Higher Education and Standardization:

Knowledge Management between Generations

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Abstract

This paper defines and explores the relevance and impact of higher education and standardization on the management of knowledge between generations within the current workforce (through Baby Boomers to Generation Y). This research was conducted using archival evidence, with an interpretivist philosophy and inductive approach.

It was concluded that higher education and standardization can both be effective tools to aid knowledge management between generations. Two theoretical models, the Generational Knowledge Framework and Organizational Knowledge Committees, indicated how higher education and standardization could have a positive knowledge management impact at both the economic and organizational level. The Generational Knowledge Framework also presented a possible solution for employers in innovative businesses, who have difficulty employing science, technology and mathematics graduates.

This study presented opportunities for further research, using different methodologies and strategies, which could widen the scope of this study or add more deductive evidence to the subject. That few answers were found, but many further questions arose indicates how important the subject of generational knowledge management could be to successful, innovative economies.

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1.0 Introduction

The last 40 years have seen the workforce in what feels like a constant state of flux with Baby Boomers replaced by Generation X who are now ceding ground to Generation Y.

As the generations enter and leave, it may be apt to consider there is a need to ensure that the knowledge and experiences of the generations leaving the labour force are not lost. Anthropologist, Elizabeth Lindsey understood the need for maintaining the knowledge of previous generations, saying,

"When an elder dies, a library is burned."
(Lindsey, 2011)

Lindsey's suggestion appears to broach that we need to manage how knowledge is passed between generations and how generations could work together to create further knowledge. This can enable societies, economies and organizations to continue progressing and improving, without fear of haemorrhaging valuable knowledge resources.

Previous work proposed that knowledge management would become a vital tool for Generation Y and become ingrained into practice, almost to a cultural level:

"In the hands of the new generation, Knowledge Management as a concept or theory may subside but not because it is irrelevant. I believe we will see the value of Knowledge Management thrive and integrate itself so closely to Generation Y's lifestyle that it will become a part of mainstream culture. Knowledge Management has no danger of being discredited by the latest generation, we have only seen signs of embracing the concept and helping it grow and reach its potential. It is becoming too big to be defined by business and economy alone and I believe that Knowledge Management is on its way to becoming a staple part of the sociological make-up of Generation Y."
(Hampson-Jones, 2009)

It is suggested the role of knowledge management when looking between generations has a far greater impact than stated by Hampson-Jones. A generation-focused knowledge management structure could have great positive impact, both economically and sociologically. Insuring against the same mistakes made by previous generations, a structure like this could increase the speed and reliability of innovation. On an organizational scale, having a generational knowledge management strategy can ensure the organization's processes and policies are always evolving.

In order to investigate what strategies and tools can affect generational knowledge management, this study will focus specifically on the roles higher education and standardization play in the success or failure of both organizations' and economies' knowledge management strategies.

As the subject of generational knowledge management is so vast, this sort of focus can ensure the recommendations made are much more proactive and can make a practical difference to organizations. It could be argued that the knowledge management traits of both higher education and standardization are similar. They perform knowledge creation roles in different areas of the economy and finding a structure where the two feed into each other and indirectly collaborate could improve the performance of both sectors; assisting individual organizations and the wider economy.

With the scope of the study set, three objectives have subsequently been established against which, success of the research can be measured:

1. Explore knowledge management theories and frameworks available to and used by governments and organizations.

2. Analyse higher education's role within the context of it being a possible component of an economic knowledge management strategy, making appropriate recommendations.

3. Examine the role of standardization within the same knowledge management context, exploring how it could affect economic and organizational strategies, also making recommendations.

The following chapter explores the knowledge management theories which frame the analysis later in this work. Chapter 3 looks at defining the generations and understanding the traits that present unique factors for consideration when engaging and managing each generation. Chapter 4 looks at the role higher education plays on the economy; specifically how this sector of the economy is structured and the role of autonomy within it. Chapter 5 makes a similar exploration of the standardization sector, first explaining what standards and standardization involves, how organizations may be compliant to these standards and, finally, the benefits that standardization and compliance to standards can bring an economy and an organization. Chapter 6 recommends two methods which could improve knowledge management between generations both economically and within organizations. Finally, conclusions from the previous analyses will be discussed in Chapter 7 and appropriate further research, based on the explorations in those earlier chapters, will be recommended.

2.0 An Overview of Knowledge Management

Central to this study is the role of knowledge management, but how is knowledge management defined and what effects can it have on a business or an economy?

Over the course of this chapter, knowledge management theory shall be evaluated and provide the grounding for both this study and the recommendations arising. Of particular interest is the building of practical knowledge management models and the tools used by organizations to manage their knowledge as well as the knowledge economy as a concept, all of which have a strong influence on the recommendations made later. The second half of this chapter is devoted to how the generations have been defined, the challenges of generational transition and will explore any relationship between knowledge management and the generations.

2.1 The Theories behind Knowledge Management

Drucker was arguably one of the first academics to introduce knowledge management as a concept in the context of the economic success of organizations, when he said,

"To remain competitive-maybe even to survive-[most businesses] will have to convert themselves into information-based organizations, and fairly quickly. They will have to change old habits and acquire new ones. And the more successful a company has been, the more difficult and painful this process is apt to be."
(Drucker, 1988)

Drucker's work appears to have been written with the intention of being revolutionary; however it also appears to be evoking the Zeitgeist, judging by research that followed. Noticing the importance of a computer-savvy workforce, Drucker was sounding a warning that the future would be dictated by a de-industrialization of society. This intellectualization of industry would widen the effect knowledge would have on organizations and industry and exponentially increase the importance and benefits of managing that knowledge. This was the "knowledge economy". Migration towards the knowledge economy was believed by Drucker to have begun in America as post-World War II de-industrialization saw the labour market forced away from 'blue collar' jobs and herded towards information-focused 'white collar' roles. These jobs required the labour force to transfer their skills and become, as Drucker terms it, "knowledge workers". Knowledge workers are college-educated and adept at dealing with intangibles, using data, information and knowledge to empower themselves enough to make educated decisions as opposed to performing rote tasks. The knowledge worker's traits evolved and became more virulent as the knowledge economy rose. These workers did not believe that to become a good manager they needed to work through the labour roles and up the organizational ranks. Instead, the knowledge workers preferred to educate themselves to increase the speed of

their rise to management – in some cases moving in to management immediately after furthering their education. This impression of advanced mobility is proposed by Drucker's belief that the root of the knowledge economy can be found in those post-WWII years, where he declares,

"One possible factor may have been the GI Bill of Rights after World War II, which by offering a college education to every returning American veteran established advanced education as the 'norm' and everything less as 'substandard'".
(Drucker, 2007)

Drucker believed the shift towards the knowledge economy was complete by 1990; however one could argue against this theory by referring back to Senge (1990), as well as Davenport and Prusak (2000), who refer to a continuous evolution of knowledge. It could be argued that the shift to a knowledge economy could never be a complete shift due to the need for economies to be diversified, mitigating the risk of economic failure.

Whilst Drucker was highly influential in knowledge management's conception at a purely theoretical level, other academics created the tools and structures for the process to thrive. Nonaka's influence came in taking Drucker's ideas and applying them to real world practices, creating definitions of knowledge and identifying practices of management of that knowledge in the real world. Nonaka decried the Western management structures and their approach to information, saying,

"Deeply ingrained in the traditions of Western management, from Frederick Taylor to Herbert Simon, is a view from the organization as a machine for "information processing". According to this view, the only useful knowledge is formal and systematic – hard (read: quantifiable) data, codified procedures, universal principles.

And the key metrics for measuring the value of new knowledge are simply hard and quantifiable – increased efficiency, lower costs, improved return on investment."
(Nonaka, 1991)

Nonaka's preference was for companies to transform their cultures in to being more like their Japanese counterparts who, he believed, were much more understanding of the organic nature of innovation. Nonaka believed that the Japanese approach was concerned more with the creation of knowledge rather than the processing of information. These companies understood the importance of adding contextualization to information gathered to create knowledge; subjectivity, instinct and insight play just as important a role in innovation as data. Nonaka went on to use this approach to define knowledge in detail with the example of Ikuko Tanaka, declaring that,

"Explicit knowledge is formal and systematic. For this reason, it can be easily communicated and shared, in product specifications or a scientific formula or a computer program. But the starting point of Tanaka's innovation is another kind of knowledge that is not so easily expressible: "tacit" knowledge, like that possessed by the chief baker at the Osaka International Hotel. Tacit knowledge is highly personal. It is hard to formalize and, therefore, difficult to communicate to others."
(Nonaka, 1991)

This example referred to the creation of a bread-making machine by Muatsushita Electrical Company, of whom Tanaka was an employee. Using science and the previously captured knowledge available, the company was unable to understand why the bread maker could not produce bread that was cooked through. The specific issue appeared to be the kneading of the dough. It was only when Tanaka observed the process that she realized there was a specific technique that the hotel's baker had mastered over years of experience. The baker had experimented, looking at previous documented knowledge, trying new techniques and discovering the best method through hands-on discovery. The difficulty, Nonaka realized, was in understanding the nature of these two forms of knowledge and how to translate this knowledge so it is not lost and can be practically applied. This process of translation was key. Nonaka defined the two types of knowledge as explicit and tacit, with the former referring to previously documented knowledge and the latter referring to the knowledge of experience.

With these definitions, Nonaka was able to set out a model defining how knowledge can be created and transformed, seen in Figure 1:

Tacit to Tacit

Observing, imitating and practising under the mentorship of an employee. Also known as 'socialization'.

Tacit to Explicit

Using data from around the company and applying personal tacit knowledge to create a new source of knowledge. Also known as 'externalization'.

Explicit to Tacit

Absorption of a new source of knowledge in to personal process, converting the knowledge in to tacit knowledge. Also known as 'internalization'.

Explicit to Explicit

Collating data from different sources to create a new knowledge source. Also known as 'combination'.

Figure 1 - Nonaka's model of knowledge transfer (Adapted from Nonaka 1991)

A knowledge management strategy could be mapped to this model to evaluate its effectiveness and make recommendations for improvement. Whilst some may feel that a 'combination' focused strategy (Explicit to Explicit) could appear the most achievable aim, shifting a strategy towards one area would prove disastrous-as Tanaka's experience shows. To fully harness the knowledge within an organization and nurture innovation, a knowledge management strategy must look to balance creation and transfer between all stages.

