

All-Encompassing Skill Portal for Skills Management and Development

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One of the challenges for new engineering graduates is to find the dream job, and one of the challenges for industry is to find the right engineer to hire. Graduates will have to apply for many companies hoping to get interviews that will give them an opportunity to sell their skills and get the job. On the other hand, companies will have to interview many candidates hoping that they will get the right candidate to offer him/her the job. This is a tedious, time consuming, and costly process for both the industry and the new graduates. Many efforts are done by universities to offer certain general specialties to meet the industry needs. However, changes in universities curriculums are constrained by the curriculum requirements for the offered degrees. Also, curriculum changes are long processes, and by the time the changes are implemented, the industry needs may have already shifted. -Universities are educating students to have a solid skill set and inspire them to be life-long learners, and the companies can provide the training on the job for their new employees to further develop their skill sets.

The authors of this paper propose building a skill portal with all three stakeholders in mind: Students (future engineers), Industry (potential employers), and Academia (educators of the potential engineers to be employed by industry or other sectors). The skill portal will allow the industry (company) to enter their desired skills via a GUI (Graphical User Interface) and save it into a database; allow students to view needed skills per different companies, and the university will design programs and activities (certification programs, in particular, given its flexibility and the potential to integrate it with some courses) to prepare students with the needed skills for certain industry needs. A pilot program is now running to solicit needed skill from the industrial partners of our university, and to encourage the students in a class to pursue a certificate, with both pieces of information to be shared among all the relevant parties. The pilot program will be used to evaluate this program's impact on shortening the time for the students to get the right job after graduation, and the time for the companies to hire the right employee.

Introduction and background

It has been a challenge to prepare engineering graduates with skills that meet the market needs. The U.S. Chamber of Commerce Foundation developed Talent Pipeline Management® (TPM) to alleviate some of those challenges by building a talent pipeline that can empower employers to drive the training programs and have configurable curriculums [1]. TPM have feedback where it can help improve meeting the employer's expectations and prioritize the most in-demand jobs and careers. Credential Engine, a non-profit on a mission, makes skills/opportunities/credentials transparent. Credential Engine have cited 1.076 million credentials in the U.S [2]. However, Credential Engines also reported that \$2.13 trillion spent in education and training by 59690 credential providers across the U.S. [2]. This data shows how huge the spending is, and how wide the range of credentials is. This makes it difficult to narrow down at a specific university or institution to target a specific industry. It will also make it very difficult for students to narrow down on a specific skill/training/certificate. National Association of Colleges and Employers

(NACE) have among their services a talent acquisition initiative that was acknowledged by employers to add value in connecting college to career for students [3].

The above initiatives are great; however, their scope make it impractical for students, employers, and universities.

Whereas there is no ready tool that can help the implementation of the skill portal idea at the level that the authors are proposing, IT of the university development team was involved and are working on the requirements for the development.

The goal of this paper is to make a skill portal which more customizable per program and scalable for department level, college level, and university level.

Skill portal:

The idea of the skill portal is to establish a link among the different stakeholders of an engineering program. Three stakeholders were identified: first, students who are the future engineers seeking jobs in the industry; second, employers who are looking for certain skills that their future employees have; and third, universities, who have certain engineering programs designed to graduate students hopefully with the market needed skills.

The purpose of linking all three stakeholders together is to help synchronize the efforts of the universities to direct their curriculum to serve the industry needs best. Each stakeholder has a benefit of engaging in the skill portal. Employers will have an opportunity to narrow down on their skill needs rather than general description of position's description. Students will be able to see the companies of interest and match the skill they have and/or acquire new skills to match the companies of preference. As for the universities, it will help formulate the curriculum and activities around the curriculum to best prepare students with the needed skills.

The skill portal will be a platform that is based on a win-win-win model. All stakeholders will be empowered to make the best from their perspective. The students want to get the value of their dollar and hope that the program that they pursue will prepare them to get "the-job" that they dream to get. However, the employers are always in need of more contemporary skills and training. Employers have to train fresh engineers that they hire and don't have the needed skills. On the other hand, universities are the main supplier for the market with graduates who should be able not only to run current business, but also to lead the future of the companies that they are hired by.

So all stakeholders have an advantage to gain by using this proposed platform to communicate and coordinate and manage the skills needed for a successful engineer that meets the market expectations.

