
Building cyber knowledge through online portals - a case study

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Abstract

Online learning has become a key role player in facilitating the growth of the knowledge economy in the past few years with Massive Open Online Courses (MOOCs) becoming a hot topic of debate. Although there is still much speculation about how these online courses may transform academic institutions in the future, the ease of access to information and learning is undeniably convenient. In certain instances, however, end users are not necessarily looking to complete a course or receive formal training – they merely require on-demand access to single pieces of information that are of some relevance at a specific time.

This presents an opportunity for web portals to address an individual user's needs by providing them with quick access to core pieces of information. These portals can also address a bigger audience by providing information that is relevant to various levels of expertise as opposed to MOOCs that are often level-dependent.

In this paper we discuss the development of such a web portal, the University of Johannesburg (UJ) Centre for Cyber Security (www.cybersecurity.org.za), by looking at the changes that the portal had undergone from 2013 to 2016, and also list some of the lessons learnt. We conclude the paper by reiterating important aspects to consider when developing such a portal also noting that portals and MOOCs may be used in a complementary fashion to further enforce or encourage user awareness and knowledge gathering.

1. Introduction

Online learning has facilitated the tenacious growth of the knowledge economy over the past few years with Massive Open Online Courses (MOOCs) becoming a hot topic of debate. Although there is still much speculation about how these online courses may transform the operation of brick-and-mortar academic institutions in the future, the ease of access to information and learning is undeniably convenient.

As a result, individuals from all over the world now have the opportunity to gain knowledge from some of the world's most renowned educational institutions through the use of platforms like Coursera (www.coursera.org) and edX (www.edx.org). In some instances, specifically that of the Swiss-based École Polytechnique Fédérale de Lausanne for example, numerous language options are also being made available in selected courses (such as the Learning New Ventures MOOC) through the use of subtitles which, in turn, makes it possible to accommodate an even larger audience at once.

In certain cases, however, end users are not necessarily looking to complete a course or receive formal training from an institution – they merely require on-demand access to single pieces of information that are of some relevance at a specific time. This presents an opportunity for web based information portals to address an individual user's needs by providing them with quick access to core pieces of information. These portals can also address a bigger audience by

providing information that is relevant to various levels of expertise as opposed to MOOCs that are often based on a specific academic level.

In this paper we discuss the development of such a web portal, the University of Johannesburg (UJ) Centre for Cyber Security, by looking at the changes that the portal had undergone from 2013 to 2016. We discuss various aspects ranging from Search Engine Optimisation (SEO) techniques, user interface design approaches and also list some recommendations and lessons learnt.

Before delving into the specifics of the portal's design, however, it is necessary to gain a better understanding of the traditional learning process. Additionally, it also merits identifying how online learning compares to more traditional learning techniques. Both of these will be discussed next.

2. Traditional and Online Learning

Despite the fact that technology is modernising the way in which information is conveyed to an audience by means of MOOCs, portals etc., the traditional process of learning remains very much relevant. When looking at Figure 1 we are presented with Bloom's (revised) taxonomy of learning.