2.2 Knowledge Management in Practice

So how can Nonaka's model be integrated in to knowledge projects effectively? The difficulty in doing this comes from the conceptual nature of knowledge management philosophy, as Davenport and Prusak explain,

"Knowledge management is an evolving practice. Even the most developed and mature knowledge management projects we studied were unfinished works in progress. Most of their managers, however, were able to articulate specific business and knowledge management objectives, some had already achieved some of their goals."
(Davenport & Prusak, 2000)

Knowledge is a continuously moving concept as once it is mastered it becomes a catalyst for further knowledge discovery. Perhaps this could appear to imply a generational influence on knowledge creation? Davenport and Prusak appear to acknowledge this when they studied the management of a number of knowledge-based initiatives. From the results, there appeared to be three categories of knowledge management projects: knowledge repositories, knowledge access and transfers, and knowledge environments.

Knowledge repository projects collate information, data and knowledge to make it accessible to a wider base. Figure 2 details the three forms of repositories discovered in Davenport and Prusak's research:

Repository type	Knowledge held within repository
External knowledge repositories	Competitor or openly available market knowledge
Research structured internal knowledge	Internally produced research
Informal internal knowledge repositories	Captured tacit knowledge built up through employees' experiences

Figure 2 - The three types of knowledge repository projects (adapted from Davenport and Prusak, 2000)

One issue with knowledge repositories is they merely consolidate knowledge and are not exploratory, meaning new knowledge is most likely to be collated rather than evolving from these projects.

Knowledge access and transfer projects create a pull system for knowledge transfer. That is to say that a person seeking certain knowledge is directed, through the system resulting from this project, to the individual or resource that could provide that knowledge. Transfer then occurs once the two are connected. Rather than being a library of the knowledge itself, as a repository would be, this system is a database of resources instead. By working this way, it is possible that knowledge creation could occur at the point of transfer; however there is no mechanism to capture or distribute that knowledge.

This makes the knowledge environment the most proactive of knowledge projects. These projects focus on creating a culture of knowledge and are driven by the work needed to create and manage a learning organization.

2.3 The Learning Organization

A learning organization is an organization that has become skilled at creating and transferring knowledge within it; able to respond to that knowledge and, if necessary, modify its behaviour accordingly. The theory replicates how an individual learns and the benefits, whilst not all tangible, generally err towards the long-term. Senge was one of the architects of the learning organization concept, describing it as an organization,

"...where people continuously expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together."
(Senge, 1990)

Senge's words echo Davenport and Prusak's previous assertions of knowledge management as an evolutionary practice, but add a pragmatic element by adapting these assertions for organizations. Creating a learning organization is an ideal many companies aspire to, but are rarely able to reach. Garvin supported the learning organization model and believed in five vital areas for companies to encourage focus upon. Each of these has distinct mental approaches, behaviours and tools to succeed, which Garvin goes on to describe:

"Learning organizations are skilled at five main activities: systematic problem solving, experimentation with new approaches, learning from their own experience and past history, learning from the experiences and best practices of others and transferring knowledge quickly and efficiently throughout the organization."
(Garvin, 1993)

The areas noted by Garvin interlink with the component technologies referred to in Senge's work. Senge's component technologies – systems thinking, personal mastery, mental models, shared vision and team learning – could all be mapped to Garvin's solution, adding strength not only in the theories of both but in the potential practical applications which is seen in Davenport and

Prusak's later work. Whilst the concept of the learning organization could be argued, as knowledge management can, to be theoretical, it is difficult to deny there are practical aspects to the strategies; suggested by Nonaka, Senge and Garvin and evidenced in Davenport and Prusak. The pragmatic approach of knowledge management is very closely linked to the technologies available, which can be used to drive relevant projects.

Hansen, Nohria and Tierney look at the technological relationship between knowledge management projects' theory and practice and how technological infrastructures could be the bridge between concept and practice. The study describes two knowledge management strategies which have been discovered in a number of consultancy firms: codification and personification. Of the strategies, codification mostly deals with the explicit knowledge, whilst personification is concentrated on building creativity and individual expertise through tacit knowledge. The authors appear to believe these approaches work at odds to each other when they discuss the different technology requirements:

"The two knowledge management strategies require different IT infrastructures as well as different levels of support. In the codification model, managers need to implement a system that is much like a traditional library – it must contain a large cache of documents and include search engines that allow people to find and use the documents they need. In the personalization model, it's most important to have a system that allows people to find other people."
(Hansen, Norhira, & Tierney, 1999)

Further discussion on the subject brings forth interesting revelations. As Figure 3 shows, Hansen, Norhira and Tierney appear to believe reducing investment in technology will deliver more progress when pursuing a personalization strategy but, conversely, indicate investing heavily in technology when working to a codification strategy will bring the greater results:

How Consulting Firms Manage their Knowledge

Codification	Competitive Strategy	Personalization
Provide high-quality, reliable and fast information-systems implementation by reusing codified knowledge.		Provide creative, analytically rigorous advice on high-level strategic problems by channelling individual expertise.
Reuse Economics	**Economic Model**	**Expert Economics**
Invest once in knowledge asset; reuse it many times.		Charge high fees for highly customised solutions to unique problems.
Use large teams with a high ration of associates to partners.		Use small teams with a low ration of associates to partners.
Focus on generating large overall revenues.		Focus on maintaining high profit margins.
People-to-documents	**Knowledge Management Strategy**	**Person-to-person**
Develop an electronic document system that codifies, stores, disseminates and allows reuse of knowledge.		Develop networks for linking people so that tacit knowledge can be shared.
Invest heavily in IT; the goal is to connect people with reusable codified knowledge.	**Information Technology**	Invest moderately in IT; the goal is to facilitate conversations and the exchange of tacit knowledge.
Hire new college graduates who are well suited to the reuse of knowledge and the implementation of solutions.	**Human Resources**	Hire M.B.A.s who like problem solving and can tolerate ambiguity.
Train people in groups and through computer-based distance learning.		Train people through one-on-one mentoring.
Reward people for using and contributing to document databases.		Reward people for directly sharing knowledge with others.
Andersen Consulting, Ernst & Young	**Examples**	McKinsey & Company, Bain & Company

Figure 3 - How Consulting Firms Manage Their Knowledge (Hansen, Nohria & Tierney, 1999)

Hansen, Nohria and Tierney believe that over-investment in technology could make processes complex and cumbersome if out of sync with the organization's strategy, however one must question whether this is still relevant in the contemporary society. Upon examination, it appears that the personalization model, alongside Garvin and Senge's learning organization analyses, could have an increased impact when the processes are integrated within the knowledge economy. That said, technology has arguably played an important part in the development of the knowledge economy; becoming most recently one of the most vital drivers of the economy. Software to enhance the knowledge cycle has been developed and many organizations have the opportunity to choose their technology strategies and tools, rather than spend costly time and resources developing them in order to enter or maintain position in a market.

It is very noticeable that a majority of knowledge management theories were constructed over a decade ago and we have seen, in that time, a new generation enter the labour force; a generation which might understand the importance of learning and knowledge to the organization but not the reasons why they are important. It is for this reason that defining the generations and their traits becomes significant. Understanding how they interact, specifically in a knowledge management context, could benefit organizations and economies.

3.0 Defining the Generations
3.1 Who are the Generations?

There has been a comparatively rapid shift in business thinking over recent decades.

Davidson appears to believe this evolution could be linked to the rise of the internet, saying:

"Just as steam power and the assembly line changed the 20th century, two inventions have changed the workplace in the 21st: the internet and the World Wide Web."
(Davidson, 2011)

Technology has always been an important catalyst to generational shifts. As Davidson says, many shifts have been the result of disruptive technologies. While technology is undoubtedly important, one cannot assume it is the only defining factor of a generational perspective. Drewery et al. (2008) explored the different aspects of the generations and discovered a number of traits. Most interesting is that the study discusses the presence of knowledge workers throughout the summing up, but frustratingly does not expand on this elsewhere. The definition within this research is detailed in its analysis, looking at the size of the population and influential business movements, as summed up in Figure 4:

Generation	Born	Current age	Approximate Size	Business influences
Veterans	1939-1947	>60	11% of workforce	Hawthorne's Observational Experiments. Early personality tests such as 16PF
Baby Boomers	1948-1963	45-60	30% of workforce	MacGregor's Participative Management Drucker's Management by Objectives Total Quality Management
Generation X	1964-1978	30-44	32% of workforce	Transformational Leadership The Learning Organization Peter's Search for Excellence
Generation Y	1979-1991	16-29	27% of workforce	Porter's Strategic Thinking Organizational Core Competence Piore & Sabel's Flexible Specialisation Womack's Lean Production
Generation Z	1992-2008	<16	Yet to enter workforce	Kaplan's Balanced Scorecard Covey's Seven Habits of Highly Effective People

Figure 4: Pine et al.'s Mass Customisation Kidd's Agile Manufacturing Goleman's Emotional Intelligence Collins & Posner's Good to Great

According to the research from Drewery et al. as seen in Figure 4, much of Generation Y has already integrated into the workforce, although not all of it. The study goes further, pointing out the following generation, labelled here as Generation Z (but sometimes known within other research and media as Millennials), is beginning to enter the employment market as well. It appears that, where Gen Y was a revolution from Gen X, Gen Z is a mere increment from Gen Y, with both generations sharing very similar traits. It is for that reason, then, we could look at the impact Gen Y has had and use it as a template for managing Gen Z's emergence. There is also the issue of the withdrawal of the Baby Boomers from the workforce to contend with appearing, in this research, to have begun most recently. Gen X and Gen Y have both been disruptive generations, but the Baby Boomers and, as mentioned previously, Gen Z both appear to be incremental generations to their respective predecessors. This makes the prime area of focus, the difficulties of three largely differing generations managing knowledge together as they enter or leave the workforce. As we begin to see the Baby Boomer generation depart from the workforce, it is interesting to note that the study found that they have a stronger concern about social responsibility than any other generation group when they consider employment, adding,

"This is different to common belief that Gen Y value social responsibility more than other generations. Although many of that generation do value social responsibility, their choices and behaviour are not driven by this."
(Drewery et al, 2008)

One common trait of the Gen Y worker that Drewery et al. qualify is the tendency of this generation to blur work and social lives, creating a work/life balance that previous generations would describe as unhealthy. It appears this generation views their social lives as also a tool to improve employability. This could correlate with the rise in importance of social networking over recent years. Consider the issues that generational integration could present for organizational culture and another Gen Y trait - the increasing likelihood these employees will recommend rewarding employment - becomes more relevant.

