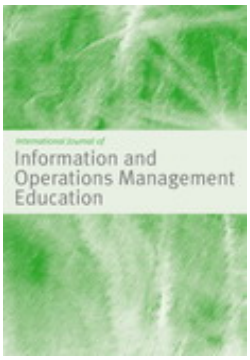

International Journal of Information and Operations Management Education

ISSN online: 1744-2311 - ISSN print: 1744-2303
https://www.inderscience.com/ijiome

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DOI: 10.1504/IJIOME.2023.10061188

Article History:

Received:	06 March 2023
Last revised:	28 July 2023
Accepted:	05 August 2023
Published online:	06 March 2024

Talent development for the knowledge economy

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Abstract: The world's economies are attempting to transform themselves to have a greater focus on developing knowledge as a commodity through innovation. Innovation starts with a creative activity that yields an invention but is augmented through a systematic value driven knowledge management system to yield new knowledge that can create a competitive advantage. To succeed in such an economy, organisations must have or develop the talent that can produce and use information effectively, they must have an ambidextrous organisational structure that allows them to innovate and produce simultaneously, and they must have an innovation management system to sustain effective innovation. In this paper we show how to augment existing university courses to simultaneously develop subject matter and innovation skills in students. We also suggest the incorporation of the new Innovations Management System Standard Series ISO 56000 into business curricula to better prepare students to function in the knowledge economy.

Keywords: innovation; ISO 56000; knowledge economy; innovation management system; curriculum; flipped learning; contextualised leadership development.

Reference to this paper should be made as follows: Swart, W., MacLeod, K. and Fernandez, R. (2024) 'Talent development for the knowledge economy', *Int. J. Information and Operations Management Education*, Vol. 7, No. 3, pp.254–267.

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1 Introduction

Over time, the factors that created economic well-being have changed. Once, it was land that represented wealth (the phrase 'On my honour' meant 'I am pledging the land I hold'). As the exploitation of mineral wealth became normal, a class of craftsmen came into existence, which began the centralisation of population into towns, then cities. The industrial revolution accelerated that movement, as fewer people were needed to work the land, and more were needed to work the factories. Wealth was no longer based on owning land, but on owning the means of production.

The next 100 years were a period of refining the processes of the industrial revolution. Henry Ford developed the assembly line, which led in turn to industrial engineering, a discipline initially devoted to developing the best methods and establishing the time standards that increased productivity. The resulting ability to mass produce items, in particular military items, was perhaps the one single reason why the axis powers were not able to achieve their objective of world domination during WW2. It gave the Allied powers time to harness the mental powers at their disposal and develop innovations that ultimately allowed them to prevail. From the development of radar to the development of the first modern computer (the Turing machine), to the breaking of the Enigma code, and to the development of the atomic bomb, it was the power of the mind together with the resources to turn innovation into reality that eventually won the war. It was the beginning of what we now refer to as the knowledge economy, one where wealth is generated through intellectual resources.

2 The knowledge economy

Having won the war through technological innovation, the intellectual resources that gave the allies the victory were returned to civilian life. These 'operations researchers' (so-called for their work on solving military operational problems) were not immediately welcome in a business world where that term held no meaning or appeal to employers who viewed mass production as synonymous with economic success. Computers, however, were rapidly becoming a reality with the advent of HP, IBM, and Univac and the new computational power allowed the former operations researchers to transfer their former experience and innovative talent to the private sector.

While the military was the catalyst for these innovations and the research universities provided the skilled science base, the transfer of these military innovations to the civilian sector required plentiful venture capital. All of these merged in what is now known as Silicon Valley, the precursor and prototype of a knowledge-based economy (KE). The Fourth Industrial Revolution (Industry 4.0) is an umbrella term for this tech-enabled transformation of industry (Sopheak et al., 2022).