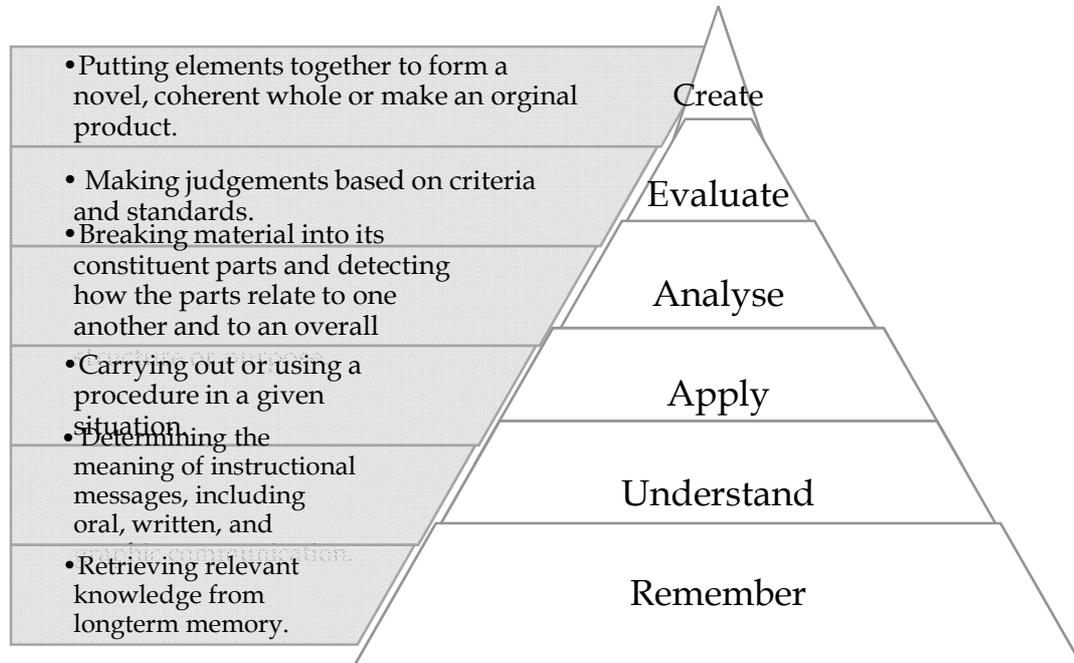


Figure 1

A Revision of Bloom's Taxonomy of Learning (Adapted from Krathwohl, 2002)

Learning typically advances from the bottom level to the top as it is reasoned that we need to remember before we can understand; understand before we can apply; apply before we can analyse; analyse before we can evaluate and evaluate before we can create. The key difference between traditional learning and online learning, however, is not only the method in which the information is accessed, but also how sources of information are found. With online information sharing approaches, the learning process is often preceded by conducting an online search, typically, by making use of a search engine.

Only once a suitable source has been found, does information retrieval and subsequent learning follow. This results in the addition of an extra level to the taxonomy as seen in Figure 2.

