WIM

Research Paper

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No 01/2004

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Modularization, Individualization and the First-Copy-Cost-Effect – Shedding new light on the Production and Distribution of Media Content

Munich, 2004

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1 Introduction

The media industry is one of the industries which have recently undergone most dramatic changes in the production and distribution of their products. New technologies, based on the paradigm of digitization, enable a more modularized production of media content and its individualization for specific consumer needs. While media content has primarily been produced monolithically and barely on the basis of modules, modularized production currently gains importance and will likely be the prevalent concept in the future. However, this doesn't mean that modularized content production is per se beneficial in every case (Magnusson, 2000). Since traditional theory on content production – such as the concept of economies of scale – is focused on monolithic content production, it can hardly explain the – positive or negative – impact of modularization and individualization and should be rethought. Most research on modularization was primarily empirical and qualitative in nature and did not focus on a particular industry (Magnusson, 2000). Thus, it has not yet captured the specificities of modularization in the media industry and has not provided a theoretical fundament for the modularized production of media content.

The problem, which emerges from this starting point is twofold. From a theoretical perspective, the impact of modularization and individualization on the media industry calls for a change in the traditional perspective on content production and needs to be considered in the theory of content production. From a more practical point of view, media companies have to decide on whether to pursue a strategy of modularization and individualization and need an economic basis for this decision.

Thus, the aim of this paper has two elements. First, we want to rethink the traditional theory of content production and realign it with the new possibilities for modularization and individualization. The First Copy Cost Effect as a very simple, yet the most prevalent, element of the traditional theory on content production needs to be revised and analyzed under new light. In the paper on hand, we analyze the impact of modularization and individualization on the production and distribution of media content and develop a model that accounts for these effects. Further, we identify the current understanding and definition of the First Copy Cost Effect as too simplified for an increasingly elaborate media research and present a refined view on this concept. Second, we want do derive a mechanism that helps media companies to decide on whether to employ modularized and individualized content production or not. For this reason, the new model of modularized content production will consolidate the technological impacts to a single results, describing the prospective change in profit when modularized content production in employed.

The paper is organized as follows. We first present the state of the art in theory and practice of content production and distribution and take up the current discussion. Then we introduce modularization and individualization as relevant technological changes and discuss their impact on content production and distribution. Here, we start with modularization as the more basic concept and then focus on individualization, which builds upon and presupposes modularized content. For both concepts we present a formal model, starting from the currently simple notion of the First Copy Cost Effect and adding relevant new impacts on costs and revenues. We conclude with a summary and a refined definition of the First Copy Cost Effect and give an outlook to further research.

2 Production and Distribution of Media Content – State of the Art

The production and distribution of goods are the central tasks of a firm. Both have been subject to intensive analyses by researchers in the fields of economics and business, who pursue the optimal combination of input factors in order to maximize output and profit. Numerous types of production functions were invented within production theory, which more or less exactly describe the real world production of goods in various industries and give hints on how to produce goods and services efficiently and economically. Paradoxically, the media industry has only marginally been touched by the theory of production – a fact that might be attributed to the more creative and unpredictable input-output-relationship in this industry. We only find scarce references to a theory of media production that considers the specificities in the creation of media content (Bourreau/Gensollen/Perani 2003), while there are already various works on the design of content distribution, such as video distribution, price differentiation and bundling of media products (Owen/Wildman 1992, Shapiro/Varian 1998). Related works in the field of content production mostly have conceptual character and describe systems designed to support content production (Koehler/Anding/Hess 2003, Meyer/Zack 1996) rather than provide an economic analysis or model for a theory of content production. Considering the theoretical state of the art in content production and distribution, we conclude that distribution has far more been in the focus of research than content production.

We analyze the production and distribution of media content by starting with the framework of the media value chain. This rather theoretical framework describes the creation, bundling and distribution of content as three generic steps of value creation in the media industry.

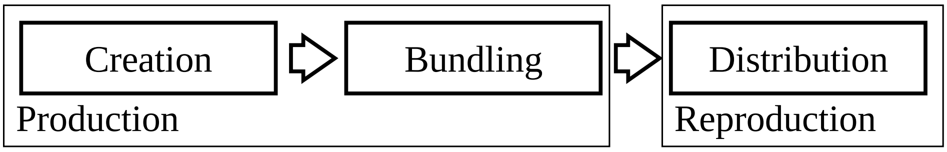

Figure 1: Media Value Chain (for the concept of media value chains see Zerdick et al. 2003)

The “production” of content in the traditional and current understanding comprises two value chain activities: *creation* and *bundling*.