The happiness in employment of Gen Y employees could carry more weight than their predecessors because they are more likely than other generations to encourage new talent to join their organization. With that in mind, it is interesting and also slightly concerning when Burkinshaw and Pass state:

"Our research shows that most organizations have not fully embraced the needs of Generation Y employees of the opportunities afforded by Web 2.0 technologies."
(Burkinshaw & Pass, 2008)

With the considerations of Drewery et al. in mind and the risk of not catering for generational integration, as shown by Burkinshaw and Pass, a lack of a strategy to manage the knowledge held by different generations could have a telling negative effect not only on the performance of an organization but, if widespread, on an economy. This means that understanding the possible issues of generational integration, as the recommendations will show, is vital to organizations succeeding in a knowledge economy.

3.2 What Challenges does Generational Integration Present?

Understanding the challenges of generational integration can help prevent issues caused by the transition from arising and affecting an organization or economy's performance. Drewery et al. identified the key concerns of four generations in the workforce:

Veterans – Retention and Customer service

This generation is concerned with being able to work, refusing to retire and wishing to remain employed both in the market and by society. They measure their relevance by their respect, which can be earned through retention and demonstrated through customer service.

Baby Boomers – Performance measurement

This generation does not equate pay to meritocracy, feeling that good performance does not result in financial reward but loyalty and experience does. They also believe in a divided work/life balance and avoiding overflow between the two.

Generation X – Internal communications

The majority of Gen Xers are happy with the resources provided for their job; however this is a prime concern in measuring their productivity and happiness. If relevant knowledge is not communicated to them, motivation may fall and productivity may reduce.

Generation Y – Leadership and Development

The following diagram details these as the factors most important to Generation Y employees, and explores how these factors may affect relationships with the preceding generations:

Veterans

Leadership: The Veteran is less inclined to trust senior managers. Gen Y may feel surprised that Veterans don't expect their manager to be among their contacts network.

Development: Gen Y may be surprised at the Veteran's lack of interest in changing jobs frequently to progress along the career 'scramble net'. Veterans are less positive about numerous aspects of development than their Gen Y colleagues (career paths, opportunity to grow and job opportunities). They are also less likely to feel their manager provides opportunities for them to learn.

Baby Boomers

Leadership: The Baby Boomer is less likely to trust senior managers than their Gen Y colleague. They may also feel the information they receive is not believable. Boomers do not expect their manager to be in their social contacts network. One in ten don't want to be managed by someone younger than them.

Development: The Boomer is less positive than Gen Y about their development opportunities including - career paths, opportunity to grow, job opportunities and fair competition for jobs. They are also less inclined to feel their manager provides opportunities for them to learn and grow.

Gen X

Leadership: One in six don't want to be managed by someone younger than them.

Gen Y

Leadership: They are most likely to trust senior management. Their manager is more likely to be in their social contacts than any other generation. One in four don't want to be managed by someone younger than them.

Development: Gen Y are more inclined to feel that they have opportunities for development than any other generation. They are more positive about career paths, growth on the job and that there is fair competition for jobs. They are also most positive about using formal performance feedback processes to improve performance. They feel their manager provides opportunities for them to learn and grow.

Figure 5 - Possible sources of generational conflict from the perspective of Generation Y (Drewery, Riley, Staff, Worman, & Line, 2008)

Erickson's study in to the working practices between generations show further issues that could occur. The issues presented match those covered in Figure 5, but in more refined situations, with one Executive advising,

"Josh isn't doing much here to disprove the theories that some people have about Generation Y: a life experienced through machines, no respect for what's gone before, and a constant need for praise, entertainment, and instant gratification. Josh is intelligent and tech-savvy, sure, but he won't get very far by trying to make a name for himself on the backs of his boss and the members of his work group."
(Erickson, 2009)

This advice appears to agree with the earlier findings of Hansen, Nohria and Tierney, where technology reliance saw personalization practices hindered. When contrasted to Drewery et al., however, there are also issues on the other side of the generational gap. Snook explains how traditional management beliefs may not be suitable for the more contemporary employee, stating,

"Acceptable models of leadership have shown their softer side. This shift in the predominant leadership model reflects the move from an industrial to an information economy. In factories, you need strict rules and you reward people based on very simple and clear productivity metrics. Knowledge workers don't respond well to such rigidity, and fearful service employees would have trouble putting on a good face for customers."
(Snook, 2008)

When comparing these studies, it is becoming clearer where the divides fall and for what reasons. Understanding these issues can present an ideal dynamic which can maximize the ability to provide possible frameworks to resolve generational friction. In an ideal organizational culture, leadership would soften and nurture younger employees, encouraging their development. The expected results would see Gen Y employees respecting the pre-existing hierarchies and using their ability to blend their social and work lives to drive performance. The main difficulties the organization could encounter on the way to this ideal include the lack of trust in ability that appears to exist towards the younger generation and the over ambition of that generation, which could fuel the conflicts shown in Erickson's case study. Through effective knowledge management, tools and frameworks can be constructed to assist with implementation, integration and bridging the divides seen between generations without technology interference, as seen in the recommendations of this study.

4.0 Higher Education

The previous chapters established the role of the knowledge economy and defined the generations.

There is strong evidence to support the view that the UK has been transitioning into a knowledge economy, which has been accelerated through the influx of Gen Y to the labour force, as technology becomes more ingrained in areas like manufacturing and construction. One key factor to this move has been the role education has played within the UK economy, in particular the rise in perceived importance of higher education.

The objective of this chapter is to detail the benefits the higher education sector brings to the UK in both a financial and knowledge management context. This evaluation will have a significant impact on the recommendations made later, especially when exploring them in the context of practical implementation. It is my hope that the information and discussion provided in this chapter will form a strong, contextual foundation which can naturally link between the two focal subjects of this study: knowledge management and generational transition.

4.1 The Benefits of Higher Education

To support recommendations made later, an understanding of the benefits of the HE sector is needed. Kelly, McLellan and McNicoll concluded that in the 2007/2008 financial year the sector added £59.25 billion output, of which £23.44 billion was direct and £35.81 billion was indirect. This meant a GDP contribution of £33.41 billion which split to direct and indirect contributions of £15.16 billion and £18.25 billion respectively. This study also stated that the sector brings export earnings of £5.3 billion. The report concluded saying,

"The evidence confirms that higher education (defined as the universities together with the expenditure of their staff, international students and international visitors) is a substantial industry, with a significant impact on the national economy. It also reveals that higher education is particularly effective in generating GDP per capita, compared to several other sectors of the economy."
(Kelly, McLellan, & McNicoll, 2009)

The positive benefits of the HE sector to the UK economy is reaffirmed by London Economics, who detail that the net present value for the government in funding an undergraduate degree is currently £81,875 per degree awarded. The study goes further to add,

"The rate of return provides an indication of whether the Exchequer investment is worthwhile relative to the next best option (generally considered to be the cost associated with long term borrowing). If the rate of return exceeds the cost of borrowing (30 year UK Gilt currently trading between 4.25% and 4.75%), then the investment might be considered to be worthwhile. The Exchequer rate of return resulting from the funding of undergraduate degrees stands at between 11.0% and 12.1% overall"
(London Economics, 2011)

With such a high rate of return for the Exchequer there are clear public benefits for the economy that come from the higher education sector. These benefits are not wholly limited to the public purse, with individuals benefiting, according to London Economics' calculations, to a similar rate of return, 12.1%, giving the degree earned a net present value of £117, 342. In the higher education debate surrounding the tuition fees vote, the Conservative MP for Reading West, Alok Sharma, declared,

"Students realise that having a good degree adds value to their prospects and is a passport to a better job. OECD figures clearly indicate that UK graduates earn, on average, 50% more than those who finished education at A-level."
(Hansard, 2010)

The figure itself is of some consternation, particularly as he goes no further to detail these calculations. London Economics agree that there is significant benefit to the individual, calculating an increase in salary of £112,000 over a graduate's lifetime (London Economics , 2011). This evidence goes some way to showing there are financial benefits to both the economy and the individual which are gained through the higher education sector. The benefit gained by the economy becomes exponentially larger when one considers how the UK has progressed from an industrialized to a knowledge economy in recent decades. This could arguably build an argument that places higher education, alongside further education and other tertiary education schemes, at the forefront of any growth stimulation strategy for an economy. Buchbinder is an advocate of the publicly funded university. He believes they provide social knowledge which could benefit wider society, saying

"The academic staff, charged with the production and transmission of knowledge are the core of the university along with the students who are recipients of that knowledge and often engage in its production as well... A key ingredient in the production and transmission of social knowledge is autonomy; autonomy of the academic worker and autonomy of the academic institution."
(Buchbinder, 1993)

The role for higher education presented by Buchbinder appears to use knowledge management ideologies over the financial arguments commonly presented. From this unique perspective, he sees the sector as vital to creating what Buchbinder defines as "social knowledge"; knowledge for the wider society that the private market would not be able to provide due its unprofitable nature. It could be argued that knowledge management tools, such as those recommended by Nonaka, Senge and Garvin, could soften the market's stance to unprofitable research, presenting this research as a catalyst for innovation and new product development. Buchbinder, however, believes truly social research would still be in decline, which he feels will impede the evolution of society and the economy. Buchbinder is clearly a proponent of the current autonomous financial structure and, it appears, finds an ally in the form of the Organization for Economic Co-operation and Development (OECD) who believe,

"Public investments in education, particularly at the tertiary level, are rational even in the face of running a deficit in public finances. Issuing government bonds to finance these investments will yield significant returns and improve public finances in the longer term"
(Organization for Economic Co-operation and Development (OECD), 2010)

Even after the consideration of the OECD's recommendation to fund higher education, there is still debate focused around the balance of value to individuals and the state. Alongside the issues raised earlier by the Innovation, Universities, Science and Skills Committee on standards and the nature of the funding structure in higher education had provoked increased scrutiny. With this in mind, one could ask, as we await the arrival of Gen Z to the workforce, whether a knowledge management framework could add an extra dimension to assessing the benefits of higher education. This is a perspective that does not appear to have been referred to in any depth within recent debates surrounding the sector. The financial arguments that dominant these discussions are, in no doubt, important but it appears that value of social knowledge that the higher education sector brings has been ignored; it is this value which forms the basis of the higher education recommendations later in this research.