Skill portal architecture and description:

The architecture is based on three main components, namely: a database, a web application, and a smart engine.

Web application with user interface for different user groups will help manage the data related to users, employers, certificates, and university. A smart engine will work in the backend of the application to generate matches between positions, skills, students/engineers, and planned certificates/training programs.

User Groups:

- | | |
|-------------|---------------|
| 1) Students | 3) University |
| 2) Admin | 4) Employers |

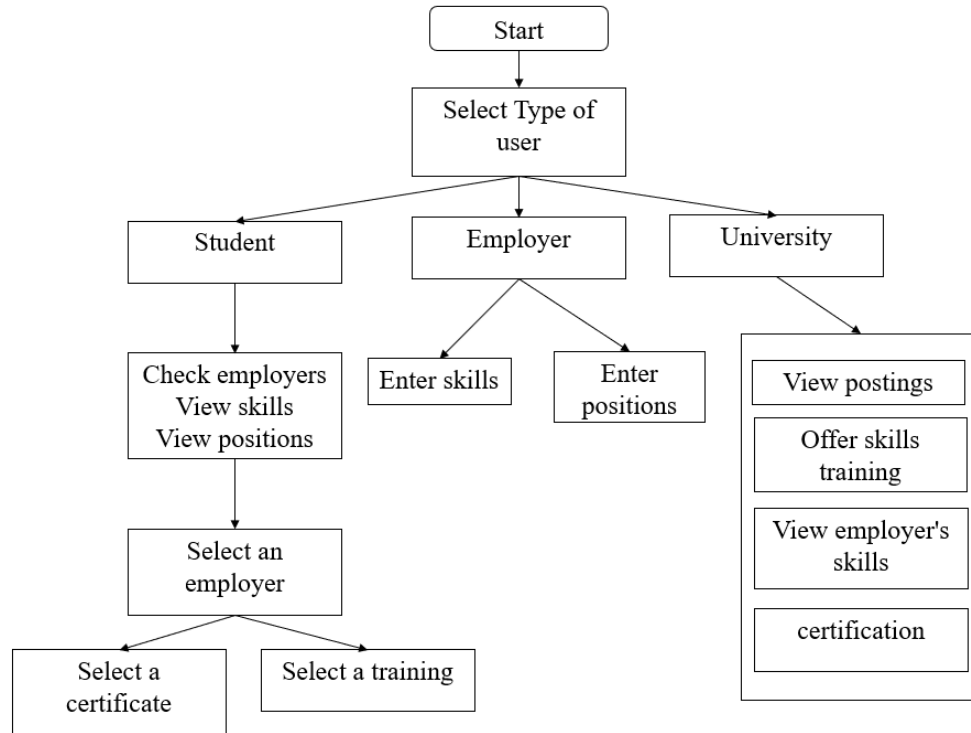
User interfaces:

For every user group there is a dedicated Graphical User Interface (GUI).

The GUI for the students will serve the following functionality:

- Student login with their WCU authentication credentials. Then the student can search for a certain company required skills, a certain certification offered by the university for specific skills, and build/maintain a plan for their certification.
- Employers' login through the system with special permissions and authentications. They can post their jobs, but more importantly the skills that they have openings for.
- University, a program director, or a university outreach officer can login with their university credentials. They can see what the needed skills for the market are, evaluate and re-evaluate the curriculum to check if the curriculum can meet the market needs, and decide on priorities to offer internal and/or external training and/or certification

Skill portal flow chart



Implementation phases:

Phase one: the authors have designed a survey to test the importance and the need for a wide range of certificates. Current students, alumni, faculty, employees, and employers were surveyed.

Survey design:

Survey was very simple and has only three main question to determine the role the person is holding, the certificates he/she has, and the relevancy of the certificates he/she has.

Survey questions:

Q1: Which role(s) below describe yourself? - Selected Choice:

- 1) Current WCU student
- 2) Alum who has had one year experience
- 3) Faculty and/or staff
- 4) Employer
- 5) Industrial Advisory Board Member
- 6) Other

Q2: Experience. Only check the certificate(s) that apply:

- 1) I have this certificate

2) I wish to have this certificate

Q3: If you have checked a certificate, do you think that it is valuable?

- 1) Yes
- 2) Neutral
- 3) No

Q4: Please provide any additional comments if you feel necessary.