The distinction between production and distribution can be described as follows: while the content production regards the creation and bundling of new, distinct content, which is called *first copy*, the distribution represents the production of *copies of this first copy* and their delivery to recipients. Thus, the distribution of content also comprises a type of production, which we call *reproduction*. When it comes to digital media and content distributed over the internet, the reproduction activity coincides with the distribution activity, since copies are virtually generated while content is delivered to the recipient over digital transport media. In this traditional perspective, the first copy is the result of the first two steps in the media value chain: creation and bundling. In fact, this first copy is not a copy, but a “master”.

A theoretical concept based on this idea of the “first copy” is the First-Copy-Cost-Effect, which addresses the particular relation between the costs of the first copy of a specific content and the costs of every reproduced copy. While the production of the first copy is typically expensive in the media industry, the production of every further copy is comparatively cheap or even costless. Although we find similar relationships between the costs of the first copy (or prototype) and the costs of reproduced copies under the name *Economies of Scale* in many other industries (e.g. in automotive or pharmaceuticals), this effect is considered a particular feature of the media industry. It has widely been discussed in literature, although it was seldom called *First-Copy-Cost-Effect*. Picard (1998) explains the cost structure of newspapers and distinguished First-Copy-Costs and reproduction costs. Shapiro/Varian (1998) discuss first-copy-costs and economies of scale and give the Encyclopaedia Britannica as an example. According to Varian (1995), about 70% of the costs of an academic journal are First-Copy-Costs. Many real-world examples can be found for the First-Copy-Cost-Effect: The movie industry spends hundreds of millions of dollars for the first copy of a new movie, while each DVD-copy is produced for less than a dollar.

Figure 2 shows the First Copy Cost Effect as a functional relationship between the number of units and the strongly declining average costs per unit.

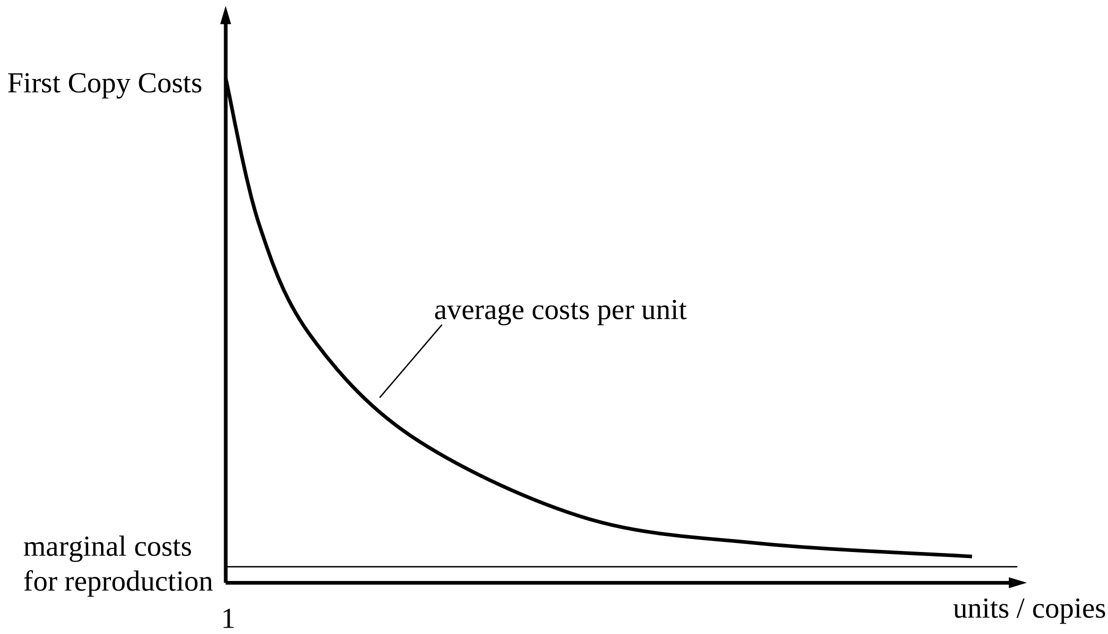

Figure 2: First Copy Cost Effect

Considering this effect, the total production cost can be formalized as follows:

$$C = C_{FC} + n * c_R \quad (1)$$

In this model, C describes the costs occurred for n copies of the content product with C_{FC} being the First Copy Costs and c_R being the marginal reproduction costs per copy. We assume that the first copy will not be sold and thus is not counted as a unit of the product (otherwise only n-1 copies of the first copy would have to be produced for an output of n units). Hence, the average production costs C_{AVG} for a product unit is:

$$C_{AVG} = \frac{C_{FC}}{n} + c_R \quad (2)$$

This traditional concept of the First-Copy-Cost-Effect exhibits two inadequacies. First, it focuses solely on a single product and doesn't consider a multi-product situation, which in fact is the more prevalent case in practice where most media companies produce a set of interconnected media products. Second, this concept cannot cover the impact of modularization and individualization on content production. We want to analyse these aspects in more detail.

The current literature on the First-Copy-Cost-Effect typically considers a single product, e.g. a book, of which a first copy is created at high costs and a defined number of copies are produced at low marginal costs. (Shapiro/Varian 1998:20) From the traditional perspective, the First-Copy-Cost-Effect occurs on the third step of the value chain, with the first copy being a content bundle, which is copied during the distribution process. This enables simple analyses of economies of scale in traditional media production but doesn't reflect content production in reality, where typically not only one media product, but a portfolio of media products is created and even interdependencies between these products occur.

Thus, the traditional perspective of the First-Copy-Cost-Effect is insufficient when it comes to multi-product media firms, which create a set of media products based on modularized content, especially when modules are multiply used in different products. Furthermore, the First-Copy-Cost-Effect currently does not consider the market perspective and the possible impact of consumer demands on content production. To allow for this more complex view of content production we have to adapt the concept of the First-Copy-Cost Effect. We will analyze the impact of modularization and individualization on content production and extend the traditional model to a more realistic economic model for module-based content production and -distribution. Modularization and individualization only apply to a multi-product case, since a re-use of content modules is not possible with a single content product. With a single product there will be no advantage from modularization and individualization is not viable. Thus, before taking a closer look at modularization and individualization, we will have to transform the simple model in expression (1) into a multi-product firm model.

3 Modularization and Individualization

The advent of new technologies brings about substantial changes in the traditional production and distribution of media content. Digitization is a base technology, which allows any kind of content to be represented in a standardized format: as a series of bits.

From the perspective of *content production*, digitization has a significant impact on the way content is created and represented. While traditionally there is a strong bonding of content and transport media (e.g. photographs are bound onto celluloid and cannot exist independently from this medium), digitization enables the separation of content and media (see Barlow 1996). This allows the production and storage of content independently from any media (e.g. the photograph can be stored digitally on a hard disk) such that any content can easily be bound to various transport media during the distribution process. Further, digitization enables the segmentation of content into smaller parts (modules). These modules can easily be copied, modified, and assembled to various content products. A basic technology for modularized content production is the eXtensible Markup Language (XML), which allows separate content, structure and layout of a content product. A so called Document Type Definition (DTD or *XML Schema*) enables the content creator to define a structure for the content product and then create the content separately. The structure of a newspaper article might consist of a title, a header and a body which are filled with content for each article. These elements can be used as modules and recombined easily. Other technologies that support modularized content production (and which are often based on XML) are multimedia databases, content management systems and product platforms (Koehler/Anding/Hess 2003).

Considering *content distribution*, the compression of digital data enables a higher bandwidth and a faster transfer of content. Especially audio-, video- and graphical content can be significantly compressed by omitting those parts of the data stream which are irrelevant for human perception, such as in MP3-compression. At the same time, feedback channels, implemented in digital transport media, allow the transmission of information from the recipient back to the content originator. This finally enables the content originator to gather information about the recipient and to deliver individualized content to a mass audience. An example for these feedback channels is given by the current advances in interactive television. Here, the recipient can influence the TV program or order products directly through the TV connection. Another example is the internet, for which the feedback channel is a prerequisite and which allows users to specify the content they want to consume (e.g. by clicking a hyperlink).

Thus, new technologies on the basis of digitization introduce two concepts to the media industry: *modularization* and *individualization* of content.