5.0 Standardization

Chapter 4 looked at higher education, evaluating its benefits which will, in later chapters, highlight the importance of recent events to generational transition and the knowledge economy.

This chapter explores how standardization can benefit organizations and the economy, presenting evidence which will later back up recommendations and conclusions focused on knowledge management between the generations. This chapter looks at defining the types of standards and their practices, the tools and methods by which an organization can comply with standards and most importantly the benefits that standards can offer the economy and organizations, with an explicit regard for knowledge management theories and processes.

Where higher education has a role in training future knowledge workers, the standardization process can be harnessed to ensure knowledge is created and available to share between the generations whilst still contributing to the economy, having an important impact on the recommendations made later on.

5.1 Defining what Standards are

British Standards Institution (BSI) has identified six commonly considered levels of standards, detailed in the diagram below.
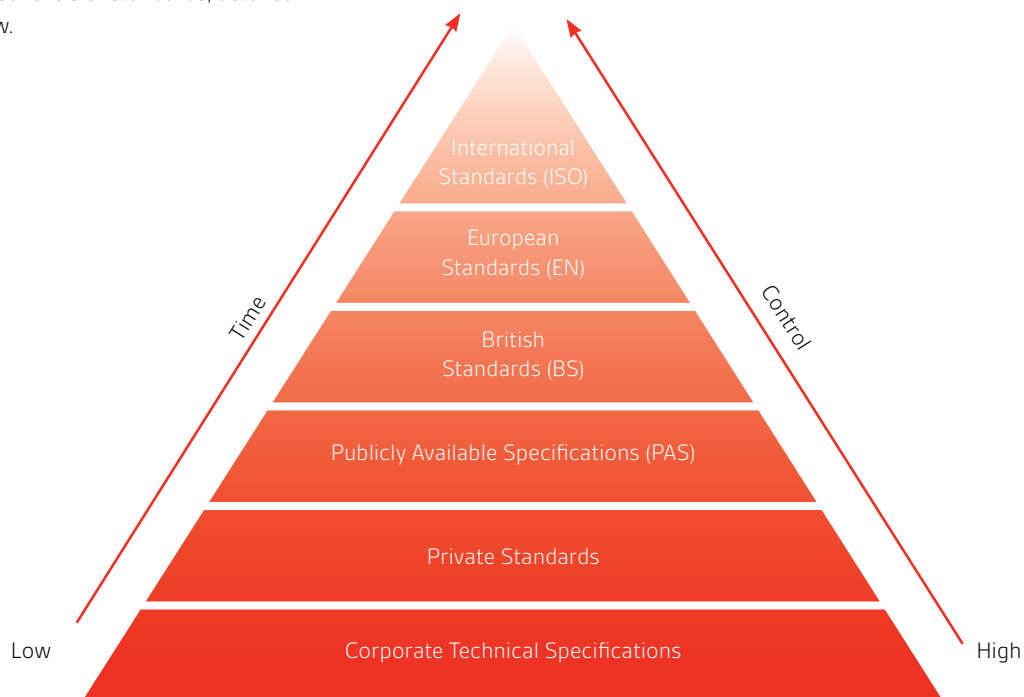

Figure 6 - The 6 Levels of Standardization (British Standards Institution, 2011d)

Corporate Technical Specifications contain explicit sets of requirements that relevant materials, products, or services should conform to. For example, the product specifications of a laptop or iPod. These standards are quick to write because the contents are easily controlled by the wishes of the company or company's dedicated employees producing them. Moving up the diagram, each level takes longer to write. This is because for each further progression up the scale, more varied stakeholders enter the process, meaning the final standard requires consensus from a wider spectrum including, in some cases, the public who are within the remit of the produced standard.

Private standards are privately owned process or policy documents. For example, a company's branding guidelines or the equality/health and safety policies which add a level above legislation tailored to the explicit needs of the company.

A Publicly Available Specification (PAS) is a consultative document based on the national formal, European or international standard model. They are standards which begin as sponsored projects by stakeholders wishing to drive the creation of a best practice document. Any organization, association or group who wish to document standardized best practice on a specific subject, can commission a PAS, subject to the BSI acceptance process. This could be for areas where there is little to no known market for a formal standard, such as in innovative technologies or newly-researched practices. The timescale for the development of a PAS can be shorter, typically around 8-12 months as it does not have as strong a concern for consensus as standards on higher levels; a PAS invites comments from any interested party but does not necessarily incorporate them into the final publication. PAS standards can ascend to become British Standards, possibly at the review stage; a recent example of this is BS 11000 – Collaborative Business Relationships, which began as PAS 11000. (British Standards Institution (BSI), 2011a) British Standards are

formally produced national standards from BSI. Within this and the higher levels, there are several categories of standards.[1] The process for the production of British Standards is explained within its own standard, BS 0 (British Standards Institution (BSI), 2005a); (British Standards Institution (BSI), 2005b)[2]. This process starts with the proposal of a new work item, proposed from within the committee or a member of the public. Once a proposal is received, a business case is made and the proposal is entered into a formal acceptance process. Upon acceptance, the committee will create a draft of the standard which goes out for public comment once approved. The public comment stage ensures that every national, European and international standard is transparent and accepted by the wider public. Once the public comments have been considered final, approval for publication must be reached; this can only be done through consensus. Standards are subsequently reviewed at least once every 5 years, to ensure they remain relevant and any industry innovations are accounted for. European and International standards follow different processes[3], using voting systems, rather than consensus building to approve drafts.

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[1] The categories of British Standards can be found detailed in Appendix C.

[2] Since the time of writing, BS 0 has been reviewed and will be republished in 2012.

[3] These processes are fully explained in documents released by CEN (European Committee for Standardization (CEN), 2010); (European Committee for Standardization (CEN) , 2009) and ISO (International Organization for Standardization (ISO), 2007).

5.2 Compliance with Standards

Laws have no value if they cannot be enforced. Standards have a similar caveat, in that they have no value if companies cannot be compliant to them. There are a number of ways for a company to become compliant:

Self-assessment

The company evaluates the criteria of a standard and declares that they meet the requirements of this standard. This can leave the company open to legal challenges should they be proven to be noncompliant. There are self-assessment tools available, designed by third parties, to help companies mitigate such risk. (British Standards Institution (BSI), 2011b)

Testing

One-off testing, where all or a sample of products are laboratory tested to meet a standard's specifications, presents a number of issues.

There are varying levels of test laboratories ranging from a manufacturer's own facility to a fully accredited (UKAS) laboratory and copies of a test report should be requested to evaluate the competence of the testing facility as well as the validity of the claim.

It is important to remember that in all these cases, testing is a snapshot in time. A sample may meet the requirements of a standard during the testing phase, however small changes of materials and components, staff rotation and deterioration of manufacturing equipment may lead to products produced later being of lower quality or even unsafe.

In addition test samples could be susceptible to 'golden sampling' where a company will choose examples that are certain to pass the tests for the process. To try and prevent this, reports or certificates gained through testing are usually very specific, saying, "The sample submitted conformed to the requirements of [standard number]".

System Certification

To help achieve consistent production quality, management systems such as ISO 9001 can be implemented by the manufacturer. Based on the Plan, Do Check, Act method, a well-implemented management system will set out clear plans to assess and evaluate the manufacturing process from beginning to end. As with testing there are varying degrees of implementation and the most robust and reliable method is to seek third-party certification of the system by a UKAS (or equivalent) accredited body.

Product Certification

Product Certification is the most stringent form of product evaluation and as such provides the highest for of due diligence available today.

"One such product certification schemes is the BSI Kitemark®. In order to achieve a Kitemark® for a product, BSI will assess the quality management system at the factory and test the finished product to the appropriate standard. After issuing a Kitemark® certificate, BSI will then inspect the factory on an ongoing basis and audit test randomly selected products to ensure there has been no reduction in quality and safety. Only after all these checks have been carried and all requirements met can a Kitemark® be affixed to the product."
(British Standards Institution (BSI), 2009)

A standards body may publish a standard, but they cannot claim authoritative regulatory powers over those standards. Any organization can, if it wishes, be a testing house, certification or accreditation body for PAS, national, European or international standards. Border and Danvers define the relationship between compliance and standards body when they say of BSI,

"All… activities and products are entirely voluntary on the part of those who choose to use them. However, in many cases, complying with a British Standard or being able to demonstrate third-party product certification will offer an attractive and cost effective short cut in discharging statutory obligations… Its product testing and certification businesses simply assess a product against a set of objective criteria (typically, but not necessarily, a British Standard). They don't say that it is 'good', 'high quality', or necessarily fit for the purpose to which someone might wish to put it; simply that it meets or fails to meet the requirements stipulated."
(Border & Danvers, 2010)

The clarification here is that BSI does offer the compliance services as detailed above, however these are dealt with independently from the standard publishing aspect of the organization, meaning they are no more or less authoritative to other companies. Border and Danvers also clarify the statutory powers of standards, in that there are none, directly. A company has no legal obligation to comply with a standard however formal compliance does add an indirect legal aspect to standardization that must be considered. If an organization were to declare compliance, and a product or service was proven to not conform to the standard, then the company making the declaration becomes legally culpable.

5.3 The Benefits of Standardization and Compliance

Standards can benefit a wide base of stakeholders, however the focus for this study is those benefits gained by companies and the economy. Standardization is, as stated previously, voluntary but compliance can be occasionally coerced by a government mandate. It is interesting to note, however that there are more benefits to companies complying voluntarily than there are through mandates. Explaining why government would set the mandate, Henry observes,

"Measures for voluntary application are more likely to benefit business. In that case, the benefit to business outweighs the costs of implementation and the market will adjust itself, once an agreed benchmark is established through the standard.