Seeking to emulate the model that Silicon Valley has provided, global organisations including the World Bank, United Nations and the Organisation for Economic Cooperation and Development (OECD) have focused on the importance of knowledge as a vehicle for economic development. The goal is to move economies from a reliance on agriculture, manufacturing, and the exploitation of non-renewable resources (oil, gas, metals, etc.) toward valuing their worker's knowledge and their intellectual property as intangible assets, as the more highly developed economies have done. The OECD has formalised the following definition:

> "The knowledge-based economy' is an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors." (OECD, 2005)

The KE is one in which we mostly work with our minds. It is driven by innovation, and it produces ideas as commodities. It must measurably improve its human capital through lifelong learning so it can continue to contribute in the future. A successful transition to a KE has the potential to vastly improve the economic well-being of its citizens. Using South Korea's transformation as an example, real GDP per capita was estimated at US$1,110 in 1960 increasing eleven-fold to US$12,200 in 2003. In contrast, Mexico's experienced only an increase from US$2,560 to US$5,800. Without the contribution of knowledge, South Korea's real GDP would still have been below Mexico's at the end of that period (Chen and Dahlman, 2006). In another example, Cambodia has implemented a plan to become a KE with higher-income country status by 2050 (Sopheak et al., 2022).

It has been found that the successful transition to the KE typically involves elements such as long-term investments in education, developing innovation capability, modernising the information infrastructure, and having an economic environment that is conducive to market transactions. These elements have been recast by the World Bank as the pillars of the KE and together they constitute the KE framework (Chen and Dahlman, 2006). These pillars are:

- An *economic incentive and institutional regime* that provides good economic policies and institutions that permit efficient mobilisation and allocation of resources and stimulate creativity and incentives for the efficient creation, dissemination, and use of existing knowledge.
- *Educated and skilled workers* who can continuously upgrade and adapt their skills to efficiently create and use knowledge.
- An *effective innovation system* of firms, research centres, universities, consultants, and other organisations that can keep up with the knowledge revolution and tap into the growing stock of global knowledge and assimilate and adapt it to local needs.
- A *modern and adequate information infrastructure* that can facilitate the effective communication, dissemination, and processing of information and knowledge.

The educated and skilled workers alluded to in the second pillar are knowledge workers trained for the KE. Such workers are university-trained 'white-collar, high-skilled' workers. They must have the ability to produce and use information effectively. To be able to maintain competitiveness in response to changing consumer preferences and technological change, companies in the KE have had to re-invent their organisational structure and redefine the requirements of their workforce and management systems (Statz, 2001). Underlying all of this is the assumption that the knowledge dispensed in universities is transferable to the KE workplace.

Yet, even as companies have repositioned themselves to be competitive in the KE, universities appear to be oblivious to the new requirements of employers, continuing to produce graduates more suited to the industrial economy than the KE. KE companies continue to hire university graduates that are lacking the essential 'workplace competencies' and 'interpersonal skills' (team-working, problem-solving, communication, analytical skills) required for employees in the KE and 'innovation leadership skills (aspire, choose, discover, evolve, accelerate, scale, extend and mobilise)' that allow them to succeed and to lead others in an innovative environment (DeJong et al., 2015). Instead of demanding educational reform, many companies are opting to develop more extensive on-the-job training programs and/or supporting employees in obtaining these skills elsewhere (CFI, 2022). A central theme of such programs is that innovation is 90% perspiration and 10% inspiration and is the result of an orderly individual and organisational process that ties innovation to value creation.

3 Universities and the KE

Recall the industrial transformation, from craft to industry to mass manufacturing to knowledge-based that was presented earlier. Education followed a similar pattern – moving from the philosophers of Ancient Greece, talking to their disciples on a porch (Greek *stoa*, hence the name stoics) to the universities of the Middle Ages to the modern expansion of university systems to satisfy the demand for 'educated' personnel to meet the needs of the military-industrial complex.

To do this, higher education systems were designed according to the industrial model of the time – mass production. Students became the raw material to be processed in batches (classes) by a skilled professional (instructor). The instructor applied the same process to all students (lecture) and the results of the process were inspected during production (quizzes). If some defects were encountered (poor performance), corrective action was taken (tutoring, etc.). All products in the batch were inspected at the end of the process (exam) and those that did not meet specification were rejected (failed the course). State universities in particular were organised into 'systems' and large bureaucracies were formed to administer these systems.