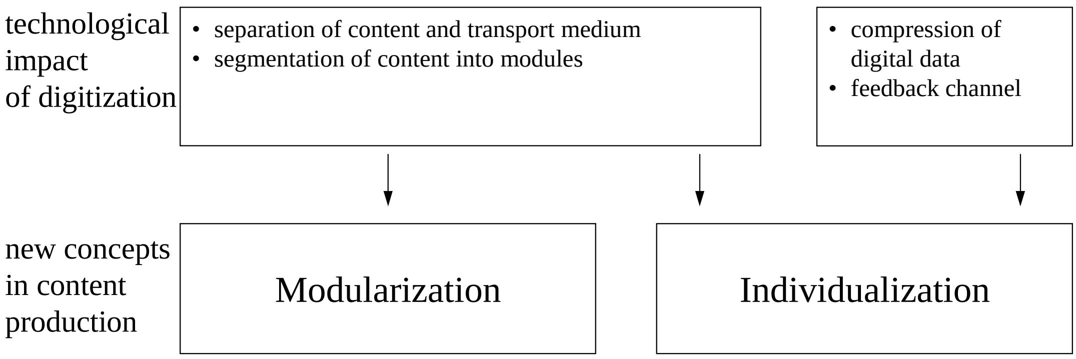

Figure 3: Digitisation as a driver for modularization and individualization in content production

Modularization and individualization will have significant impact on the production of media content. In the following, we will analyze this impact and show how the simple model for content production will change. We first analyze the impact of modularization on the production of media content and the changes in production cost. Thereafter we will discuss individualization, considering that individualization presupposes modularization and is not only relevant for the production but necessarily also affects the distribution of content. Thus, we will include revenue effects of individualized content into the model.

4 The Impact of Modularization on the Production of Media Content

Modularization describes the decomposition of a product into a set of delimited modules. Besides the media industry, modularization (or modularity) is an important concept throughout many other industries such as automotive or computer hardware (Baldwin/Clark 1997). Here, modularity is primarily used to handle the increasing complexity of technical products (Magnusson, 2000, Langlois 2000). In the media industry, modularity does not reduce product complexity in the first place, but has significant impact on the production costs of content, as will be shown in the following. Besides a reduction of production costs due to increased economies of scale, modularization also delivers an opportunity for specialization and can also be a driver for innovation (Magnusson 2000, Miller/Elgard 1998). In the following, we first want to have a closer look at content production and modularity in content production.

Content modules do not necessarily have to emanate from existing content products (such as an existing text which can be decomposed in smaller parts) in a *modularization* process but can also be created as modules in the first place (such as the songs on a CD, which are produced independently and then bundled later on). In the following, we won't distinguish between modularization of content and the creation of content modules since the result of both approaches is the same: both enable modular content production. In modular content production, media content is not produced monolithically as a single content entity but assembled from a set of content modules. In fact, the traditional perspective on content production already resembles a kind of modularization, since during the bundling activity in the content value chain already existing content modules (e.g. the mentioned songs) are bundled to larger products.

In order to derive a model for modularized content production from the simple model in equation (1), we first have to transform the one-product model into a multi-product model. This step is necessary because modularized content production does not make sense in a one-product situation where monolithic production is always more efficient. Thus, the following analysis requires a multi-product perspective, where the cost of the production of B different media products (B for "bundles"), each with an individual circulation n_i, is:

$$C = \sum_{i=1}^{B} C_{FCi} + \sum_{i=1}^{B} n_i * c_{Ri} \qquad (3)$$

C_{FCi} is the first copy cost of product i, while C_{Ri} represents the reproduction cost of product i under the assumption that the costs of reproduction (can) differ for each product.

If content is produced on the basis of modules rather than monolithically, production costs change. Instead of a first copy for each product, a set of modules is created, which then are bundled together to different products. This requires a redefinition of the term “first copy”. While the first copy in the traditional understanding describes a master copy of a content product ready for distribution, we in fact have two kinds of first copies: *first module copies* and *first product copies*. The character of a first module copy and the process of its creation are identical to the traditional first copy: it primarily involves creative and editorial work. The first product copy instead either simply describes a logical compilation of modules or represents new content, merged from a set of modules which are strongly interconnected (this means that new creative or editorial work is involved in the bundling activity). An example would be a news article, which is assembled from different existing text modules and some pictures. The text modules can either be simply put together in a specific order without changing the text or the text itself could be edited in order for the modules to be better aligned with each other. For simplicity reasons we assume that a first product copy only represents a logical assemblage of modules which are not edited in the bundling process. Figure 4 visualizes the relation of the different types of copies in modularized content production.