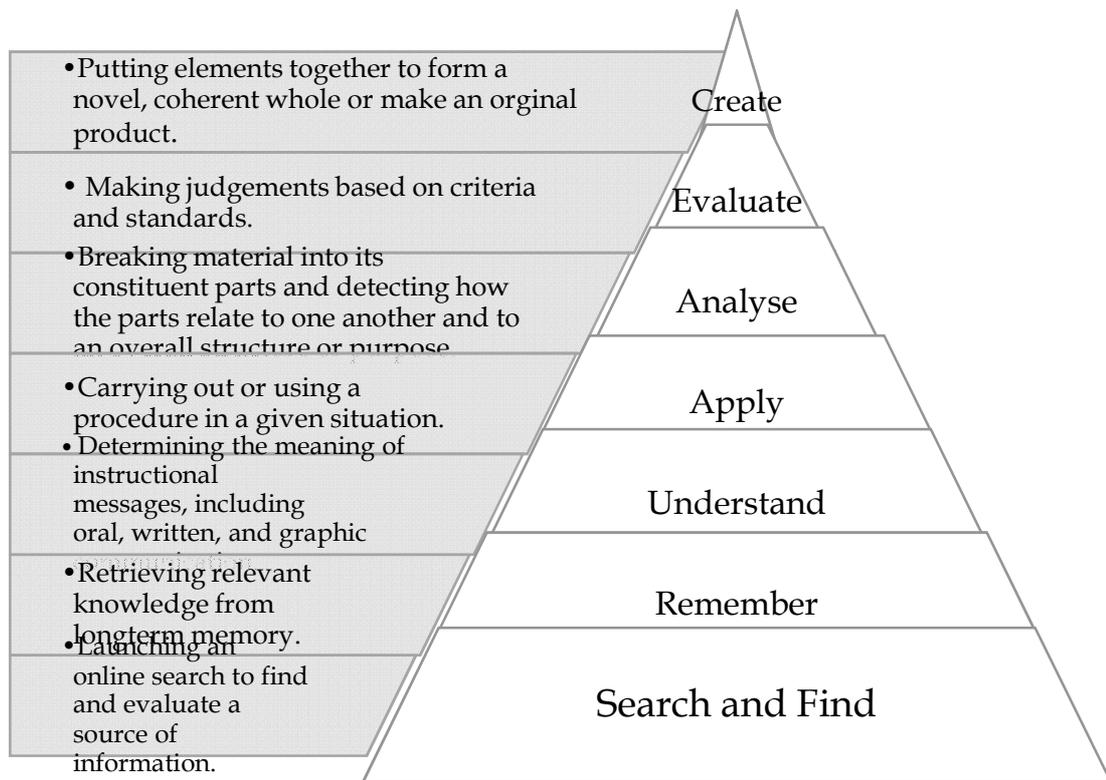


Figure 2

Search and Find Addition to the Revision of Bloom's Taxonomy of Learning (Adapted from Krathwohl, 2002)

The addition of the newly introduced 'Search and Find' layer in Figure 2 makes specific reference to end users that utilise search engines to find a relevant source of information. Once a source, such as a particular portal for instance, has been located, end users may evaluate its contents and assess the relevance thereof. If the contents are to their satisfaction (reputable, relevant, correct etc.), they may then proceed with the learning process. The introduction of this additional step in the learning process is an important aspect that needs to be taken into account specifically by online information providers. This is due to the fact that the success and relevance of online content relies greatly on its ability to firstly, be found and secondly, to be found in the correct context that it was searched for.

Furthermore, traditional learning content would typically be accessed through physical means such as consulting a textbook or referring to lecture notes, where online learning requires the use of an internet-enabled computing device. The scope of computing devices currently available range from small, handheld devices to large, multi-screen desktop devices. Making content accessible to all end users, across all devices, is yet another essential element to consider when delivering content to an information-hungry, digital society.

Ensuring not only information visibility (through services such as search engines) but also information accessibility (across various devices) are thus core elements to consider for online content delivery. A more in-depth discussion on each of these follows next, starting with visibility.

3. Visibility

The first step in ensuring that the contents of a particular webpage are visible, is to ensure that a website as a whole is firstly visible. Domain names, sometimes also referred to as website

addresses, enable end users to find a particular website and its contents on the World Wide Web. The chosen domain name of a particular website thus plays an important role in increasing its visibility and one should ideally choose a domain name that is (Google.com, 2016):

Descriptive - a domain name should ideally provide end users with an initial idea of its website's contents.

Easy to remember - short, simple domain names are naturally easier to remember.

Adaptable - an ideal domain name is specific, yet vague enough to stay relevant through content evolution that may occur over time.

To assist with further increasing a website's visibility, tools such as Google Analytics (analytics.google.com) may also be employed. This allows web developers to gain a better understanding of end user search queries that eventually lead to website visits. Armed with knowledge such as which keywords or search phrases lead end users to their webpage, developers now have the opportunity to focus on the expansion of the most sought after content that their site has to offer thereby further increasing visibility.

4. Accessibility

Once a website is visible to end users, they may choose to proceed by accessing it. As mentioned previously, numerous devices with varying screen sizes may now be used to access a particular website.

When looking at Figure 3 specifically, we come to realise that a large number of end users may, in fact, choose to access a website by means of a mobile device of sorts. This is evident from the substantial percentage of the device platform market share that Mobile (38.85%), Tablet (5.25%) and Console (0.1%) devices make up. With the introduction of various different mobile devices, end users are now capable of accessing websites by means of these devices in addition to traditional desktop machines.

