary of Findings

We now summarize our findings and come up with some recommendations.

Summary:

1. Use of buzzwords is widespread on job-search websites. Job recruiters expect potential employees to have some familiarity with the latest buzzwords. Thus, a complete lack of knowledge of the latest buzzwords can serve as a handicap for the student.
2. Buzzwords tend to be more frequently used in magazine articles and conference proceedings, but their usage is less widespread in journal articles and even less in books used for instruction. Some buzzwords like lean and supply chain management are however used more widely even in books compared to buzzwords like poke yoke and 5S.
3. Some buzzwords produce a significant impact on the nature of industrial practice and hence our teaching. However, many buzzwords appear to be new names for old principles and sometimes old buzzwords. Hence, great care must be exercised to determine if the buzzword represents new knowledge.
4. The results of the student survey will be presented in the final version of the paper.

Long-Run Considerations and Buzzwords

While we have recommended that students must be prepared to encounter and respond to widely used buzz phrases in their job search (currently "lean" dominates the job sites), we also want graduates to continue to have success. We believe that fundamental knowledge has staying power and will serve students better in the long run. Graduates must be prepared to adapt to new buzz phrases, but also to recognize the fundamental knowledge they have. Without this, it may be difficult to identify root causes and solve the kind of problems of engineers are required to. It is also clear from our survey that students are first exposed to buzzwords in a classroom setting, and hence the instructor clearly has an

opportunity to ensure that students get a good perspective on the use and limitations of buzzwords.

Recommendations

1. Students should be exposed to those buzzwords that have had transformative power on the nature of the subject taught, e.g., lean. Knowledge of these buzzwords is essential in getting a job. Hence, it is essential that the industrial engineering instructor keep abreast of these buzzwords and their usage from going to conferences or reading suitable material. Results of our survey indicate that students believe these buzzwords are important in securing jobs and that employers value them.
2. From the long-run perspective of a student's career, it is essential that the student recognize that the life of most buzzwords is limited and that it is more important to understand the underlying principle rather than the latest buzzword. Without this, the student may not be able to adapt to the new buzzwords of every generation.
3. Buzzwords that confuse students because of similarity with a buzzword of a similar meaning that was in use only a few years back should not be used. In other words, only those buzzwords that contain a significantly novel idea should be exposed to students. Otherwise, there is danger of confusing students. If such buzzwords are used, the instructor should discuss the similarities, and differences if any, between them. The results of our survey also indicate that a significant number of students are confused by buzzwords.
4. Finally, students need to recognize that the principles of industrial engineering do not change as fast as the buzzwords do. Also, many buzzwords promise instantaneous solutions to complicated problems. Embracing one or two buzzwords cannot change the health of any firm; rather, it is essential to go to the root of the matter when solving a problem.

Conclusions

The goal of our paper was to study some of the buzzwords frequently used in industrial engineering, their origins, the nature of their usage, and the impact they have had on our teaching and profession. It was interesting to find that most textbooks avoided using them while job sites such as monster.com used them widely. An important question is: is there a disconnect here that professors of industrial engineering should be concerned about? In our paper, we have tried to analyze this question and numerous other issues in an objective manner, keeping in mind that our long-term goal is to keep our profession alive, healthy, and useful. Also, most educators realize that the education imparted to students must have lasting value, and from this viewpoint, it is important that we teach students about the short life of most buzzwords. From the long-run perspective, it is imperative that students recognize this fact and realize that it is more important to understand the underlying principles, so that years after they have graduated, they are able to identify the correct principles under the new buzzwords of those times.

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