Free text to enter general comments about the idea, the certificates list, and any other suggestions. Most of the comments were encouraging the idea and some added other skills.

Survey results:

The survey was send mostly to specific individuals whom they have a certain relationship with the university. There were 97 responses to the survey.

The respondents can choose multiple roles, as some alumni could also be an employer, and/or on the industrial advisory board. The survey was posted on our college’s LinkedIn page, and hence there are a few “Others” who are not affiliated with WCU.

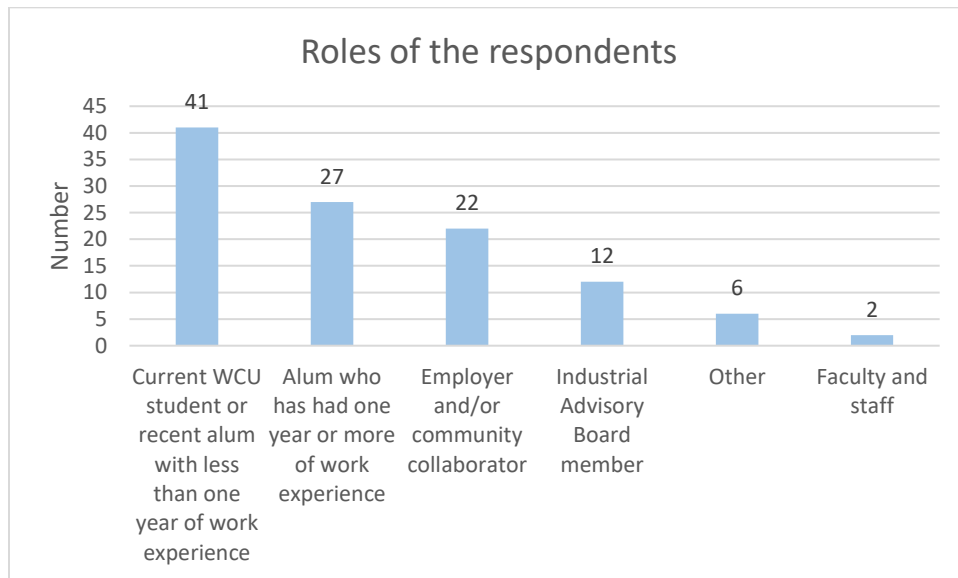


Figure 1. Roles (non-exclusive) of the respondents to the survey

The 32 certificates that are provided in the survey, as well as the ones proposed by the respondents in the “Other” options, are listed in the second column of Table 2. Given the big number of certificates, they are grouped into nine categories, as shown in the first column of Table 1. The absolute numbers of choices on how many people have had a certificate and how many wish to have a certificate are shown in the third and fourth columns of Table 1. A congregated result across categories is shown in Figure 2.

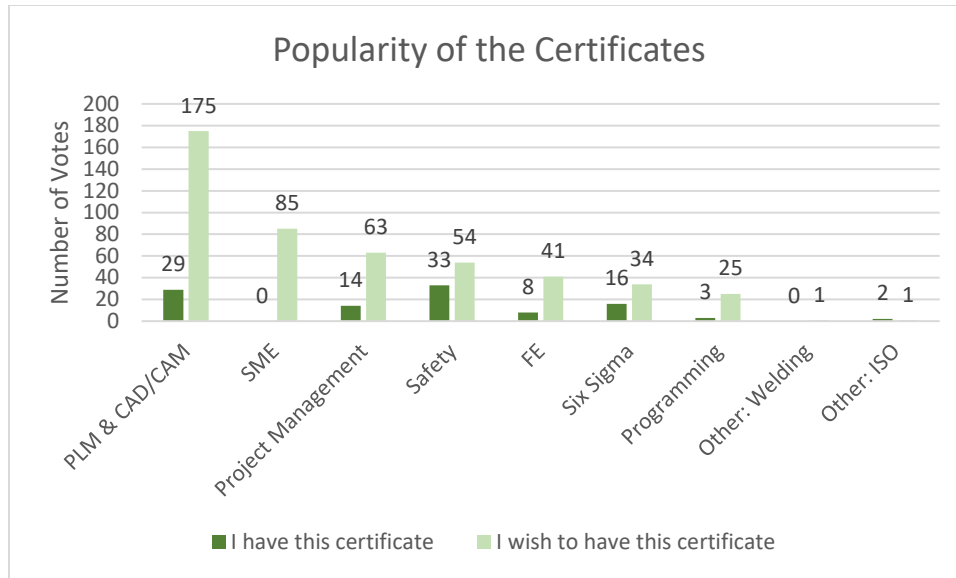


Figure 2. The popularity of each category of the certificates

In Figure 2, the last two categories on Welding and ISO 9000 are written-in answers and hence their counts are not high, but there are people having or wishing to have them.