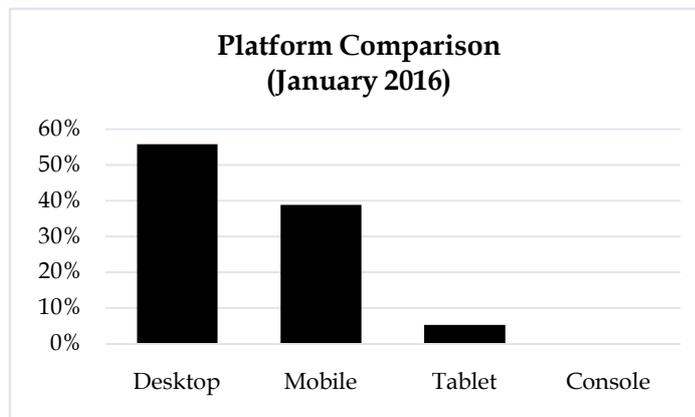


Figure 3

Platform Comparison Market Share January 2016 (StatCounter Global Stats, 2016)

Providing end users with a seamless experience across multiple devices by means of responsive design may thus contribute to not only reaching a larger audience, but also enhancing the overall User Experience (UX). Technical considerations, such as browser compatibility, are of course necessary to ensure that a responsive design approach is effective not only across devices, but also across different technologies.

Additional complimentary technologies, such as smartphone applications (apps) for example, may further contribute to reaching a larger audience and also streamlining the process of information access quite considerably. By means of an app, end users are now able to visit a source of information, find pieces of relevant information and share this information on various

other platforms, all from within the same app. Provided that a specific website or portal is optimised for the mobile environment, end users can thus enjoy a seamless experience without the need to constantly switch between apps.

It is worth mentioning that special precautions should be taken to ensure that end users and their information are not unnecessarily exposed to third parties if they do in fact choose to make use of additional technologies (such as apps) on their mobile devices or otherwise (Louw, 2016). This may prove to be counter-productive and ultimately defeat the intended purpose of a website, portal or MOOC.

In the event of a more formal method of design being required, standards such as the ISO9241 were created with the intention of providing guidelines on the development of a UX, also addressing numerous aspects of responsive design (ISO, 2010).

5. Content Delivery

With visibility and accessibility playing a big role in ensuring that end users may firstly find, and secondly, make use of a particular website, content delivery is the third important factor that should be taken into consideration. By providing unique, yet relevant content that is regularly updated, not only will end users be engaged by a website and its contents, but its search engine ranking may also improve as a result (Google.com, 2016).

With the introduction of aggregation tools such as the Global Internet Policy Observatory tool (observatory.giponet.org), accessing and embedding third party information through OPML (Outline Processor Markup Language), RSS (Really Simple Syndication) feeds or APIs (Application Programming Interfaces) is becoming a reality. This may lighten the burden of content managers by providing access to numerous unique sources in a highly customisable format.

6. Discussion

With a better understanding of the importance associated with enhancing the visibility, accessibility and unique content of a website, we now shift our focus to a discussion on the various methods employed by the UJ Centre for Cyber Security web portal.

The UJ Centre for Cyber Security was established with the aim of addressing various aspects relating to cybercrime in South Africa and Africa (UJ Centre for Cyber Security, 2016a). The webpages and associated content is hosted on an internal server based at the University of Johannesburg and is available from adam.uj.ac.za/csi. In an attempt to adhere to the visibility requirements as discussed in section 4, a simplified domain name (www.cybersecurity.org.za) was registered which automatically redirects users to the content hosted at adam.uj.ac.za/csi. By providing users with this simplified URL, the conditions for delivering a descriptive, easy to remember, adaptive URL to promote accessibility, has been addressed.

Furthermore, the Google Analytics tools that have been employed provide further insight to the most popular search terms that refer users to the portal. During the year 2015, for instance, the top three searches included "security courses", "cyber security courses" and "it security courses". Consequently, an emphasis is placed on the development and timely delivery of content relating to the various security courses on offer with classes bursting at the seams as a result.

