An Assembly Line Approach to Technical Communication Pedagogy with Intelligent Content Design and Delivery

Debopriyo Roy

***Abstract*—Topic-based intelligent content design with a better understanding of semantic web schemas could be the new focus for technical communication (TC) pedagogy in academia - a major shift away from designing standalone static documents. A new such TC course focused on the basics of how XML, RDFS, and OWL schema contribute to the semantic web for CCMS and CDP, including the basics of how faceted search works and ontology creation happens for simple e-commerce based, tourism, healthcare, and consumer product information design. The course also attempted to expose students to a basic understanding of iiRDS – the standard that enables dynamic information request and delivery in the era of the Internet of Things and Industry 4.0; and how Microsoft HoloLens - a mixed reality platform caters to intelligent information processing in Toyota and smart city contexts, as case studies. This was an introductory course with conceptual development being the focus, and not programming skills. With this course, we wanted to introduce students to the new industry documentation standards and initiate a process in pedagogy that will ultimately lead to bridging the extreme shortage of qualified job applicants in the industry coming from content strategy as a new field of practice. This paper focused on a pilot study initiating an exercise to explore the extent to which such a course helps teach information management in an English as Foreign Language (EFL) context for computer science majors, within the scope of content language integrated learning (CLIL) and project-based language learning (PBLL).**

***Index Terms*—Intelligent content, CMS, CDP, topic, document, faceted search, semantic web, delivery.**

I. Introduction

Recent research in TC has correctly identified what has been defined a ‘‘seismic shift’’ away from a document-based to a topic-based approach to developing, managing, publishing, and delivery of intelligent content [1], [2]. Scholars are offering stronger arguments for technical communicators to take on new knowledge-centered roles as assembly line and symbolic-analytic workers in content management and delivery contexts but with a limited rhetorical agency. These new-age technical writers could bridge the gap between industry needs and academic pedagogy by engaging in activities such as conducting usability research, working on distributed teams, finding, and articulating patterns, structures, and relationships in large amounts of information (big data) and across specific problems, projects, and task domains.

This approach raised an interesting question – how can we teach language in modular units, and with precision use?

Here, we introduced the curriculum for an undergraduate English TC course based on a topic-based intelligent content design in a Japanese EFL technical university, far removed from the assignments involving full-fledged static document production (e.g., user guides, manuals, reports, brochures, etc.) in traditional TC pedagogy. The new curriculum is geared towards imparting knowledge on the basics of intelligent content delivery with assignments focused on decision-making concerning content design, creation, and reuse. Such an objective could be addressed not while asking students to document texts but while engineering the possibilities for text design, including how they might be arranged and displayed [3]. This could be considered a major shift away from teaching technical writing with a document-focused approach, and towards a more intense focus on searching for the most relevant information, in each context and time, for a given task and a specific audience type. Teaching TC with this approach to computer science (CS) majors in this EFL context probably suits better with students who are more into information search, access, and retrieval with an analytical mindset, have higher interest and understanding of machine learning, big data analysis, IoT, and with marginal focus on the macro-level language production at a document level. In other words, this approach calls for a mindset in language use different from a simple flare for literary use of language.

So, when language teaching is approached with a more topic-based, metadata-specific, semantic, and ontological framework with words and phrases that fits into classes, and types, and/or as subject-predicate-object, and visualization as in intelligent graphics, concept maps, etc., vocabulary and language teaching is likely to make better sense in the context of the industry. This is because the pedagogy is likely to be directly focused on how language is used by customers, technicians, vendors, etc. towards better decision-making.