Table 1. The certificates provided in the survey as well as proposed by the respondents

Categorizations	Certificates	I have this certificate	I wish to have this certificate
PLM & CAD/CAM	Industry 4.0	2	23
	SolidWorks by CSWA	6	35
	CREO	8	30
	Fusion 360	5	29
	MasterCAM	3	29
	Allen Bradley PLCs	3	26
	Siemens NX	0	1
	CNC Milling Operator Certification	0	1
	Fundamentals of GD&T	1	0
	CNC Lathe Operator Certification	1	1
SME	Certified Manufacturing Engineer (CMfgE) by SME	0	34
	Certified Manufacturing Associate (CMfgA) by SME	0	25
	Certified Manufacturing Technologist (CMfgT) by SME	0	26
	Additive Mfg	0	0
	Onshape	0	0
Project Management	Project Management Professional (PMP) by PMI	6	34
	Microsoft Project	8	29

	Certified Configuration Management CM2P (By IpX)	0	0
Safety	Robotic knowledge training and safety	0	1
	OSHA (Occupational Safety and Health Training)	14	31
	CPR, First Aid, etc.	19	22
FE	Passing the FE (Fundamentals of Engineering) exam to be EIT (Engineer in Training)	8	41
Six Sigma	Six Sigma Green Belt	14	34
	Six Sigma Black Belt	2	0
Programming	Labview Associate Developer	3	23
	Matlab	0	1
	Python certification	0	1
Other: Welding	Welding Certification	0	1
Other: ISO	ISO 9000 auditor	1	0
	Iso 9000	0	1
	ISO 14000 auditing	1	0
	Quality Management - ISO 9001 or like	0	0

The respondents are then asked if they think a certificate is valuable for them or not. The absolute numbers of choices on if they think that certificates are valuable or not are listed in the third to fifth columns of Table 2. A congregated result across categories is shown in Figure 3.

Table 2. The value perception of the certificates by the respondents

Categorizations	Certificates	If you have checked a certificate, do you think that it is valuable?		
		Yes	Neutral	No
PLM & CAD/CAM	Industry 4.0	14	8	0
	CSWA by SolidWorks	25	5	0
	CREO	27	6	0
	Fusion 360	21	4	0
	MasterCAM	16	10	0
	Allen Bradley PLCs	21	4	0
	Siemens NX	1	0	0
	CNC Milling Operator Certification	1	0	0
	Fundamentals of GD&T	1	0	0
	CNC Lathe Operator Certification	2	0	0
SME	Certified Manufacturing Engineer (CMfgE) by SME	21	7	0
	Certified Manufacturing Associate (CMfgA) by SME	11	10	0
	Certified Manufacturing Technologist (CMfgT) by SME	15	8	0
	Additive Mfg.	1	0	0
	Onshape	0	0	0
	Project Management Professional (PMP) by PMI	31	2	0

Project Management	Microsoft Project	24	4	0
	Certified Configuration Management CM2P (By IpX)	0	0	0
Safety	Robotic knowledge training and safety	1	0	0
	OSHA (Occupational Safety and Health Training)	31	6	0
	CPR, First Aid, etc.	26	4	0
FE	Passing the FE (Fundamentals of Engineering) exam to be EIT (Engineer in Training)	31	3	0
Six Sigma	Six Sigma Green Belt	31	8	0
	Six Sigma Black Belt	2	0	0
Programming	LabVIEW Associate Developer	15	7	0
	MATLAB	1	0	0
	Python certification	1	0	0
Other: Welding	Welding Certification	1	0	0
Other: ISO	ISO 9000 auditor	1	0	0
	Iso 9000	1	0	0
	ISO 14000 auditing	1	0	0
	Quality Management - ISO 9001 or like	1	0	0