Unsurprisingly, the webpage containing the information on the various courses on offer attracts the biggest number of visitors throughout the year with certain weeks preceding registration deadlines sometimes exhibiting a more notable increase in visitors.

From 1 January 2013 to 1 January 2016 specifically, a vast majority of portal visitors (74%) originated from within South Africa followed by visitors from the United States of America (5%)

and Kenya (4%). During this same time, more than 26 000 webpage views had been recorded of which 71% were from desktop machines, 23% from mobile devices and 6% from tablets.

In an attempt to ensure that end users are capable of accessing the portal and the associated information at any time, on any device, structural changes were implemented in the design of the portal which are visible in Figures 4 and 5.



Figure 4
University of Johannesburg Centre for Cyber Security Home Page on Various Screen Sizes 2013



Figure 5
University of Johannesburg Centre for Cyber Security Home Page on Various Screen Sizes 2015

Figure 4 illustrates the 2013 version of the portal as it is accessed on devices with varying screen sizes including that of a desktop, tablet and smartphone. As the screen size decreases, end users are required to zoom in on the content so that it may be legible on the smaller devices. In Figure 5, the 2015 version of the portal, however, end users are presented with an interface that

responds to the size (width) of their device’s screen which eliminates the need to zoom in on content. In the event of a shortage of resources to provide a fully responsive experience, alternative approaches can be considered including the use of media queries or text-only stylesheets (Above the fold LLC, 2012).

Finally, content delivery establishes the relevance and usefulness of a particular web resource of which the UJ Centre for Cyber Security is no exception. As mentioned previously, end users that visit the portal have been found to be looking for courses related to cyber or information security and subsequently, an emphasis has been placed on ensuring that up to date information regarding the courses on offer is provided. With similar South African web portals, such as the Internet Safety Campaign (iscafrica.net) and South African Cyber Security Academic Alliance (www.cyberaware.org.za) providing competition (locally), a unique reporting facility was introduced in 2014 in an attempt to engage end users and also provide sought after, yet accessible, crowdsourced information.

By means of a standard web form, end users are now (since 2014) able to report instances of cyber related crimes that have affected their lives for statistical purposes. An excerpt of the report for the years 2014 and 2015’s statistics is visible in Figure 6.

