OPERATIONS AND SUPPLY CHAIN MANAGEMENT ISSUES IN DIGITAL CONTENT BUSINESS

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Adoption of digital content has increased significantly over the last 10-15 years, with proliferation of computing devices such as computers, smartphones, tablets, media players and readers. Substantial digital content now characterizes categories like movies, videos, music, books, news, educational materials and apps. Such widespread adoption needs changes in the underlying business models. The scope of digital operations encompasses the entire process of creation, capture, processing, storage, sales and delivery of digital content. Just as physical goods pass through a supply chain to result in a product in the hands of a consumer, digital content must also pass through various stages until consumption by an end-user on the chosen device. In our ongoing work we study the nature of operations and supply chains underlying different types of digital content, and explore pertinent decision approaches for this domain.

Content is often produced and consumed in multiple formats – physical and digital. The same content could be consumed across multiple devices, perhaps by the same consumer, with properties varying across platforms. Standardization is still evolving, and there are even proprietary formats optimized for certain devices and technologies. This multiplicity must be recognized at the content development stage itself, so that a suitable format mix can be chosen. Some firms have adopted a "digital first" strategy, while others prefer a hybrid approach. Since it is impractical to have a variant for every possible device, platform and geography combination, decision models would be helpful in such selection problems.

Different kinds of processes are involved in digital business: content creation, format conversion, and customer order fulfilment. In particular, fulfilment processes for such content need to be near-instantaneous, so have to rely significantly on technology and capacity. Networks and processes have to be designed to balance customer expectations in terms of price, quality, and response vs. internal measures such as cost and efficiency. Quality of digital content has to be ensured at different stages in the chain. Checks are needed from content, technical and legal standpoints at sourcing and submission stages. The quality of conversion to digital format has to be verified appropriately, and the files must be checked on ongoing basis to ensure integrity. An appropriate quality assurance system has to be designed with well-planned positioning, frequency and technology-enablement of checkpoints.

At the network design level, it needs to be decided whether the same structure is used across all item categories and formats, or whether separate channels are devised for selected items. For example, apps may be sold on an apps-only channel, and physical products can be managed through a separate network altogether. Since products are not in physical form, there may be little need for multiple units of inventory. However in order to execute on-demand delivery of content, files need to be kept at hand of all possible demand units. Since even digital space is expensive, some items may need to be moved to near-line or off-line storage. Likewise, commonly demanded files may be stored at multiple points in the delivery network. To enable a postponement-based strategy for infrequently demanded items, possibly a generic form may be held centrally, and conversion tools made available for respective formats. Meeting customer expectations in terms of speed and latency requires choosing the appropriate channel, location and form for different items.

The area of contracts and pricing has been studied by supply chain researchers for some time. Digital content has more complex ownership structures compared to physical products, especially since there may not be full change of ownership in the chain between creator and consumer. Likewise, revenue monetization could occur at different stages of production/ consumption. Design of such network relationships, with appropriate revenue sharing mechanisms across participants, requires development of appropriate models. When the same content is sold in multiple formats, each with its own cost structure and margins, development of appropriate pricing and revenue models is also worth investigation.

Based on the study so far, there is rich scope for examining a wider range of digital operations, as well as identifying similarities/ differences vis-à-vis other manufacturing and service operations. The foundation effort is on documenting various decisions underlying digital operations, with descriptive modelling, to understand the effects of different parameters on system behaviour. Based on identification of performance levers, the analysis and modelling would be extended to application of optimization techniques for design, resource allocation, and process management.