The parallels are striking. Large factories had to be built (campuses) with warehouses to house products during production (dormitories) and skilled professionals had to be trained (PhD programs). To assure consistent product quality, all professionals had to process the product in a consistent manner (accreditation). Even personnel followed the same model, as apprentices (graduate assistants) helped professors, while journeymen (assistant professors) had to perform satisfactorily during a training period before becoming masters (tenured).

The above model was successful and provided the professional work force that led the United States to world economic leadership. American products were the envy of the world and were exported around the world. Productivity was the mantra of success. Individuals were expected to follow an engineered method at a standard time and supervisors were charged to make sure that every worker did their task as specified. Individual deviation from the standard by either worker or supervisor was not tolerated.

The evolution of computers and associated information technology allowed for automation and radically changed the world economy. In the more advanced economies manual work was being supplanted by automated work. Globalisation allowed whatever work required manual processing to be shifted to developing countries. The focus of the more highly developed economies became knowledge through innovation. Since it is unlikely that any single worker can generate ground-breaking innovations alone, the afore mentioned 'workplace competencies' and 'interpersonal skills' that include team-working, problem-solving and communication, together with specific analytical skills became essential for survival. Similar core competencies were identified by Dhanabakiyam (2023) including commerciality, client management skills, relationship and communication skills, collaboration, system thinking, and a strong external market focus. A consistent finding is the requirement for knowledge workers to possess 'soft skills'. Ziatdinov (2022) spoke of the shift from valuing hard skills to valuing soft skills among employers. Gordeeva et al. (2021) presented the necessity of developing soft skills in students to impact economic operations. Schislyaeva and Saychenko (2022) predicted a shortage of employees having the soft skills at the same time as employers will have an increasing need of those skills.

The requirement for these workplace competencies was established as early as the year 2000 by many individuals and by prestigious agencies such as the OECD (2005) and the RAND Corporation (Statz, 2001). Yet, a 2021 Association of American Universities and Colleges survey of employers (AACU, 2021) found that the most important critical skills missing in college graduates were the ability to work in teams, think critically, and the ability to analyse and interpret data. Lutz et al. (2014, p.19) noted that while leadership was the most identified skill in job postings, their survey of OM syllabi 'did not suggest that leadership skills are being developed'. Clearly, the higher education establishment has failed to respond to this need.

While it appears baffling that the institutions that constitute one of the pillars of the KE are failing to meet the needs of employers, the reason is simple: they, unlike their constituents, have not had to adapt to external pressures to change. It is not that they cannot change – the disruption to the university environment caused by the COVID pandemic forced institutions out of their complacency and several teachers used innovative online methodologies and developed digital tools to support these methodologies (Shtaltovna and Muzzu, 2021). Unfortunately, having weathered the storm, most institutions fled back to the past, resuming what they were doing before COVID struck.

This flight to the past demonstrates either the inability or unwillingness of higher education to innovate. While our economy has shifted to a knowledge-based model, higher education is still preparing graduates for the manufacturing economy. Specific information and communications technology (ICT) skills may be taught, but according to the AACU they are not perceived as being effective by employers. Neither are collaboration or critical thinking skills. This is a consequence of the process model adopted by higher education. ICT transformed the model of the economy, but not the process model adopted by higher education. For universities, opportunities exist to align current teaching with the needs of employers (Lutz et al., 2014). However, academic ICT is primarily used to support the process model that mass produces 'cookie cutter' students differentiated only by their grades, not their ability to meet the needs of employers in the KE.

This has been allowed to happen because the higher education establishment is not well understood by the public nor most employers. It is viewed as a mystical place populated by wise sages that dispense wisdom to all who enter. What takes place in its ivy-covered walls is seldomly questioned and few hold it accountable for its actions. Both administrators and professors stubbornly want to perpetuate the system, even though it does not need to be what it is. Sopheak et al. (2022) discuss the need for 'individualised instruction' to maximise student results. As far back as 2015, the New Medium Consortium named personalised learning, e.g., mass customisation – as one of the most significant trends in education (Johnson et al., 2015). Personalised learning is a highly individualised, often independent way of learning (Moore, 2016) where every learner brings unique traits to a learning environment. Dhanabakiyam (2023) discusses the need for student talent management, focusing on inclusivity rather than exclusivity, for the industry 4.0 era. An adaptive learning system (ALS) (Saba and Shearer, 2016) can then be used to match their own personal traits with instructional treatments. ALSs are to education as a la carte ordering is to restaurants. Learners can pick and choose what they want to learn, how they want to learn it, and where they want to learn it.