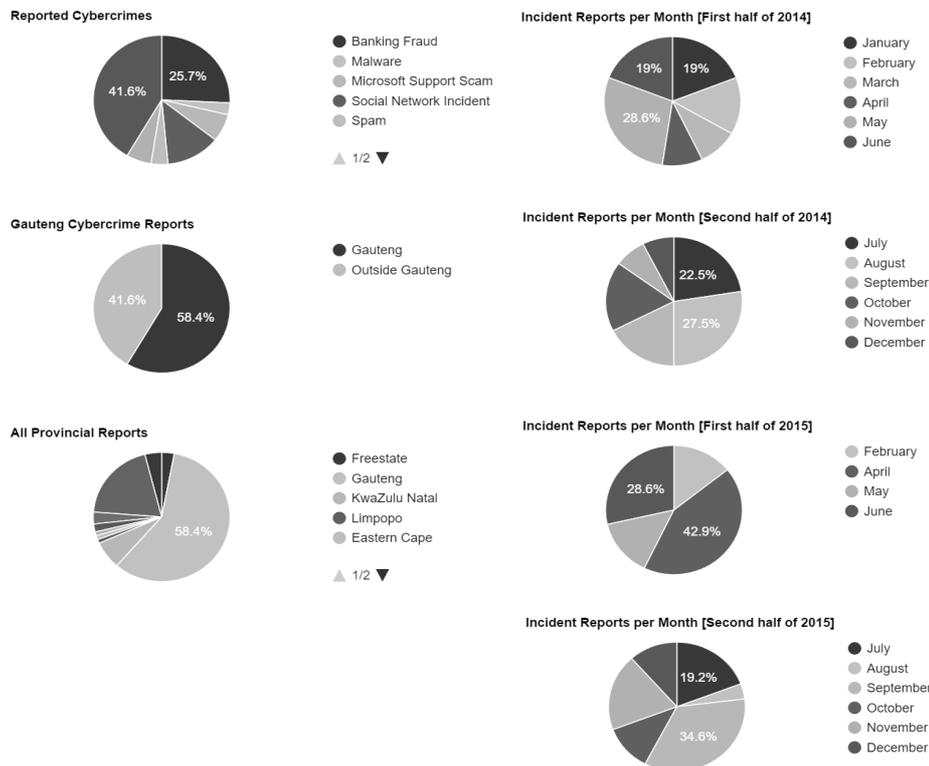


Figure 6
 University of Johannesburg Centre for Cyber Security Report Cybercrime excerpt
 (UJ Centre for Cyber Security, 2016b)

By visualising the obtained information, crowdsourced statistics are once again made available to the public, researchers and media. This creates an open, collaborative environment that values not only academics (those performing searches/trying to prevent crimes), but also the general public (those affected by crimes/reporting crimes) and media (those reporting on crimes).

An environment providing accessible, useful and open information to both academics and non-academics is thus created which aims to promote awareness and knowledge of cyber security as a whole.

Web portals may often act as a first point of contact with end users as they are redirected from search engines due to the highly customisable nature of their contents. As a result, portals should not be underestimated as a potential complementary asset in promoting knowledge sharing by means of both on-demand information access and online learning (MOOCs). Ensuring that visibility, accessibility and relevant content are delivered, web portals may ultimately act as the entry point and complementary source of information for every level of expertise.

7. Conclusion

With technology revolutionising many traditional sectors and their method of operation, traditional teaching and learning has not been left unaffected. These changes that are being experienced bear not only opportunities, but also risks. The opportunities lie in making top academic education more accessible and opening doors for new models of delivering education and opportunities to collaborate in the education space (Aberer, 2015). On the other hand, there also exists risks such as economic, legal and policy frameworks that have difficulty to adapt to the speed of change in the digital world, as well as the increasingly fierce competition in the education space (Aberer, 2015).

Web portals, such as the University of Johannesburg (UJ) Centre for Cyber Security, can be used in a complimentary fashion with Massive Open Online Courses (MOOCs). This can be achieved by providing quick access to core pieces of information for certain users, while providing more in-depth training through MOOCs for other users. An all-inclusive, continuous learning environment can thus be created.

With web portals containing highly customisable content, they are ideal for acting as a first point of entry to learning. This requires focusing on improving visibility, accessibility and delivering unique, yet relevant content. Søren Kierkegaard said that life can only be understood backwards; but it must be lived forwards. The same can be said about not only web development, but also online content development in general – its efficacy can only be understood backwards; but it must be developed and deployed forwards.

By continuously enhancing portals from good, reassessing so that they may become better and optimising so that they may be the best, a knowledge economy consisting of good, better and ultimately the best, may subsequently be built. The main challenge, however, is keeping up with the speed of technological and informational evolution in an attempt to remain relevant.

8. Research Limitations and directions for further research

With numerous tactics for improving the UJ Centre for Cyber Security web portal having been discussed in this paper, many aspects of determining its perceived success have been based solely on statistics obtained from analytics tools.

Even though the total number of page views has increased steadily since 2013 (1 January 2013 – 1 January 2014: 4161 page views; 1 January 2014 – 1 January 2015: 7200 page views; 1 January 2015 – 1 January 2016: 15329 page views), the measurement of the portal's success should not solely be based on these statistics. Instead, gaining a better understanding of exactly who the end users of the portal are and also incorporating their feedback into future development should be considered.

9. References

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