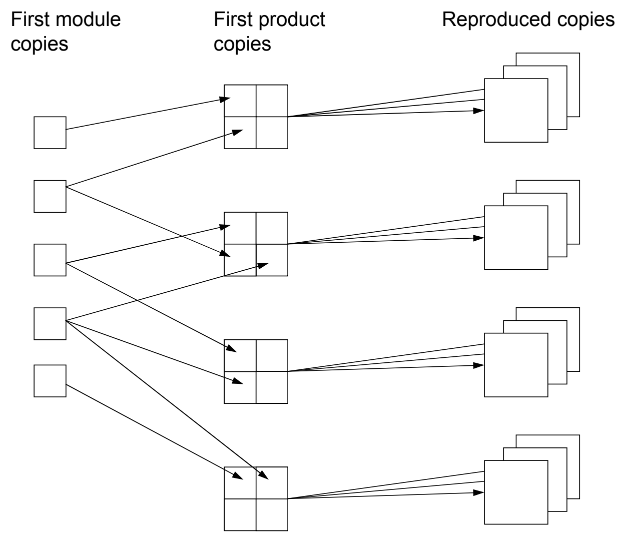

Figure 4: Different types of first copies in modularized content production

The distinction of first module copies and first products copies introduces a new component to the cost calculation in equation (3): the costs of bundling. The overall costs of bundling depend on the number of bundles which can be generated with a given number of modules. Thus, the numerical relation between modules and possible bundles is most important for the efficiency of modularized content production. This opens up a discussion of the requirements, which content modules would have to fulfil in order for the content production to have a high bundling efficiency. We won’t enter this discussion here and solely concentrate on the relation between modules and bundles, whereas the number of bundles B depends on the number of available modules M: B = B(M). If we understand the number of different bundles as the result of the content production process, we consider B(M) as the relevant production function.

Thus, equation (3) changes into

$$C = \sum_{m=1}^{M} C_{FCm} + \sum_{i=1}^{B(M)} C_{Bi} + \sum_{i=1}^{B(M)} n_i * c_{Ri} \qquad (4)$$

The second term describes the costs of bundling with C_{Bi} being the costs that occur for the creation of bundle i.

In order to compare the costs of modularized production with the costs of traditional content production, the overall number of distribution-ready content units (i.e. the number of copies) and thus the value of the last term of equation (4) must be equal to the value of the last term in equation (3). Consequently, modularized production of content is favourable if the sum of first module copy costs and first product copy costs are less than the first copy costs in traditional monolithic production. This requires a certain minimum bundling efficiency.

When clarifying the impact of modularization on content production, it is important to consider a specific ceteris paribus condition. We can either assume a *fixed number of different content products*, which in modularized production are produced at different (preferably lower) costs by using modules, or we can *fix the production costs*, which in modularized production can generate a different (preferably higher) number of products (bundles). For simplicity reasons we stick to the first c.p. condition and compare the costs occurring in monolithical and in modularized production of an equal number of different products. This allows us to exclude possible effects on the distribution side – primarily regarding the average willingness to pay of consumers – and to concentrate solely on cost effects in content production.

Thus, the cost effect of modularization can be described as the difference in production cost in traditional and modularized production: ΔC

$$\Delta C = \left[\sum_{m=1}^{M} C_{FCm} + \sum_{i=1}^{B(M)} C_{Bi} \right] - \left[\sum_{i=1}^{B} C_{FCi} \right] \qquad (5)$$

The ceteris paribus condition forces the number of traditionally produced first copies B being equal to the number of new first product copies B(M). The distribution costs are the same in both cases, since the number of distributed copies does not depend on the production of the first copies. Therefore we don't have to consider them in ΔC .

As for the bundling efficiency and the relation between B and M, we find that the highest theoretically possible bundling efficiency occurs if all modules can be combined with one another and every possible combination delivers a reasonable and marketable bundle. This combinatory relationship is expressed by B = 2^M-1. It is obvious, that this theoretical maximum can barely be reached in practice. Thus, for the actual number of reasonable products that can be created with M modules we can assume that $0 \leq B = B(M) \leq 2^M - 1$. The better existing content modules can be combined, the more B converges towards the maximum.