II. Short Literature Review

The document-based approach to technical writing has seen unique standalone documents being produced using tools such as FrameMaker, Word, Robohelp, and Flare. The topic-based approach to TC pedagogy has been compared with a manufacturing model of production [3]. It is based on content design, management, and delivery, and is focused on the processes (e.g., content strategy, business analysis), methodologies (e.g., structured authoring, minimalism, single sourcing), and technologies (e.g., XML, XQuery, RDFS, OWL, component content management systems, and content delivery portals) with the content being manipulated

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at a granular or topic level [3]. This approach to granularized content design including smart, nimble, portable, and future-ready content in content management or content delivery portal leads to intelligent content which is structurally rich and semantically categorized. The technical writers are tasked with writing and editing content topics according to the schemas and standards embedded in their XML authoring tools [4].

The basics of CCMS, CDP, and semantic web, including topics on iiRDS towards intelligent content delivery (as discussed in the course in this CS EFL context) are primarily based on Prof. Wolfgang Ziegler's publications in 2017-2021 period (HKA, Germany).

Instructors focused on this new TC pedagogy could refer to the following publications link as reference-

https://www.i4icm.de/en/hochschulinformationen/publikationen/informations-und-content-management/

Fig. 1 demonstrated the content and assessment model adopted for this TC coursework.

The syllabus for the course mentioned in this paper was largely followed based on the pedagogical schema outlined in Fig. 1.

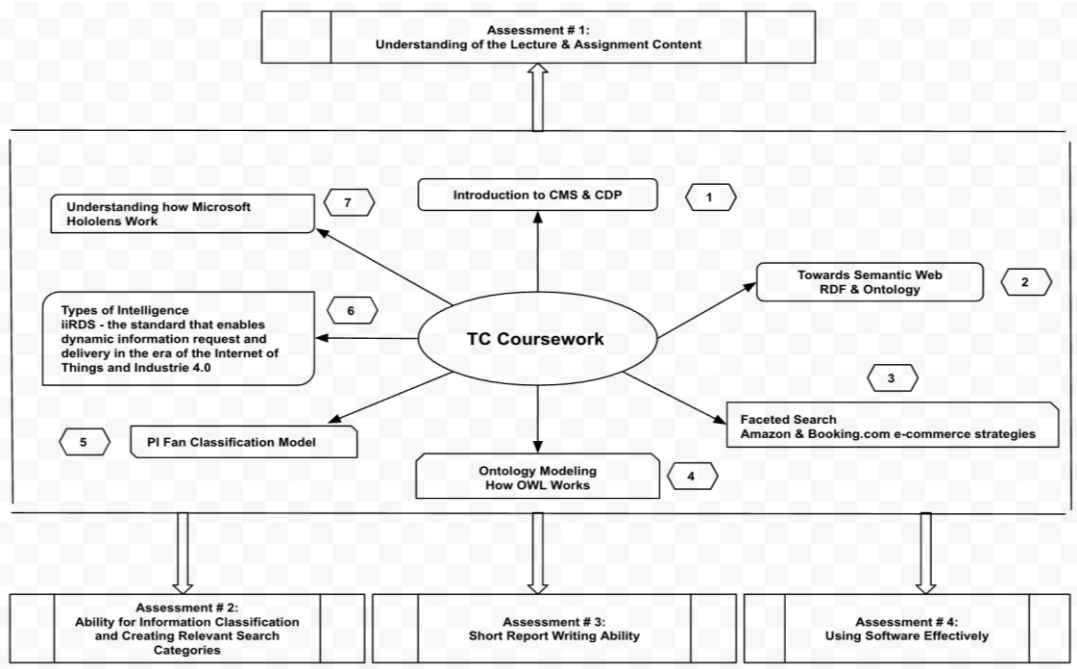

Fig. 1. The new TC coursework.

III. Curriculum Design

The course started with a robust introduction to the fundamentals of CMS and CDP, with a discussion of how fact-based information structuring feeds into content processing and metadata enrichment, content search, and delivery towards intelligent delivery in CDPs. Fig. 2 demonstrated the concepts essentially related to how CDPs are designed.

As an introductory course in TC, there may not be much opportunity to delve very deep into each of these categories, as mentioned in Fig. 2, but a definitional understanding for an introductory undergraduate course catering to computer science majors could be achieved.