The benefits of implementing a standard for business include:
a) Enhanced market share due to market demand for standards compliance.
b) Preferential treatment by government.
c) Simplifying business to business trade
d) Improved production efficiency.
e) Reduced hence inventory costs as a result of the need to hold fewer varieties."
(Henry, 2010)

This approach is strengthened through historic evidence. The earliest results of formal standardization proved to what extent voluntary standards can help companies improve processes and save money. BSI's first standard was written for steel sections and published in 1903. It reduced the number of different structural steel sections in common use from 175 to 113. More impressively, varieties of tramway rails in use reduced from 75 to 5. The estimated cost of production reduced across the industry, by £1m, approximately £91m when calculated to contemporary value. (Woodward, 1972)

The benefits of standardization are not restricted to cost/revenue improvements. A company could benefit by using standardization as part of an engaging knowledge transfer and management strategy. De Vries and van Delden identified the importance of standardization to knowledge management, saying,

"Nonaka distinguishes individual knowledge, processed by single operators, and shared by members of an organization. By definitions, standards are intended to capture organizational knowledge and they should be used by several people and may also contribute to their individual knowledge. Company standards target one organization (sometimes some of its suppliers) whereas ISO standards target a multitude. Another distinction can be made between external and internal knowledge. External knowledge lies outside the walls of an institution, like knowledge from competitors, consultants and standards bodies like ISO. Internal knowledge is generated in the organization and is easy to access and use."
(de Vries & van Delden, 2006)

De Vries and van Delden refer to their belief here that standardization is an important tool for knowledge externalization, turning tacit knowledge, as defined by Nonaka earlier, in to explicit knowledge, however they later go to show that standardization is far more wide-ranging than this. Standardization is the collation and sharing of both tacit and explicit knowledge to enable the production of aggregated best practice explicit knowledge; refined explicit knowledge. Therefore standardization is a catalyst for both the externalization and combination of knowledge. De Vries and van Delden go further, however, and remark that the standardization committee meetings and the sharing of explicit knowledge as well as the practical use later on of this explicit knowledge show that standardization also benefits the efficient socialization and internalization of knowledge, respectively. This appears to be backed by Swann who noted that standards contribute £2.5bn to UK GDP and specifically said of standards that,
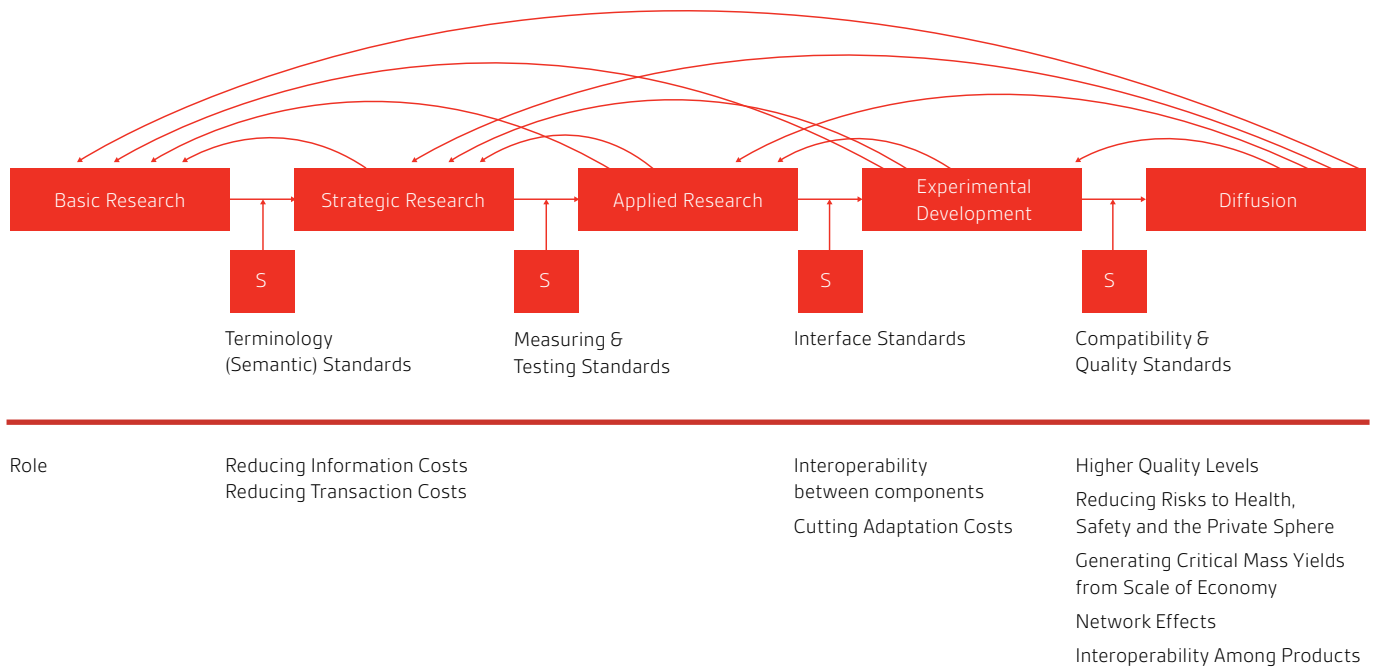
Figure 7 - Standards in the research and innovation process (Blind & Gauch, 2007)

"There is no doubt that standards, containing – as they do – a lot of codified knowledge act as important instruments in the dissemination of best practice. They can be seen as essential instruments of technology transfer."
(Swann, 2010)

Blind and Gauch also believe standardization is vital to knowledge management, creating a model which specifies how standardization is vital to the specific potential in research as a knowledge management tool, seen in Figure 7.

It is clear from this model that standardization is a vital tool throughout the research, development and diffusion process, however different standard types perform different roles and bring different benefits to the process. Early on standards are needed to understand and transfer knowledge through the basic research into strategic level research. Statistical measurement standards can convert this knowledge from strategic to applied research, a view which is also backed by Williams who states,

"Raw data does not give sufficient information to enable anyone to see the overall picture, so the data must be processed to provide the information required. Manager of laboratories and test houses need standard methods for analysing and determining the precision of test results."
(Williams, 2010)

Interface standards on specific interface practices, like design and cleanliness of laboratories can quicken the research into the experimental stage at which point interoperability and quality standards like ISO 9001 Quality Management Systems can ensure this research is diffused into market. Consider Blind and Gauch's research from a macroeconomic perspective and we see further benefits for the wider economy as a platform and catalyst for innovation, enhanced by the knowledge management tools standardization offers. Swann further qualifies this view, when he asks,

"How do standards support innovation? We can find several mechanisms at work here. First, standards support the division of labour, and the division of labour supports certain types of innovation activity. Second, open standards can help to open up markets and allow new entrants and as economists know very well, the new entrant is a powerful force for innovation. Third, the existence of generally accepted measurement standards allows the innovative company to prove that its innovative products do indeed have superior performance. And fourth, standards help us derive the greatest value from our networks. Open standards allow innovative entrants to take advantage of network effects, an sell add-ons which are compatible with the core technology and enhance its functionality."
(Swann, 2007)

This support for standardization as an innovation catalyst seems further qualified by a 2010 publication from the United Nations' International Telecommunication Union (ITU). It keeps the focus on how knowledge management techniques have been fuelling the success of new disruptive technologies but specifically on how standards help new technologies thrive through interoperability. The most fascinating aspect of this document is that it notes the possibility that the role of standardization in society could be greater in developing countries; enabling and fostering the support of innovations which have access to far fewer resources within these markets, saying:

"The interoperability afforded by standards enables new forms of knowledge exchange. Interoperability, achieved through agreed upon ICT standards, enables information sharing within governments, between governments and citizens, and more ubiquitously, in the global information society. This type of access provides new avenues for citizens in developing countries to access emerging forms of digital education, medical and health diagnostic information, and to participate more actively in cultural and political life."
(International Telecommunication Union (ITU), 2010)

This is an important consideration as standards could be a route through which developing countries can support and retain intellectual property which may benefit the local market as a whole. This evidence could be considered to show standardization helps stimulate innovation. At the micro-economic level, a company benefits when a product reaches a far wider market with much lower entry, development and testing costs through following standards during the design and management process. At a macro-economic level, the benefits are also wide-ranging. Swann, Temple and Shurmer (1996) found significant advantages to UK international trade through the standardization process, concluding,

"One main finding is that UK standards appear to increase UK exports and UK imports, though the effect on exports is stronger than on imports...The second finding is that idiosyncratic UK standards appear to have a stronger positive effect than internationally equivalent standards."
(Swann, Temple, & Shurmer, 1996)

The fact that standards offer a trade surplus has obvious direct benefit to the economy, especially in current conditions; however the second finding is most striking. UK standards appear to have greater impact than their international comparatives, which could itself add to the trade surplus. In essence, not only is standardization creating best practice knowledge which is improving the quality of products exported, but this best practice knowledge could be exported itself, to UK trade's benefit.

This evidence could be considered to show that standardization is not just a tool that can, co-incidentally, be used in a knowledge management context. Despite predating Nonaka by decades, standardization is a perfect example of a quad-dimensional knowledge management process. If a company were to participate in the standardization process, by providing members of staff to take part in the committee activities, one can map the standardization committee process back to Nonaka's model form knowledge creation to show the knowledge management benefits given to the organization. Externalization and combination occur through the publishing of standards from this process and internalization occurs when the standard is read and implemented by an employee. More importantly, though, for those actually involved in the process, internalization occurs much sooner and with far greater understanding, meaning the process is more reliable. The nature of committee meetings and consensus building in the British standardization process means that socialization is also occurring throughout the process. This implies that knowledge not explicitly captured by the committee can be tacitly captured by the individual committee member and used either personally or externalized within the organization, independent from the standardization process. Whilst it can be accepted that this positive benefit is difficult to measure, it nevertheless shows important non-financial benefits of participation in the standardization process as both a tool and in the case of the recommendations made later, a template for an organization's knowledge management strategy.

6.0 Recommendations for Knowledge Management between Generations

The evidence presented in this study so far has shown that knowledge management has a role to play in the modern economy.

Knowledge management cannot be the sole factor in assisting generational transitions within the workplace or economy, however, it can ensure that when generations leave the workforce they do not take vital knowledge with them, impeding organizational and national economic performance. Any solution must look at three key knowledge management areas: the transfer from those generations leaving the workforce, managing of this knowledge by the experienced generation within the workforce and simultaneously creating further knowledge for integration by generations entering the workforce.