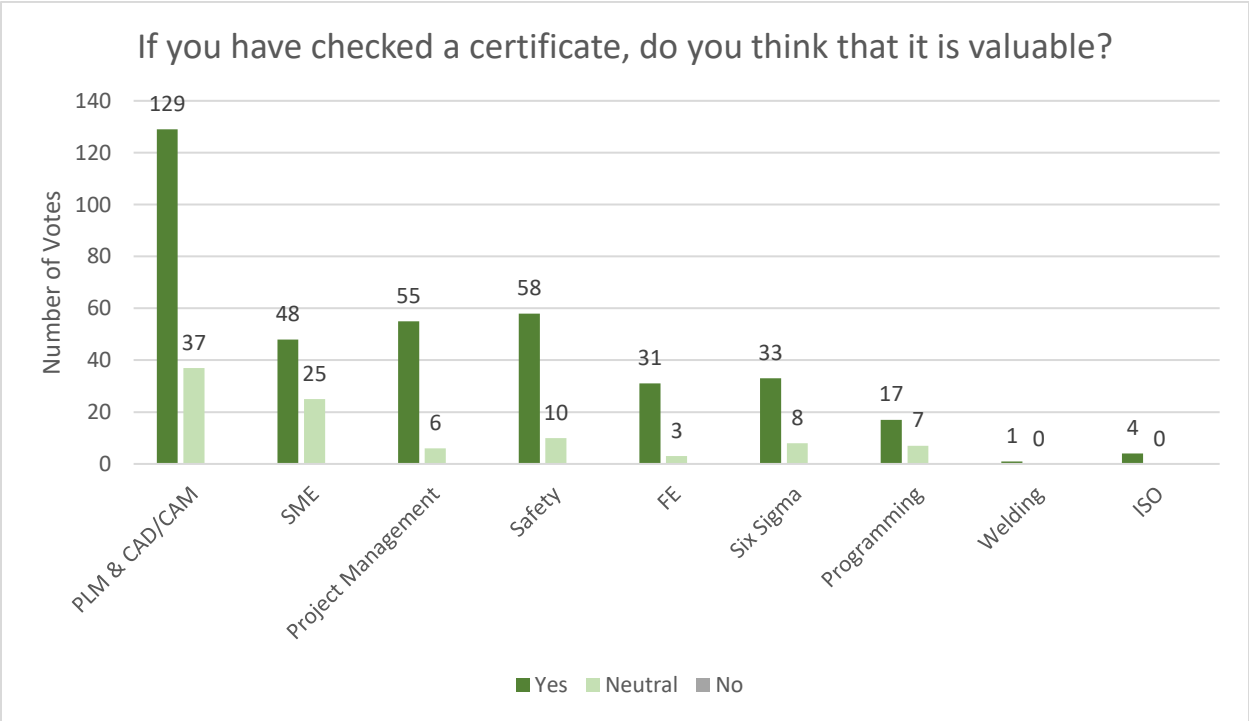


Figure 3. The perceived value of each category of the certificates

Results analysis:

It is obvious from the initial data that the university can prioritize the offering of those certificates and/or training per the demand on the different certificates and the interest in those certificates.

As the skill portal will be available for all stakeholders, university can analyze the saved data for each planning period and offer what maximizes the benefits per resources.

As for the relevancy of certificates to those who have it, the graph in figure 3 shows the distribution of the different certificates relevancy to the participants who have it. Question was general, but a certificate would be relevant to the participant if it impacts his search for “the job” he/she is interested in and the salary of the job with the certificate versus without the certificate.

Conclusion:

In conclusion the authors believe that the skill portal was received well by the participants. Vast majority of participants believe that the idea will be helpful to them whether they are current students, alumni, employers, or industrial advisory board. It is paramount based on the results that the skill portal will be used by universities to drive the qualifying process of their graduates per market needs. It will also, be beneficial for employers to reduce their training cost for new hired engineers. Based on the participants, whose majority was students and alumni, such a service will be of great value for all stakeholders of the system. A pilot application will be built to pilot the functionality with the current students, alumni, employers of the university graduates and beyond.

References:

1. Talent Pipeline Management. <https://www.uschamberfoundation.org/talent-pipeline-management>
2. Credential Engine. Making skills/opportunity/training transparent. <https://credentialengine.org/>
3. National Association of Colleges and Employers. <https://www.nacweb.org/talent-acquisition>