The above conceptualisation is an ideal vision. But ongoing advances in hardware, software, telecommunications systems, instructional systems, instructional design models, curricular system, and academic management systems are constantly facilitating progress toward achieving this vision. As KEs continue to evolve, increasing pressures will be placed on the higher education establishment to move from the traditional mass dissemination of knowledge, as it occurs in lecture-based class, to more individualised approaches that shift the focus from teachers teaching to students learning (Swart, 2016).

In the remainder of this paper, we will take two steps, albeit small ones, in that direction.

4 Developing individual talent for the KE

O'Shea and Hurriyet (2018) note that 'practice oriented experientially grounded programs' enhance student learning and improve employability. However, this is only true if the practice and experiences provided in the programs are those required in the KE. The late Steve Jobs was quoted as saying "Great things are never done by one person; they are done by a team" (Jobs, 2022). According to employers, teamwork is one of the essential skills most lacking in graduates. In response, many faculties have added group projects to their courses. These projects are typically quite specific in terms of what needs to be done and how. A leader is usually designated, the project is broken down into several tasks, and each task is assigned to one or more team members. During the semester, teams usually meet to give reports on the status of their assigned tasks, and, at the end, the various tasks are assigned to one or more individuals to assemble into a report. The fallacy with this approach is that students learn to work in groups, which is not the same as learning teamwork.

The style of leadership is a key differentiator between a group and a team. In a group, the leader knows what needs to be done and how, and the job is to assign tasks and to keep everyone on schedule and budget. Conversely, in a team everyone knows what is to be accomplished, no one knows how. Instead of assigning tasks, the key activity is brainstorming. For brainstorming to be successful diverse team members are essential and everyone must have their opinion heard. In other word, there is no single leader to impose their idea on the group. Whoever has a good idea is the leader when discussing their idea and is a follower when someone else is discussing theirs. Thus, leadership is shared rather than relying on the leadership of one person, so workers in the KE must be equally talented as leaders and followers.

4.1 Where in the curriculum to insert KE talent development?

The short answer is almost any course. Two of the authors have taught in and led both Engineering and Business Colleges and there are multiple options to do this. They currently teach the required Master of Business Administration (MBA) course in Business Analytics. Our institution's MBA program's enrolment is over 700 students, 630 of whom are online. Most online students are fully employed, and a majority have professional and leadership titles in a variety of industries.

The course content consists of the typical business analytics problem solving tools (decision analysis, simulation, optimisation, forecasting and prediction). However, they also teach their students how to communicate the results of analytics projects to top management. The course is responsible for the verbal communication competency of MBA graduates required by the Association to Advance Collegiate Schools of Business (AACSB).

Developing the workplace competencies and interpersonal skills – talents required by the KE but found lacking in graduates in the AACU 2021 Employer Report – makes sense in this course. It is part of most business and industrial engineering curricula, it applies to any organisation, it requires teamwork, and requires critical thinking and analytical skills. The course is about using analytical tools in creative and innovative ways to produce ideas that result in cost savings or increased revenues.

4.2 Course design

The Business Analytics course is taken toward the end of the MBA program. Thus, all students have taken at least one management course. A great majority of the MBA students, however, take several years to complete their degree; hence what they learned may have receded into the depths of their minds. Consequently, an initial period of time – usually the first two weeks of the course – is invested in preparing students for teamwork. This includes a review of group work vs. teamwork (Astin and Astin, 2000) and the four stages of team development (Tuckman, 1965). During that time, students are also engaged in a team member selection process that mimics a sports team fantasy draft:

1 Students take a personality traits test, an emotional intelligence test and a locus of control test.

2 Students post the results on a discussion board together with some additional personal information.

3 Two or more students can initiate a team.

4 Teams can invite students to join their team, or students can ask to become members of a team based on the information posted on the bulletin board.