Two potential solutions could utilize higher education and standardization to manage this knowledge. The first, the Generational Knowledge Framework (GKF), was originally created to be focused towards macroeconomic policy level, however this framework can be mirrored within an organization. It is a theoretical framework for nations and organizations to manage their knowledge and maintain their competitive economic performance. The second recommended proposal, the Organization Knowledge Committee (OKC) is a tool for organizations to help manage the generational transitions within their company effectively. Whilst complementary to the national GKF, it can be an effective knowledge management tool within an organization outside of a Generational Knowledge Framework.
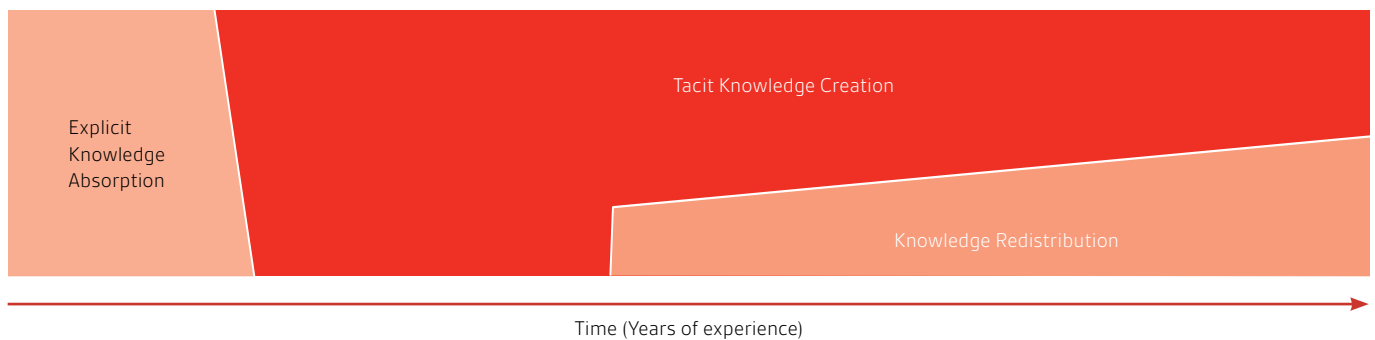
6.1 Generational Knowledge Framework

Creating a national knowledge framework can be a catalyst for a nation's economic performance. Reading back to Drucker, such a framework could be considered an appropriate response to his theories on the productivity of knowledge, which he believes should be the biggest concern to a Government, saying,

"The productivity of knowledge is going to be the determining factor in the competitive position in a company, an industry, an entire country. No country, industry or company has any 'natural' advantage or disadvantage. The only advantage it can possess is the ability to exploit universally available knowledge. The only thing that increasingly will matter in national as in international economics is management's performance in making knowledge productive."
(Drucker, 1993)

Figure 8 - The Generational Knowledge Framework model

The lack of any 'natural' advantage means that in order to compete, nations cannot use natural resources to grow their own knowledge and must look at other methods. A competitive management framework can encourage and nurture the knowledge already existing within the nation but, more importantly, it can make that economy preferable for talented knowledge workers, encouraging their immigration. The following model can ensure this; however responsibility falls not only upon government, but on the private sector as well. This model can be adapted to an organizational level, with the OKCs discussed later on integrated into the framework.

The GKF can be viewed in two ways, as an economic model or as an organizational model. From the economic perspective, the GKF takes the knowledge worker from school leaving age until retirement, managing the possible routes a knowledge worker can take and providing the resources to ensure that the economy and society best benefits from the talent within it. In the organizational sense, the GKF can be used as a guide to chart the career of a knowledge worker within the company to ensure effective maximization of their knowledge assets.

As Figure 8 shows, this model has three stages: explicit knowledge absorption, tacit knowledge creation and knowledge redistribution.

At the macroeconomic level, explicit knowledge absorption could refer to tertiary education, where explicit knowledge is input for the knowledge worker to absorb and integrate. At a national level, this role is vital, equipping the knowledge worker with skills that can be used later on in the workplace which is why it is recommended the responsibility of funding and managing this activity rest under government, not the market. Some might find the view of the university being used as a training ground for the knowledge economy a travesty, away from the autonomous nature of the sector discussed earlier; however Davidson looked at the history of the higher education sector and compared the modern structures to the reforms made for the Industrial Revolution, seeing that very few changes had occurred since then. Davidson states,

"The industrial world of work does not want individuality. It wants workers who know their specialised task and perform it routinely and like clockwork. Especially after Frederick Winslow Taylor's famous time and motion studies of the late 19th and early 20th century, efficiency was king and the goal of education was, implicitly and explicitly, to train a future labour force for mass production."
(Davidson, 2011)

This clearly marries with the way the debate on education has formed, with focus placed on the training of students to enter the workforce and the benefit received by the students for the training. If Davidson, quoting the US Bureau of Labor later on in the article, is right to say that graduates will change careers four to six times within a lifetime and 65 per cent of the jobs that will be available upon graduation for students currently entering US high schools don't exist yet, then transferable knowledge that can later be adapted to become skills is vital. For those studying in the science, technology, engineering and mathematics (referred to as STEM subjects within the UK) areas, these transferable skills could come from areas such as the humanities where analysis and comprehension are valued and could enable a student to build a foundation of soft skills alongside their more task-based skills set. This would be a similar approach to the education system in the US, where the first year of studies is devoted to giving students a broad understanding of a range of subjects to build a foundation of transferable skills. This knowledge could be the foundation for the knowledge worker's future career and their productivity within the organization and the economy. This consideration brings with it a new issue, namely the one of funding which has become so controversial. The transience of the labour market means that social knowledge, as defined by Buchbinder, becomes more valuable for the long-term economy. Knowledge demanded by the market is demanded on current data and information; however social knowledge can become the building block for future market-based innovations.

Theoretically, the market could bring consumer benefits to students, empowerment through choice being one of the most quoted, but with a labour market so transitory how are students and consumers empowered when the information on offer to make a choice is based on current expectations, with no consideration of future roles that could emerge? At an organizational level, the explicit knowledge stage can be in the form of formal training schemes for new Gen Y or Gen Z graduate employees. As higher education is at the national level, this stage will be the foundation of the employee's ability to create new knowledge as well as share that knowledge later on.

In both the economic and organizational GKF tacit knowledge creation occurs during employment of the knowledge worker. During this time that the employee can create tacit knowledge built on practical experience, referencing the explicit knowledge assimilated earlier on. After a noteworthy period of tacit knowledge creation, the employee can begin phasing into knowledge redistribution. This plays more a more significant role as their career progresses and it is important the tacit knowledge creation activities are maintained in order to maximize possible knowledge creation and continuous learning. In the economic GKF, an ideal platform for knowledge redistribution could be the employee's engagement in standardization activities. Creating widely available knowledge and ensuring the effectiveness of that knowledge through participation is writing standards could enable the worker to add benefit to the economy and society. Increasing standardization participation could also benefit an organizational GKF framework, where benefits similar to those detailed in Chapter 5 could be felt. In addition, the standards produced through participation, and more importantly compliance, would further enhance the effectiveness of the organization's explicit knowledge absorption stage, creating an almost cyclical and continuous benefit. The organization could similarly internalize the knowledge redistribution process, by creating Organizational Knowledge Committees, explained later on in this chapter.

One prospective barrier for the GKF to work effectively is the perceptive barriers of entry to higher education as a route into the knowledge economy. Overcoming this will be vital to maintaining and improving economic performance and generational knowledge management. It is highly unlikely, in the current environment that a fully publicly funded higher education structure is an attainable prospect in the UK, so we must rule that out as a possibility. What is possible, however, is adapting the generational knowledge framework into a joint public/private sector scholarship initiative. This scholarship would see a company guaranteeing post-study employment for a student with the government funding fees and living costs. The student, ideally from a non-traditional background for university participation, would be contractually obliged to meet the following conditions to both the government and the employer:

To the government – the student would be obliged to study the full length of the course and, after gaining a pre-determined amount of experience (for example, after 5 years) to participate for a set minimum amount of time in national standardization activities, ideally through joining a committee to write standards relevant to their knowledge.

To the employer – the student would be contracted to work for a set minimum amount of time. This scholarship could be managed alongside the current student loans system, by the student loans company, with a caveat that if the student were to break the contract, they would have to repay the amount given to them by the government through the normal loans system.

There would have to be a disincentive for breaking the contract; the student would not benefit from the current rule that allows their student debt to be written off after 30 years. This would mean that the student would be forced to pay back all of the money loaned to them. With the STEM sector decrying a shortfall of qualified employees as many graduates decide to move in to non-STEM jobs (Mellors-Bourne, Connor, & Jackson, 2011), this scholarship can use knowledge management strategies to provide a solution which would not hinder non-STEM areas of higher education.

6.2 Organizational Knowledge Committees

Organizational Knowledge Committees (OKC) are intended to mirror the consensus building approach of standardization committees, discussed in Chapter 5e, and create committees for knowledge sharing within the organization through experienced generations sharing tacit and explicit knowledge with the incoming generations. Newer generations, who are more likely to have participated in tertiary education than previous generations, may also offer a different perspective which can benefit the organization, as Figure 9 shows.

Experienced Knowledge Workers

SM

HR

Law

Mkg

Fin

Organizational Knowledge Committee

New Generation Knowledge Workers

Figure 9 - Organizational Knowledge Committee model

Each department of the business has an experienced representative within the group. As Figure 9 illustrates, the committee has experienced knowledge workers from Marketing (Mkg, above) and Human Resources (HR) alongside the legal and financial departments (Law & Fin respectively). The committee must include one member of the senior management (SM) who could choose to act as the chair, overseeing and navigating proceedings. Selection criteria for the experienced representatives should not be chosen by how long they have been within the company, but by how much relevant work experience they have in total; this could result in the committee becoming too introspective and damaging its knowledge creation potential. Whilst the departments represented should be static, the people representing departments could also be changed for each meeting, selected through a randomized system, to ensure the most benefit is gained. This would ensure as much perspective and new knowledge is brought into the process for the company's benefit as possible. These employees would then sit with randomly selected employees with less than 5 years' work experience (again, total experience, not company experience) on an agenda set by the senior manager or previous committees.