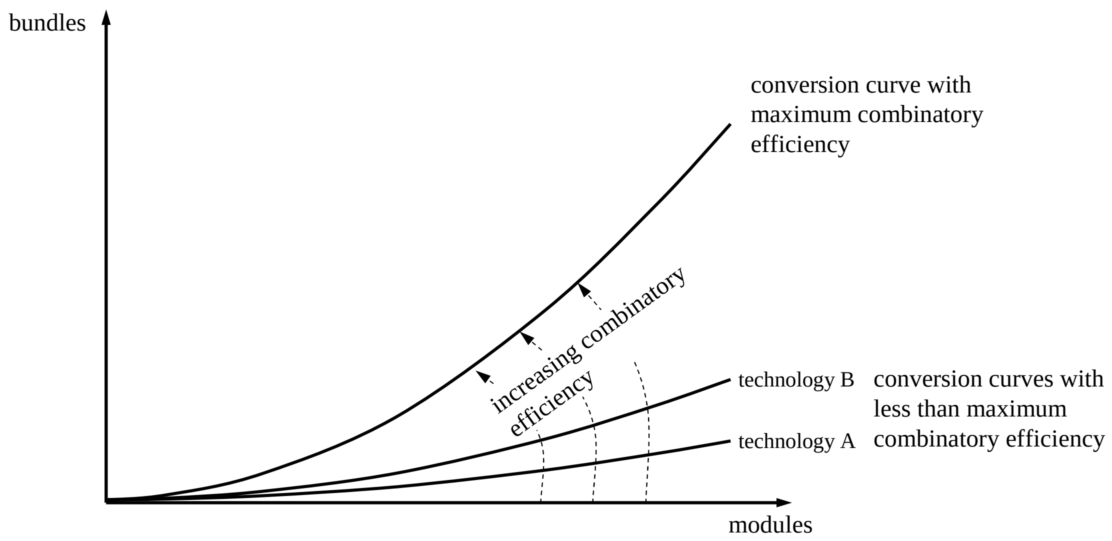

Figure 5: Relation between the number of available modules and the number of possible bundles

A first and simple approach to determine B(M) can be based on a matrix that describes the "fit" of each possible pair of modules and assesses how well these can be combined. These values would be scaled from 0 to 10, where 10 describes perfect fit and 0 indicates that these modules can not be combined at all. We could think of a set of different music songs of different artists and genres. While songs of Madonna and Britney Spears could well be bundled together and might get a fit-value of 9, the same song of Madonna would not fit in a bundle with Metallica and this combination would be valued with 0. This idea is visualized in Figure 6.

	module 1	module 2	module 3	module 4	…
module 1	0	5	9	2	…
module 2	-	0	4	6	…
module 3	-	-	0	10	…
module 4	-	-	-	0	…
…	…	…	…	…	

Figure 6: Example for a Module-Fit-Matrix

If the matrix consists of high values, the corresponding modules exhibit a high bundling efficiency. The point of intersection for one module with itself would typically be valued with 0 if multiple copies of one module in one bundle are not allowed and 10 if they are.

The proposed combinatory-efficiency-model is helpful in evaluating new bundling technologies like XML or future systems based on artificial intelligence. Each technology is more or less able to select modules from an existing content portfolio and combine these modules to bundles, such that each technology can be assigned an individual bundling efficiency curve.

5 The Impact of Individualization on Production and Distribution of Media Content

Different from modularization, individualization not only has an impact on the production costs of content products, but also on the revenue side. This derives from the assumption, that consumers have a higher willingness to pay for individual content products, which suit their needs better than standard products, such as an individual newspaper with only sports news is better suited for a sports fan than a standard newspaper with only 10% sports share. In our understanding, individualization takes place by combining available content modules such that the bundle is individualized to the consumers needs and contains a set of content modules which the consumer prefers. This concept is clearly very basic in nature, but allows an understanding of the relevant effects on production and distribution of content without loss in generality. Other ways for individualization are possible but will not be discussed here.

Individualization on the basis of modules can be facilitated in two ways. First, a set of existing modules could be combined in every possible way to generate as many different products as possible, such that the probability of one of these products fitting the specific needs of a consumer is highest. In the newspaper example every possible combination of existing articles could be combined to a single newspaper which then can be selected by recipients. This is a kind of self selection approach, where recipients can select their content product from a vast variety of products. In a second approach, information could be gathered about the preferences of a consumer, either directly or indirectly, and individual bundles of content modules could be created on the basis of this information. Here, only those newspaper bundles would have to be produced which have an audience size of > 0.This would involve an information gathering process that causes additional costs and at the same time would reduce the number of created bundles since not all possible bundles are demanded by consumers. To keep the analysis simple, we stick to the first strategy and analyze the impact of individualization based on a provider-driven combination of modules (individualization by versioning). This resembles the situation described in section four, where the number of different content bundles was to be maximised at given production costs. Thus, individualization presupposes modularization and does not necessarily involve additional activities, like information gathering, but explicitly considers revenue effects on the distribution side of the content value chain.