The initial teaming process ends with each team preparing a team charter that specifies, in measurable terms, what their goal is for the semester and how they will work together to achieve it. The goal indicates the final grade that the team jointly commits to achieve in the course. It furthermore lists what grades the team and each individual in the team must achieve in all graded components of the course to achieve that final grade. Collaboration is encouraged for everyone to achieve their goals which require teamworking skills. Such skills, like safe bike riding skills, cannot be acquired by just reading about them. They must be developed through practice during which mistakes are made which serve as learning moments. To allow the development of teamworking skills, we divided the course into four major modules, each ending in an exam. To prepare students for the exams, each module contained four quizzes, each covering a portion of the material contained in the module. Collaboration to prepare for the quizzes serves to develop teamworking skills.

Whether the course is offered face-to-face or online, the material is learned in a flipped format. In a flipped class, students are required to study the learning materials for the course which consist of an integrated e-learning platform containing text, video-lectures, exercises, quizzes, and exams (Swart and Wuensch, 2016). In face-to-face classes, before coming to class students must read the text material and watch the video lectures. During class, they are given a quiz problem and each team collaborates to develop an Excel spreadsheet representing the problem situation as a model. The instructor acts as a learning coach and consultant to the teams. Once a team has developed the correct model, each team member must take an individual quiz covering the business use of the developed model (Swart and Wuensch, 2016). In online classes, student follow the same learning sequence, except teams collaborate virtually to solve the problem and must take the quizzes prior to a pre-established due date. During this time, the instructor acts as a virtual learning coach and consultant (Swart and MacLeod, 2020).

The exam itself requires the understanding of the material developed by the quizzes, but also demands a ‘stretch’ in that the material must be applied to a novel situation, e.g.,

a team is needed as the chance of any one student being able to solve it alone is minimal. Student teams are given a week to develop an appropriate model. While teamwork is allowed in the development of the model, the exam is individual and covers business questions that require use of the model to be answered.

After each exam, a performance postmortem is held with the class in which student and team performance is compared to each team's goals as stated in their charter. The class is then reminded that 'insanity is doing the same thing over and over and expecting different results'. Everyone in the class is then given the opportunity to write a short paper reflecting on their individual and team performance. In that paper, they are asked:

1 Are you satisfied with your performance?

2 Are you satisfied with your teams' performance?

3 What would you do to maintain (if satisfied) or improve (not satisfied) your and your teams' performance?

4 What have you learned about yourself and your team so far? and,

5 What have you learned about collaboration so far?

The reflection papers constitute the feedback loop that provides corrective action to each student. Experience has shown that it is a very powerful tool. While protecting an individual's identity, it shows when a team has struggling members. Since the team has committed to achieve a certain grade by the end of the term, when it becomes apparent that there are team members that are struggling it sends out a clear message that the affected individual should have asked for help from teammates. At the same time, it also sends a strong message to those who were not struggling that they should have been more pro-active in offering help.

A consistent reflection theme, revealed particularly after the first exam, is that despite being told that this course is not about competing for a grade against your fellow students but about collaborating with your team to achieve the specified individual and team goals, they are skeptical. They have been told their entire academic lives that quizzes and exams must reflect individual work. Thus, they prefer to study for this course as they have for their other courses and in which they have been successful. It often takes till the first exam for the realisation to set in that the material covered is different and consequently more challenging than what they have encountered before, and teamwork may be a necessity rather than an option.

The above-described structure of the class, which we call contextual leadership development, or CLD, gives teams an ongoing opportunity to develop their teamwork skills. The multiple collaboration opportunities are intended to facilitate a team's transition from the initial forming stage through the storming and norming stages and reach the performing stage. The quizzes and exams are the building blocks that develop teamworking skills. The success of the efforts is assessed via the semester long project that is part of the course. This project is intended to expose students to applications of business analytics in real companies. It also has the objective to teach students how to communicate the results of business analytics results to top management. After each student team selects an industry of interest, the project is to communicate to a top management group in a fictitious company in their chosen industry why they should establish a business analytics function in their company. This project requires teamwork because no one in the team has done this before. Hence, they must brainstorm virtually

every aspect of the project to craft a story that will connect to their audience, hold their attention, create understanding and memory, and drive them to take positive action on the establishment of such a function in their organisation (O'Dor, 2017).