Fig. 2. The core essentials of a CDP.

The class discussion then progressed to XML vs. semantic web with data technologies such as Resource Description Framework (RDF) and Web Ontology Language (OWL), including the basics of how semantic web technologies and natural language processing (NLP) have different but complementary roles in data management.

The first technical report assignment asked students to highlight the major takeaway points from the lectures, the CMS they might choose including purpose and goal, their basic understanding of CDP in a specific healthcare data management context, and why they think this topic is important in TC, for CS majors, and the industry?

The third topic focused on a specific case study researching how the e-commerce information design strategies in the Amazon website create cognitive ease, personalization, persuasion tactics, exploits scarcity, use anchoring principles, etc.

Students designed a short 2-page technical report with screenshots and captions using the Canva software, explaining 5 major e-strategies that Amazon uses for selling smart home products from their website. Students were assessed on their ability to understand specific examples of how Amazon uses the e-strategies for smart home products sold from their website.

The fourth week focused on an in-depth understanding of the faceted search principles (including the difference

between faceted and hierarchical classification) exploring how *Amazon.com* and *Booking.com* use faceted search principles in their website. This was an interesting and engaging exercise as students spent quite a bit of time trying to explore how the faceted search strategies were used by these companies, and how it might have influenced customer decision-making.

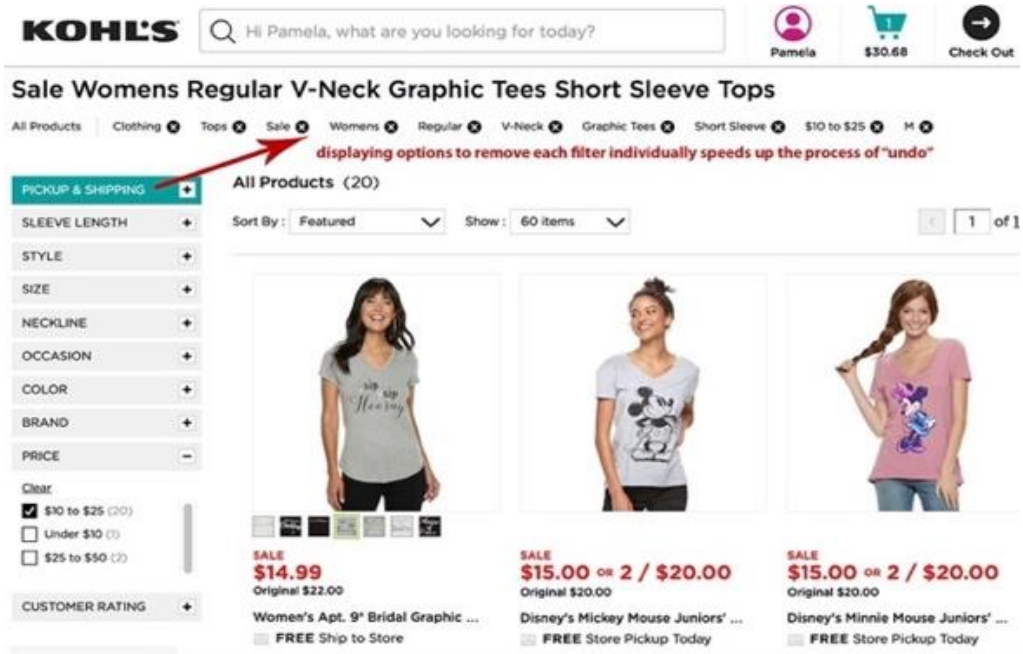

Fig. 3. Faceted Search (used with many case studies in the course).

The fifth week introduced the basic principles of ontology, and how OWL works. Students were asked to use the *WebVOWL 1.1.7* software to design a basic ontology structure for a product documentary movie.