Considering production and distribution, modularization and individualization cause a *cost effect* and a *revenue effect*. While the cost effect is driven by modularization and implies that production costs are (potentially) lower with modularization, the revenue effect is caused by the fact that modularization increases the number of different content products (different first product copies) and consumers have a higher willingness to pay (WTP) for individualized content products.

At this point, it is reasonable to provide a more elaborate analysis. Media companies typically serve two markets: a consumer (or recipient) market to which the content is sold and which is used to generate an audience, and an advertising market to which this audience is sold. Considering these two markets, not only recipients have a higher willingness to pay for individualized content, but also advertising customers will potentially pay more if advertising is better aligned with consumer interests, since this increases advertising efficiency. Thus, we have to model the revenue side in a way that regards the interdependence of individuality of content and the willingness to pay of consumers and advertisers.

We start with a simple revenue model for the case of non-individualized content and modify it in a way that considers the effect of individualization and the increased willingness to pay of consumers and advertisers.

$$R = \sum_{i=1}^{B} n_i * (r_{Di} + r_{Ii}) \qquad (6)$$

The revenue of a multi-product content producer R is calculated as the sum of the revenue of each product's number of copies, whereby the revenue of each copy splits into a direct component r_{Di}, paid by consumers, and an indirect component r_{Ii}, paid by advertisers.

To consider the effect of individualization in this model, we have to modify the direct and indirect revenues by some parameter that represents the degree of individuality of the content and thus the rise in willingness to pay of the consumers and advertisers. We expect the WTP to increase with an increasing individuality of the content and to be highest when the individuality is at its maximum. It is difficult, if not impossible, to measure the absolute individuality a consumer expects from a product and to determine when a product is at its maximum individualization level for a specific consumer. Thus, we have to employ a proxy and use a measure for relative individuality. While there are many ways to design such a measure, we use a simplified approach in order to keep the analysis simple. We can assume that the individuality of a product is positively correlated with the number of modules used for its production. If we compare monolithically produced content (which in fact consists of only one module) with content that is assembled from a large number of modules, the second one potentially exhibits a higher level of individuality than the first one. However, at the same time we have to assume that there is more than one version of the modularized content offered on the market or the consumer can assemble a bundle by choosing from the set of modules.

Thus, we can derive a direct relation between the number of modules M used to produce the content and its level of individuality as well as an indirect relation of M to the WTP of consumers and advertisers. We specify this relation by a factor λ, with $0 \leq \lambda \leq 1$ such that:

$$WTP = \lambda * WTP_{max} \tag{7}$$

λ can be called individuality-sensitivity parameter. Although we distinguish different WTPs for consumers and advertising customers we can assume that this mechanism is the same for both customer groups while λ might differ.

λ is dependent on the number of modules M used for the production of bundles with $\lambda(0) = 0$ and $\lambda(M \rightarrow \infty) = 1$. Thus, an example for a reasonable functional relationship $\lambda(M)$ with these characteristics would be (the 10 in the exponent is chosen arbitrarily):

$$\lambda(M) = 1 - 2^{(-M/10)} \tag{8}$$

The form of $\lambda(M)$ might differ for consumers and advertising customers and even among different groups of these if the content provider has a diverse customer structure. For simplicity reason again and without loss of generality we assume a single $\lambda(M)$ for all customer groups involved.

These considerations allow us to modify the simple revenue model and include the effect of individualization.

$$R = \sum_{i=1}^{B} n_i * (r_{Di}^{\max} * \lambda_D(M) + r_{Ii}^{\max} * \lambda_I(M)) \tag{9}$$

In this modified model we replace the WTPs r_{Di} and r_{Ii} of consumers and advertisers for their maximum WTPs which they would have for a perfectly individualized product: $r_{Di}^{\max}$ and $r_{Ii}^{\max}$. These maximum WTPs are exogenous factors and could be determined by empirical research on the consumer and advertiser markets. They are multiplied by the individuality-sensitivity parameter λ, which in turn is dependent on the number of modules M that are used to create the number of B bundles.