4.3 Course success

A detailed study indicated several positive results for the course (Swart et al., 2019). These are summarised below:

- Three MBA classes (136 students) were surveyed as to whether they felt that their leadership abilities as defined by Astin and Astin's (2000) group and individual leadership abilities had improved because of the course. The results indicated that each quality was significantly enhanced.
- An analysis of grades in the course from 2012–2015, prior to instituting the 'contextual leadership development' process indicated a similar number of A's and B's (note that this is a graduate class and grades less than B are rare). After instituting CLD, from 2015–2018, the percentage of A's increased to 80%. We attribute that to the impact of effective teamwork in which individuals assume partial responsibility for the performance of the entire team. Individuals with lesser ability are encouraged to seek help from their teammates, while individuals with greater abilities are encouraged to help their teammates.
- The MBA capstone course is taken at the end of the program and requires a major team project. Prior to this course, students must have completed the business analytics course. We compared the performance in the capstone course of students who took the Business Analytics course with CLD to those who took it prior to the advent of CLD. The results indicated that CLD had a significant positive impact on the grade received in the capstone course.

In addition to the above quantitative measure of success, the course also was named the winner in the Educational Innovation Award Competition held by the Institute for Decision Sciences in 2018.

While Steve Jobs said that "great things in business are never achieved by one person. They are done by a team of people", it should also be noted that a team of people, even if trained as workers for the KE as we have discussed in this section, are unlikely to achieve great things unless they are part of an organisation that pursues innovation in a deliberate fashion.

5 Developing the innovative organisation

Successful organisations in the KE must

- Be able to exploit the benefits from past successful innovations which is best facilitated in a stable organisational environment.
- Be able to explore new knowledge and create new ideas that are better facilitated with an entrepreneurial organisation.

This requires continual organisational change that will allow the firm to operate in an environment of rapid product innovation while maintaining the stability of a production company.

While the two organisational models appear to be incompatible, 'ambidextrous' organisational structures have allowed some firms to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. Because these firms' senior leadership developed an innovation culture and created flexible, adaptive and antifragility-systems, they were able to create competitive advantages by operating in multiple modes simultaneously – managing for short term efficiency by emphasising stability and control and managing for long term innovation by taking risks. Existing capabilities reflect the firm's ability to compete in the current environment. The challenge for senior leaders is to both nurture and refine these and to be prepared to reconfigure these assets as contexts shift (O'Reilly and Tushman, 2007).

The emergence of an ambidextrous organisational structure is seldom evolutionary and more often revolutionary. When there is no clear consensus within the senior leadership team about the requirement for the organisation to shift to be ambidextrous, then the senior leader needs to be prepared to eliminate those who opposed the ambidextrous form. When USA today encountered this problem, CEO Tom Curly replaced five of seven senior managers. At Ciba Vision, 60% of the senior team was replaced, and at IBM new CEO Lou Gerstner replaced almost his entire senior team citing the potential importance of 'public hangings' to ensure focus (O'Reilly. and Tushman, 2007).

Revolutionary change occurs when conflict arises between those who want to focus primarily on the here and now by exploiting past successes and those who want to devote resources to the often-risky exploration of innovation. To reconcile both approaches, innovation should be pursued deliberately and managed systematically. A first step in this direction is to recognise that an invention is not necessarily an innovation. There are thousands of patents or inventions that are approved yearly in most industrialised countries. An invention relates to the technology, process, or product but an innovation is when an invention is deployed, and value is created. Invention is only the initial discovery while innovation is a process that starts with an invention but also includes all the steps of commercialisation, adoption, utilisation, and measurement of success. Unless an invention can be implemented to yield value for a customer or user, it remains an invention. It is the innovation process that leads to a competitive advantage, additional market share and financial gains.