Fig. 4 demonstrated an example of an ontology as is expected to be designed by students. Students could successfully design their own movie ontologies in a successful way using the WebVOWL software. Topics of choice included TED videos, star war movies etc.

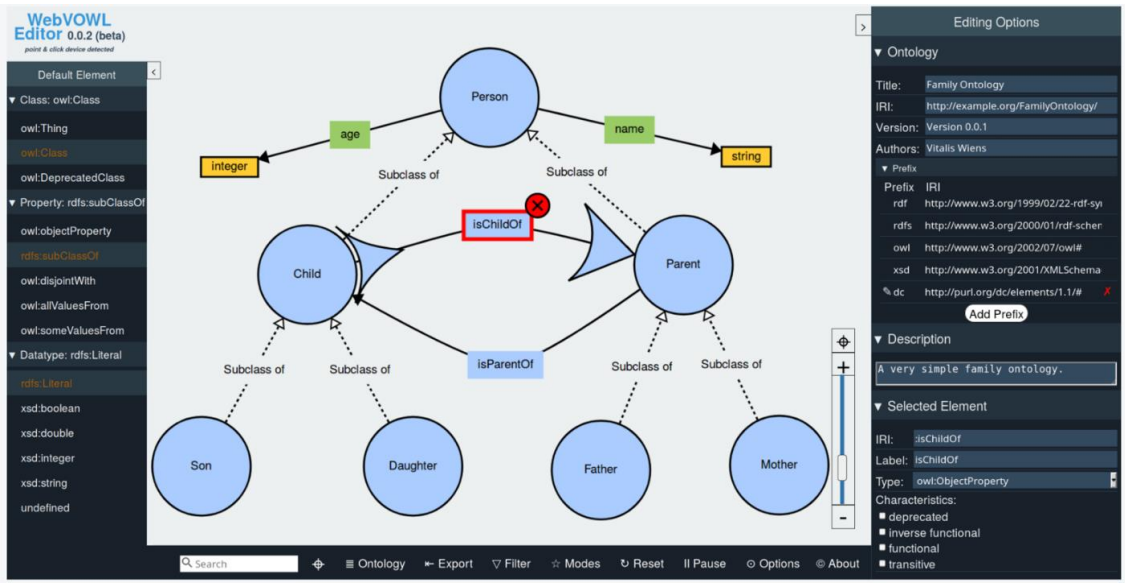

Fig. 4. Ontology with WebVOWL 1.1.7 - http://editor.visualdataweb.org/.

Students were asked to create the ontology for an English movie of their choice. They were asked to closely follow the video example showing how the ontology was created and try to copy it for their own movie example.

Students were graded based on the extent they could use RDF-based triples and based on the basic elements of RDF; and if they could add more vocabulary for describing properties and classes. Students were asked to use the following as much as possible, based on the project:

- Relationships between classes (ex: disjoint with)
- Equality (ex: sameAs)
- Richer properties (ex: symmetrical)
- Class property restrictions (ex: allValuesFrom) in the ontology for the selected product movie.

Students were instructed that the movie ontology should cover the following:

- A. Movie Type (long, short, language, other classification if any).
- B. Actors/Directors/Producers and other roles
- C. Genre (e.g., horror, thriller, romantic etc.)
- D. Storyline (opening, middle and climax)
- E. Relationships between actors

The 6th week focused on the PI-fan classification model (product class and information class) - a faceted search and information design strategy based on concepts of intrinsic and extrinsic classifications and variant management. Students studied static user manuals for coffee machines, microwave ovens, and washing machines, along with other details related to the product versions, and designed a limited PI-Fan classification structure.