As for the cost effect, we can also calculate the revenue effect of modularization and individualization as the difference between the revenues of monolithically and modularly produced content: ΔR.

$$\Delta R = \sum_{i=1}^{B} n_i * ([r_{Di}^{\max} * \lambda_D(M) - r_{Di}] + [r_{Ii}^{\max} * \lambda_I(M) - r_{Ii}]) \tag{10}$$

After having analyzed the cost and revenue effects of modularization and individualization independently from one another, we can now create a synopsis and summarize the overall impact of these new technological means on content production and distribution. This overall impact can be represented by the change in profit:

$$\Delta P = \Delta R - \Delta C \tag{11}$$

$$\Delta P = \sum_{i=1}^{B} n_i * ([r_{Di}^{\max} * \lambda_D(M) - r_{Di}] + [r_{Ii}^{\max} * \lambda_I(M) - r_{Ii}]) - \left[\sum_{m=1}^{M} C_{FCm} + \sum_{i=1}^{B(M)} C_{Bi} \right] + \left[\sum_{i=1}^{B} C_{FCi} \right] \tag{12}$$

This change in profit is not a general value but depends on the specific media company for which the calculation is made. This is because all parameters depend on the individual situation of a media company, especially the WTP of its customer groups, the production costs and the technology employed for modularization and bundling.

We conclude that the profit impact is primarily driven by the combinatory efficiency of the production and bundling process (on the production side) as well as by λ, the individuality-sensitivity parameter of the customer groups (on the distribution side). While we generally assume this effect to be positive, there can also be situations where modularization and individualization have negative impact on profits. This can happen if λ and/or the combinatory efficiency (B(M)) is small, such that the first module copy costs exceed the first copy costs of a monolithically produced content product.

The initial intent of the model was twofold. First, it should deliver a refined view on the theory of content production that considers the new technological means of modularization and individualization. Second, the model should provide a mechanism for media companies to decide on whether to employ modularization and individualization techniques. The proposed model can be considered a first approach to a refined theory of content production and thereby provides a measure for the profitability of modularized content production. If the profit impact as stated in equation (12) is positive, the company should switch to modularized content production.

6 Conclusion and Outlook

The paper on hand presented an analysis of the production and distribution of media content under the influence of modularization and individualization as two new technological concepts induced by digitization. We have found that the traditional concept of the First-Copy-Cost-Effect is no longer up-to-date and we presented a modified concept which primarily distinguishes a First-Module-Copy and a First-Product-Copy in the production process. Based on the distinction of modules and bundles, we derived a more elaborate model for content production which helps to estimate the profit impact of modularization and individualization and can be used by media companies to drive a decision on whether to employ modularization and individualization techniques. We find that from the production and distribution point of view these new technological concepts create a cost- and a revenue-effect. While the first effect results from cost reductions when content is no longer produced monolithically but bundled using a (small) number of modules, the second effect is driven by a potentially higher individuality of content bundles and a higher willingness to pay of consumers and advertisers. If it turns out that modularization and individualization are beneficial for a specific company, the cost- and revenue effects can have significant managerial implications for those media companies. They might have to re-design their production and distribution processes in order to better exploit the advantages of modularized content production and re-use of content modules. It is important to integrate both modularization and individualization into a streamlined production process.

The main critique of the model presented in this paper concerns its simplicity. The model provides a first step towards the integration of modularization and individualization effects into a formal analysis of content production and employs very basic and simplified approaches to regard functional relationships among the identified parameters.

On the production side, the creation of bundles from different modules needs further analysis and an individual function B(M) could be derived for different types of content and even different media companies. Furthermore, the stochastic character of media content production could be regarded by implementing a probability distribution function in B(M). On the distribution side, the simple "brute force"-approach for individualization could be replaced by a model considering an information gathering process, which allows for more customer-driven individualization. Complementing the conceptual approach of this paper, an empirical study should be conducted with companies that already use modular content production in order to gather data on the real world impact of modularization on costs and revenues in different environments. Based on this empirical insight, the model could be refined and optimized. Another important aspect of modularized content production, which needs to be addressed with further research, is content syndication, the business-to-business distribution and re-use of content (Werbach, 2000). Based on the simple approach presented in this paper, it would be important to consider the extended possibilities of syndicating single content modules instead of whole content bundles.

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