The innovation process begins with invention – creating something new. Creativity has been notoriously difficult to standardise which makes the entire process of innovation hard to standardise. The standardisation of the management of the innovation process has been taken on by the Technical Committee 279 of International Standards Organisation. While much progress has been made in the standardisation of the innovation management system, this committee has not yet found a way to standardise innovation. There are many tools available to enhance innovation, but not to standardise invention and creativity. What the committee has been successful in doing is to develop an innovation management system that standardises the management of innovation and through the ISO 56000 family of standards which is exhibited in Table 1. Their individual descriptions provide guidance as to their content. Additional information is available on ISO's online browsing platform (https://www.iso.org/obp/ui).

Table 1 ISO 56000 family of innovation management standards

Document name	*Description*
ISO 56000:2020	Innovation management – Fundamentals and vocabulary
ISO/AWI 56001	Innovation management – Innovation management system – Requirements
ISO 56002:2019	Innovation management – Innovation management system – Guidance
ISO 56003:2019	Innovation management – Tools and methods for Innovation partnership – Guidance
ISO TR 56004:2019	Innovation Management Assessment – Guidance
ISO 56005:2020	Innovation management – Tools and methods for intellectual property management – Guidance
ISO 56006:2021	Innovation management – Tools and methods for strategic intelligence management – Guidance
ISO/DIS 56007	Innovation management – Tools and methods for Idea management – Guidance
ISO/CD 56008	Innovation management – tools and methods for innovation operation measurements – Guidance
ISO/DTS 56010	Innovation management – Illustrative examples of ISO 56000

6 Incorporating knowledge management into the curriculum

In a recent survey of 1,000 global companies (Boston Consulting Group, 2023), nearly 80% of the respondents named innovation as one of their top three priorities and 66% ranked it as a top priority. Many of these innovative companies already know about the ISO 56000 family of standards and are trying to find ways to implement them to further their innovation goals. This paper has presented a seamless way to introduce teaming skills into existing courses to prepare talent for the KE. These skills are necessary; however, they are not sufficient to prepare students to contribute to companies that have targeted innovation as one of their top priorities and have adopted the ISO 56000 family of standards to manage their innovation process.

While businesses are naming innovation as a top priority and are adopting the ISO 56000 family of standards, it is estimated that only 38 of the estimated 3,982 degree-granting postsecondary institutions in the U.S. have someone in their institution associated with the International Association of Innovation Professionals (IAOIP), where the US Technical Advisory Group (TAG) ISO TC 279 – innovation management, is currently housed. This could be because of academics being generally unaware of their existence and therefore of how knowledge of the standards could be helpful to the student as they go into the world of work where they will be faced with companies who are focused on innovation as their top priority. Institutions whose graduates are likely to be employed by firms in the knowledge industry have a responsibility to equip their graduates with knowledge management skills such as those contained in ISO 56000. Given the general lack of knowledge in academia about ISO 56000, a first step is to support interested faculty in developing their ISO 56000 knowledge which can be accomplished by supporting their live or virtual attendance at one of the ISO conferences and/or workshops (https://www.iso.org/home.html). The faculty member can then be given time to modify their existing course to include ISO material or to develop an innovation management course that includes this material.

7 Conclusions

The KE requires talent that is proficient in team-working, problem-solving, communication, and analytics. We have described how these skills can be seamlessly integrated into a business analytics course. We have also shown that successful companies in the KE need to establish ecosystems which have proven to multiply the results of innovative organisations by creating a culture of collaboration, open innovation, and co-creation. By looking at innovation as a system rather than simply a creative process, all of these factors are integrated. There needs to be a coordinated approach that the organisation can follow to create and nurture their innovation ecosystem. This can only be achieved through the implementation of innovation management system standards such as the ISO 56000 family. Familiarity with these standards is also crucial to future talent for the KE. However, the delivery of this knowledge in academia is more problematic given the apparent lack of familiarity in most universities with this family of standards. To overcome this, faculty must be offered opportunity to learn about these standards and be incentivised to incorporate what they learn into appropriate courses for the benefit of students and their employers.

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