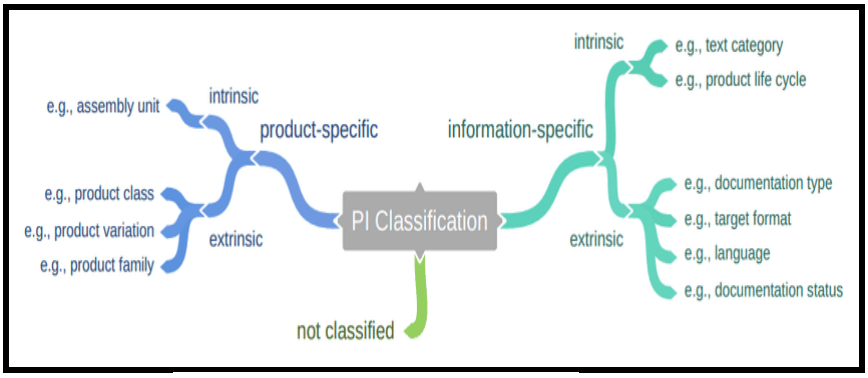

Fig. 5. Basics of PI-Fan classification (Reußner, April 2018).

The seventh and the final course week introduced a basic introductory understanding of information intelligence types and *iiRDS – The New Delivery Standard for Technical Documentation* (https://iirds.org/) exploring how technical documentation can be delivered in the age of Industry 4.0, and how it's based on the PI-Classification standard. Students then watched YouTube videos for a basic understanding of two case studies suggesting how information is used intelligently in the industry for different purposes and are as follows: 1) QR Code, Work Requests, and Inventory Management and 2) Microsoft HoloLens, which is a "mixed reality" platform for Industry 4.0, using multiple sensors, advanced optics, and holographic processing that melds seamlessly with its environment, exploring how intelligent information design is an integral part of using HoloLens for Industry 4.0-based product and information classes. Two reference case studies were studied briefly to develop a better understanding of MS HoloLens:

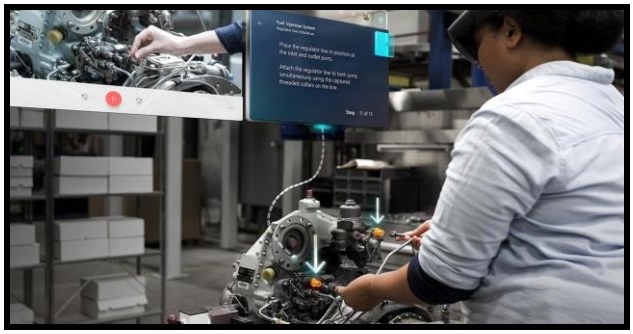

Fig. 6. Using mixed reality Microsoft HoloLens in production /Assembly/Repair Floor (Factory context) https://news.microsoft.com/innovation-stories/hololens-2/

The first case study focused on understanding how city planners take advantage of augmented reality (AR) technology as a method for visualizing the three-dimensional (3-D) city model of Toronto and various types of city data with the cutting-edge AR device Microsoft HoloLens [5]. The second case study focused on understanding how Toyota uses mixed reality with Unity and Microsoft HoloLens [6].

Both case studies involved content comprehension-related activities. The first case study involved reading a journal article and the second case study involved watching a video in Japanese from Toyota Corporation and then making an English technical report explaining the technology and its use for intelligent data access.

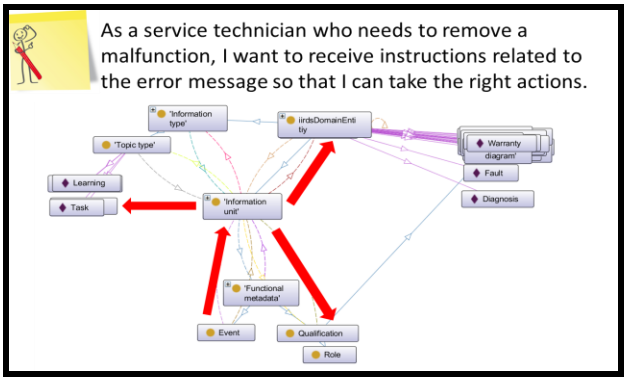

Fig. 7. An Example Slide explaining how iiRDS is used in the industry (Parson, November 17, 2016).