The focus of each committee meeting should be a one day workshop, producing, through consensus, a report/selection of minutes to be distributed to the company. In creating this report the OKC, like a standards committee, manages to ensure all knowledge creation elements defined by Nonaka are used. Externalization, internalization and combination all occur connected with the reports' creation, and socialization and internalization are vital to successful consensus building. It would be hoped that free, open discussion and debate can create new knowledge which can be considered for implementation within the organization, ideally offering individuals similar autonomy to universities within the committee. In many ways, the process is intended to create social knowledge tailored for the organization's culture. There is the possibility that the meeting could spawn further actions and policy or process documents to be created. The role of the senior manager in these cases would be to decide how to proceed, with either the committee becoming a project team or individuals being required to complete the arising task.

There could be a number of benefits attached to the OKC. As mentioned earlier in the chapter, the OKC could be a vital part of any graduate scheme or the induction of labour market entrants to the organization, solidifying their explicit knowledge creation, but also assisting their tacit knowledge creation by teaching and using skills that may not be present when seeking consensus and debating issues. Integrating the OKC could add motivation for the employee; giving them the impression of empowerment and collaboration to the strategic decisions of the company. As stated in Chapter 4, keeping Gen Y and Gen Z employees motivated could invoke the trait shared within these generations of recommending the organization to other talented knowledge workers.

This proposal could also play a significant positive bearing on any generational conflicts, such as the one seen in Erickson's work. In the case study, a Gen Y employee, Josh, felt their manager, Sarah, was stymieing their progress by excluding his ideas. Josh later disclosed the idea to a senior manager, Sam, who liked the idea. Unknown to Sam, there were contextual reasons why it was not the best option for that situation, hence Sarah's refusal to accept the suggestion in the first place which now had to be navigated, causing more work and reducing productivity. It was, as Erickson puts it:

"A classic case of impatient Generation Y meets 'pay your dues' Generation X"
(Erickson, 2009)

There are a number of issues with the relationship that are tackled by the case study, but an OKC could have helped prevent these issues arising. Had the company an OKC programme, Josh may have already raised his idea there. Alternatively, Sarah could managed Josh's expectations and enthusiasm more effectively by suggesting that idea be taken to the committee, where it could be noted and discussed as to whether it is suitable or not and reasoned why. If the decision is reported and distributed to all employees, the project could be assisted by another employee who has knowledge which could contribute to the solution. In short, the OKC could be the impetus for many possible routes of long term knowledge creation and create an environment very similar to, if not mirroring a learning organization.

As well as these internal benefits an OKC can bring external benefits to an organization that is already involved in standardization activities. As the process itself mirrors the standardization committees detailed in Chapter 6, the OKC can act as a mirror committee for any work currently in progress. The organization's employees can comment on national standardization activities and possibly make a difference to the industry, not just the organization which, if successful, can greatly increase the motivational benefits mentioned above. This also means an indirect benefit occurs to the national economy if organizations put in place OKC, through increased indirect consensus in the process.

The recommendations made here are exploratory by nature and are proposals that can be quickly initiated in the short-term to bring benefit to the economy and to organizational performance. The GKF can be vital in ensuring national knowledge economies build a competitive advantage, although understand the limitations that currently exist. With that consideration, the scholarship which mirrors the GKF feels a far more pertinent solution. Organizational Knowledge Committees hold great potential for defining an organization's culture to increase and benefit the organizations' knowledge creation and management strategies.

7.0 Conclusions

It was declared earlier that generations can take with them the knowledge they have created.

Three objectives we set for this study, focused on discovering how knowledge management can be used to prevent losing knowledge during generational transition and, more specifically, how the higher education and standardization sectors can both contribute to resolving this issue.

On analysis of the evidence presented, there is a clear connection between all these factors and, when managed effectively, higher education and standardization can combine within a framework to manage the transition of knowledge between generations. The GKF establishes a route for a knowledge worker, showing how they can traverse from higher education, through employment and into the standardization process to the benefit of the employee, the organization and that knowledge economy. In mapping these links, the need to analyse traits of each area that affect the wider framework arises, bringing with it further recommendations and conclusions.

Higher education has a role to play as a training ground for knowledge workers and, whilst to some the idea of higher education being framed in this way is horrific, evidence shows that the historical role of HE was just that. This does not mean that the idea of 'education for education's sake' has no relevance; in fact it is very relevant. The economy that workers are entering into has changed and continues to do so. The role of higher education continues to be training of the workforce but the method changes. It can offer a far broader foundation of knowledge which can be transferable as the knowledge economy evolves under new generations, making the higher education sector vital to maximize the effectiveness of generational knowledge management. For example, skills set education, like the STEM subjects, could be integrated with traditionally soft skills based education, like the arts and the humanities. This more rounded understanding can improve knowledge creation and impart 'soft skills' which can fuel innovation.

Another vehicle for knowledge creation and management is the standardization sector. Standardization plays a role at the opposite end of the generational knowledge management paradigm. Where higher education is more focused on training a new generation how to understand and use knowledge, standardization is concerned with distributing the knowledge from previous generations to ensure it is not lost. At its purest definition, standardization is a knowledge creation tool and, if participation in the process by knowledge workers was high within an economy, a vitally positive tool for that economy. This participation also directly benefits the participants as organizations have access to the explicit knowledge, their employees have the potential to gain and bring into the organization tacit knowledge. If the standardization committee process can be mirrored within an organization, it can be a knowledge creation tool to harness the tacit knowledge within. Further benefits through standardization arises through compliance, which has a large economic contribution, but also an immediate organizational financial benefit which can come through cost savings as well as increased revenue stemming from possible marketing and branding advantages that are attached to the compliance to a standard.

The benefits of standardization, as well as higher education are mostly measured in financial terms in current research and this is where issues arise; not enough research looks at the non-financial benefits of and in both sectors. Standardization is a very thinly researched subject and further study is needed in a number of related areas. One example would be to measure the practical act of standardization against the objectives of the concept. Standardization can be a knowledge management tool to create knowledge and benefit generational transition. It would be interesting to see qualitative research examining whether the process fulfils that role and, if not, how it differs, what issues arise and how this issue can be prevented. Higher education research could explore the importance of the sector in non-financial terms and could provide the evidence to support funding of social knowledge projects which have a wider benefit away from the market as well as projects which support generational transition, like the scholarship project in the recommendations. There also appears to be opportunity for continuing research into the subject of knowledge management between generations which widens the scope of this study, looking further than higher education and standardization. Research looking at further education, pre-tertiary education and the role technology has played in generational transition could present a wider panorama of the role knowledge management can play and create new frameworks, recommendations and solutions which can complement or contradict the conclusions of this study. In meeting the objectives set for this research, only further questions have arose which require us to consider seriously the role of knowledge management between generations.

Appendix A - The Higher Education Structure in England

In order to understand the role this sector can play within the knowledge economy, understanding the complexity of the structure and systems in place is vital. The UK Higher Education sector lies within the public sector, but is unique in that the institutions within it are autonomous; not owned by the state, but in receipt of government funding to operate. Each institution manages, to an extent, its own degree award standards with internal management processes following guidance set by the Quality Assurance Agency for Higher Education (QAA), an external and independent body evaluating the maintenance of academic standards in universities (Quality Assurance Agency (QAA), 2010). The power to award degrees and the authority for an institution to call itself a university are both legally protected, bestowed upon institutions by the Privy Council. Like the universities' management processes, these decisions are influenced and guided by the QAA.

Funding the sector becomes difficult due to the devolution of powers meaning the Welsh Assembly and Scottish Parliament direct their respective universities' funding and the United Kingdom Parliament oversees the English and Northern Irish institutions, even though the QAA works on a UK-wide basis. Funding is set by the respective Parliaments and distributed through various national funding bodies, as Figure A.1 shows.

For the sake of focus, this research will concentrate upon the English branch of the sector, which is currently under the remit of the Department of Business Innovation & Skills (BIS - formerly the Department for Education and Skills, as seen above). The Higher Education Funding Council for England (HEFCE) distributes the funds allocated by BIS within the broad policy guidelines of the Secretary of State, who-at the time of writing-is The Right Honourable Vince Cable MP. On occasion, HEFCE can advise the Secretary of State on funding matters, but they have no authority upon which to set any funding levels.

Funds from HEFCE are distributed to 253 institutions of which 123 are further education colleges, providing higher education courses, and 130 are higher education institutions (HEIs) to support teaching, research and related activities. In setting out their methodology for granting these fees, HEFE say,

"Institutions receive most of their funding as a 'block grant'. They are free to spend according to their own priorities within our broad guidelines. We do not expect them to model their internal allocations on our calculations because they are autonomous bodies that set their own strategic priorities."
(Higher Education Funding Council for England (HEFCE), 2010)

The issue of autonomy is a vital one for the higher education sector as it is one so staunchly defended. Some could claim that the defence of this independence can create an over-defensive hostility to responsibility. HEFCE are quick to point out that despite autonomy, there still exists accountability, both to them and to Parliament as well as clarifying the HEI's ability to source additional funding:

"Institutions are accountable to HEFCE, and ultimately to Parliament, for the way they use funds received from us. As independent bodies, they also receive funding from many different public and private sources. This gives them scope to pursue activities alongside those for which they receive HEFCE funds."
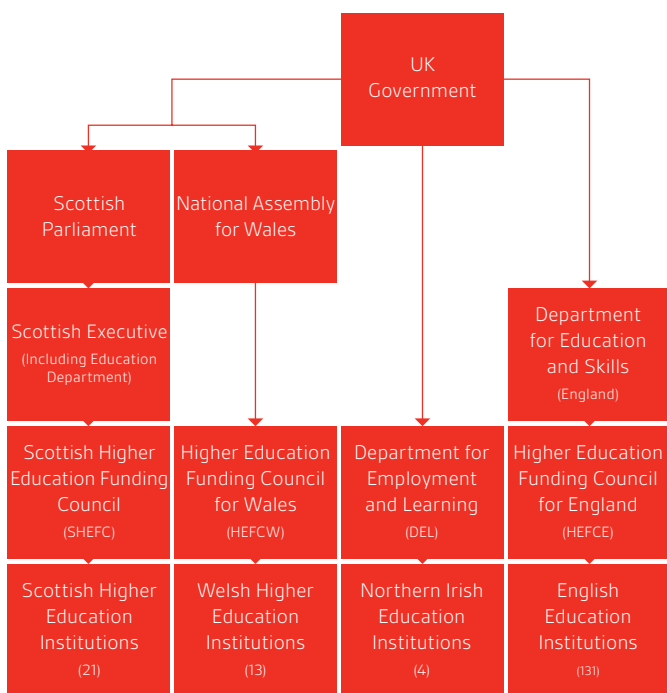(Higher Education Funding Council for England (HEFCE), 2010)