IV. Priliminary Performance

Initial performance assessment was based on student reports (N=48) categorized into 8 short technical reports completed for the 8-weeks quarter.

Results suggest a moderate understanding of how CCMS and CDP function, and/or moderate ability to explain in English. Further, students showed moderate ability to explain how semantic web-based on RDFS and OWL adds value to a CCMS and CDP, and how OWL and RDF add value to any system when compared to XML-based DITA information model. Similarly, students needed a more in-depth understanding of concepts such as faceted search, iiRDS, ontology modeling using software such as *Protege*, but the much simpler *WebVOWL1.1.7* was used to ensure a basic conceptual understanding of ontology design. Preliminary

results demonstrated that the concepts were moderately understood for basic case studies involving booking.com, Amazon, healthcare management records, etc.

Similarly, the final assignment on mixed reality Microsoft HoloLens demanded more iterations and research for students to go beyond the technology and understand how the tool relates to IoT and Industry 4.0 and connected documentation practices in the context of intelligent content access and delivery in a full-blown CDP. The final assignment was easier to comprehend in terms of a basic understanding of the technology, but more difficult to grasp reasonably in terms of connecting the dots between mixed reality technology and the previous concepts discussed in the course. More in-depth analysis and discussions were required.

V. Future Directions

The assignments and assessment focused on the ability for analytical reasoning, visual design, clear and concise writing, information and product classification, and the ability to undertake basic research. Instructors should look for more concrete examples and guided instructions to explain and demonstrate example case studies of intelligent content design and retrieval from CDPs, related to Microsoft HoloLens. Special attention should be given to understanding how standards such as PI-Fan classification models are implemented and ontologies are created for more complex products in the market. Future studies should also focus on a statistical analysis of student perceptions for such assignments.

Future developments will include course-level collaboration with German universities, Tekom (Europe), and CMS vendors towards relevant curriculum design in a Japanese context. More advanced versions of the course could focus on using *Protégé*- a free, open-source ontology editor and framework for building intelligent systems and using applications such as *CosimaGo* (an XML editing system) for designing multi-level documentation frameworks.

A more advanced course with this semantic web-based approach to TC will be attempted by the course instructors at the graduate level in a 3D printing context. Different major steps in the 3D printing process with a special focus on the PI-Fan classification model and variant management will be attempted, with and without the basic use of software such as *CosimaGo* and *Protege*. Advanced TC courses should also explore AI technologies like object and speech recognition to identify the requested object and information types and facilitate search processes; and the linking of ontologies with search mechanisms among other related topics [7].

VI. Conclusion

This TC course on understanding intelligent content design was not about programming skills with XML, RDF, or OWL. This entire course was taught in mostly a non-coding environment, given that this was an EFL-based language course. Rather the idea was to generate standalone explanatory technical reports in a way that demonstrated 1) students could generate explanatory technical reports based on all standard organizational styles, formatting, visualization, etc., 2) student writers understood the concepts, and how it's used for specific scenarios. This overview course focused on semantic web and intelligent content delivery at a very introductory level.

One of the major challenges faced in this context was the fact that this institution does not currently offer any such TC-based courses, that would help design a full track towards a TC certificate based on knowledge, information, and content management. A big problem facing the TC pedagogy as seen in the worldwide university curriculum is that we are still quite a distance away from adapting to the topic-based ID contexts, away from the rhetorical work in document-based ID contexts, particularly those producing intelligent content. Expectedly, the industry continues to see an extreme shortage of qualified job applicants coming from content strategy as a new field of practice. Towards establishing a topic-driven and ID context-based TC curriculum, the first step should be for TC researchers to investigate research problems that the industry considers important, and these investigations should lead to guidelines and best practices for the field [8].

Conflict of Interest

The authors declare no conflict of interest.

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