Figure A.1 - Funding in UK Higher Education (Quality Assurance Agency (QAA), 2004)

HEFCE later adds that their funds make up less than forty percent of the sector's overall income, student tuition fees usually being the other main source of funding, along with various private and public sector engagement projects. The QAA has been criticized in the past for not holding to account enough the universities under its remit and not showing enough transparency of its academic standards processes (Innovation, Universities, Science and Skills Committee, 2009), however this report has been disputed within the sector and the organization itself with the Chief Executive, Anthony McClaran saying,

"It wasn't describing a sector I could recognise. It seemed to be placing a great weight on a narrow evidence base."
(Curtis, 2009)

With such a politically charged subject this is not the first, nor will it be the last, report on higher education to be criticized for narrow evidence gathering. Part of the consternation fuelling the critical committee paper appears to stem from the issue of funding the sector. The final report from the Innovation, Universities, Science and Skills Committee (now the Science and Technology Committee) was critical of the defensiveness of some university heads when challenged on their levels of academic standards. It went so far as to take the telling step of noting specifically the role the public purse has in the sector's financing, despite standards measurement not appearing to be intrinsically linked to funding. The committee declared:

"It is unacceptable for the sector to be in receipt of departmental spending of £15 billion but be unable to answer a straightforward question about the relative standards of the degrees of the students, which the taxpayer has paid for."
(Innovation, Universities, Science and Skills Committee, 2009)

This is not a lone example of the sector's financial structure being used to place political pressure upon it. Brown expressed concern at the scrutiny the sector is being put under, defending the British quality control systems as some of the most elaborate globally with many institutions receiving positive feedback; feedback which is backed by student evaluations and surveys as well. But there are issues, as Brown says,

"Whilst some of the problem areas, such as grade inflation, are relatively recent, others, notably external examining and assessment, are of long standing. Moreover, the imminent intensification of competition allied to an almighty resources squeeze will test both institutional and external quality-control mechanisms as never before. It must be seriously questionable whether the limited, incremental and frankly muddled programme of work set in train by the Funding Council, the sector and the QAA will prove adequate in these circumstances. We may be back at all this again before very long."
(Brown, 2010)

Brown again brings to the foreground the issue of funding and its apparent dislocation from the management of academic standards. His assessment was to prove to be accurate in the months following this article. The role of public funds in the higher education sector had already been under increased scrutiny from a range of perspectives in recent months, some sympathetic and some critical and the need to prove the benefits of the sector gained importance.

Appendix B - Standardization in History

Society has understood the need for creating measurement systems since its inception. The earliest discovered examples of such systems were found excavating artefacts of the Indus Valley Civilization, existing between of 3000-1500 BC. Their measurements for length, mass and time are considered extremely precise and have been influential throughout the maturation of society; the weighting units were approximately 28 grams, making them similar to the Imperial ounce. (The New World Encyclopaedia, 2009) The first Magna Carta of 1215, made mention of the importance of standard measurements, with clause 35 stating:

"There shall be standard measures of wine, ale, and corn (the London quarter), throughout the kingdom. There shall also be a standard width of dyed cloth, russet, and haberject, namely two ells within the selvedges. Weights are to be standardized similarly."
(British Library , 2011)

As these instances show, standardization as a concept existed long before the first standards were written. But why are these examples not standards? For a start they were, to their contemporaries, legislative measures and standards do not have a legislative function, despite the common misconception that they do. Standards, in their current defined form grew out of needs established during the British Industrial Revolution.

From 1850 onwards, the emerging British rail network changed the face of trade in the country. Previously, markets had been local and the rail lines being built offered producers the ability to transport goods into new markets and collaborate nationally with other suppliers. As Woodward points out:

"The engineering shops of Birmingham, the steel mills of Sheffield, the cotton looms of Manchester had all Britain on their doorsteps — and beyond England there were further markets to conquer in all the other countries of Europe which, with England, were thrusting forward with their own railway networks and industrial development."
(Woodward, 1972)

Whilst the emergence of the rail lines was a positive economic catalyst for the UK economy, it also created a number of problems:

- The diversity of the sizes and quality of products made in different regions increased the risk for businesses to order from outside their locality and damaged competition and efficiency.

- Matching components bought from different regions together to form a whole unit could very rarely be done without costly adjustment.

A letter to The Times in 1895 which presented the example of a contractor having to procure iron girders from Belgium to complete an order encouraged London iron merchant Henry Skelton to write:

"Rolled steel girders are imported into Britain from Belgium and Germany because we have too much individualism in this country, where collective action would be economically advantageous. As a result, architects and engineers specify such unnecessary diverse types of sectional material for given work that anything like economical and continuous manufacture becomes impossible... no two professional men are agreed upon the size and weight of girder to employ for given work and the British manufacturer is everlastingly changing his rolls or appliance, at greatly increased cost, to meet irregular unscientific requirements of professional architects and engineers."
(Woodward, 1972)

Skelton's letter was the catalyst for a number of acts which resulted, on April 26th 1901, in the first meeting of the Engineering Standards Committee, formed with two representatives each from the Institution of Civil Engineers, Institution of Mechanical Engineers, Institution of Naval Architects and the Iron and Steel Institute. The intention was clear. This was a non-legislative method of creating agreed best practices within industry, created by industry. It was self-regulation for increased efficiency.

The Institution of Civil Engineers later became the British Standards Institution (BSI) and in 2002, became the UK's National Standards Body (NSB) (British Standards Institution (BSI), 2011c). Within the focus of this study reference to standardization, we will focus on three organizations in particular; BSI, the European Standards body European Committee for Standardization (CEN/CENELEC)[4] and the International Organization for Standardization (ISO) which is the world's largest developer and publisher of international standards.[5] BSI was a founding member of both organizations and can still exert influence on their practices.

All three organizations are non-governmental, however the work produced generally bridges the areas of the public and private sector where legislation and formal regulation would be detrimental, but free market individualism could lead to widespread inefficiencies. In some cases the work can be started by government mandate or EU mandate, but in many cases work is driven by the self-aware industry; aware of the need to collaborate for corporate social responsibility or for efficiency reasons.

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[4] CEN/CENELEC comprises of the National Standardization Bodies (NSB) of Europe and is the only recognized European organization according to Directive 98/34/EC for the planning, drafting and adoption of European Standards (EN) in all areas of economic activity with the exception of electro technology and telecommunication.

[5] ISO is a network of national standards bodies from 163 countries, allowing only one member per country.

Appendix C - Categories of British, European and International Standards

Category	Features	Benefits	Approval	Timescales
Full Consensus Standards				
Specification BS, EN, ISO, IEC	Detailed document outlining performance and/or design and/or service requirements that need wide consensus	Controls variety so products, systems and services can be more easily designed, developed, made, specified, bought and understood. Detailed documents which are clear about products, systems, services and materials help specifiers to make comparisons	Committee prepared and approved, with public consultation	12 months for national up to 3 years for others
Method BS, EN, ISO, IEC	Detailed document that focuses on the way products and materials are tested or the way they are specified	Knowing how to text and ensuring that like products pass such tests is important to manufacturers, suppliers, customers and those who have to verify conformity of products against specifications. These documents say what should be done to prove the integrity of products	Committee prepared and approved, with public consultation	12 months for national up to 3 years for others
Vocabulary BS, EN, ISO, IEC	Referenced/indexed document defining terms used in a sector or technology.	Facilitates understanding of terms and their definitions for all standards used in a sector or technology	Committee prepared and approved, with public consultation	12 months for national up to 3 years for others
Code of practice (CoP) BS	Guidance and recommended options, including wide range of subjects from outline design to workmanship and safe practice	Covering wide subject matter, they provide accessible information and give authoritative guidance to good practice in a technology or sector. Useful for designers, project managers and building managers	Committee prepared and approved, with public consultation	12 months
Guide BS	Provides general guidance with recommendations and background information. Tends to be less specific and more discursive than a code of practice	Guidance across an industry/subject area, with in-depth explanations and examples based on scenarios	Committee prepared and approved, with public consultation	12 months
Drafts for development DD	Not a formal standard, but released early in a product or technology cycle when guidance is urgently needed	Gives customers insight into a new developing technology or product, enabling them to plan product development. Also provides an opportunity for users to feed back information	Committee prepared and approved, with public consultation	12 months or less

Category	Features	Benefits	Approval	Timescales
Related publications				
Technical report from CEN/CLC and ISO/IEC PD/TR	Additional information from that published in international standards (e.g. data collection)	Gives customers information needed to support other standards in that field	Committee prepared and approved, may be implemented as PD	Up to 3 years
(Formal) published document PD	Supporting document produced by committee for information only. Includes guidance, reports and recommendations	Can be read alongside other publications to provide insight in a integrated way	Committee prepared and approved, with public consultation if needed. Can be full or partial consensus document	12 months
Technical Specification from CEN/CLC and ISO/IEC - TS	Document establishing a norm where there is insufficient support for a full standard or where the state-of-the-art is not stable. Cannot conflict with an existing international standard but may compete with another TS.	Givers customers insight into a forthcoming specification or other formal document, enabling them to plan business activities. In the case of competing TSs, enables the market to decide on a definitive standard	Committee prepared and approved, with public consultation. May be implemented as a DD	Up to 3 years
BSI Publicly available specification PAS	Industry-sponsored standard produced at speed as it does not require full consensus and has dedicated resource. Can be detailed and solution-specific	Produced quickly, can be tailored to specific solutions and does not need to incorporate broader views. May be offered at review stage as a possible BS. If accepted, faster BS adoption should enable since the standard has already undergone some consultation and already follows BS 0-2	Developed and approved by BSI with industry, government or professional association sponsorship with some consultation	6-9 months

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