

PERCEIVED CUSTOMER VALUE IN CONSTRUCTION INFORMATION SERVICES

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ABSTRACT: The information needed to design, construct and manage a building is nowadays mainly produced, stored and made available in digital form. Information is produced partly in the design process itself. Design and procurement documents refer only to information produced elsewhere as external printed matter or databases (for example, describing building products).

An important channel for such external information is provided by specialized information service providers. In order to meet competition from companies' homepages, search machines, internet start-up companies etc, established infomediaries need to rethink their services as well as their business processes. A key issue is achieving a deep understanding of how customers perceive the value of these services and products compared to those of new competition enabled by the internet. A study of new business patterns and networks provides the empirical support for the concepts examined in this paper.

Traditionally, value is regarded as something inherent in the product; and which is handed over to the customer. More recently, research argues that value cannot be pre-produced. Value is co-produced by the customer, partly as a result of interactions between the customer and the supplier or the service provider. For services, value is, according to this view, produced and consumed simultaneously. Using this theoretical framework as a basis, the conclusions of the study are that it is not enough for construction infomediaries to produce just digitised versions of their traditional products, e.g. printed standards, and product sheets. They also need to gain a thorough understanding of their customers' business processes and, instead of producing products (or services), become facilitators of value creation for customers.

KEYWORDS: construction infomediaries, customer value, information service providers, product information.

1 INTRODUCTION

The use of ICT, and hence digital information, has become an inseparable part of everyday practice in construction. Where information has traditionally been handled using various paper media such as drawings, schedules, catalogues, brochures and other types of printed matter, it is now produced, transferred and stored digitally. The construction process now has to produce not only buildings, but also information about them. Information needs to be produced and exchanged better and more efficiently, and the amount and accuracy of it has grown. Information is produced partly by the design process and is thus unique for each building. Some consists of general information produced outside particular projects and is noted in design and procurement documentation by references to printed standards, guidelines etc. or to external databases.

Much of this general information is provided by service providers, for example, Rakennustieto in Finland, Svensk Byggtjänst in Sweden and NBS Services in the UK. They are infomediaries, or information middlemen, as well as information producers, and they provide standards, general specifications, standard contract forms, product directories etc. for customers and stakeholders in the construc-

tion value chain. Digitization in combination with the emergence of the internet has changed the prerequisites for their success in business, and created a need to produce more customer value in order to sustain their competitiveness.

The research, of which parts are reported in this paper, examines these new business patterns and networks for digital information in the construction sector (taken in the broadest sense). It strives to provide new insights into how the supply chain of general information should be organised in the networked, internet age. The research question is to identify and describe a basis for the design of sustainable business strategies for infomediaries in the sector. The need for infomediaries to adopt an e-business approach, and integrate into the construction value chain has been reported in an earlier paper (Finne 2003). Areas of the architect's work where the use of ICT, in particular CAD, can be beneficial have been identified. Product models, as a means for data storage, and the need for external databases such as those provided by infomediaries, have been proposed as solutions for making ICT use more efficient (Finne 1992, 1993). The architect's work processes have been examined further as an integral part of the construction value chain via the use of a formal model (Finne 2006). The last part of the study, described in this

paper had, as its objective, establishing an understanding of customer perceived value, such that it can aid infomediary managers in the construction value chain in their pursuit of sustainable answers to the question of ‘how to plan business strategies?’

This part of the study is on a conceptual level, relying on an extensive literature study, where the theories put forward in marketing and management science have been viewed from a construction process perspective. The use of services and the business model of one particular company, the Building Information Foundation, provide the basis of the case. The company is representative of its kind and a member of the two international organizations of relevance: UICB and ICIS. It has a larger mix of services than any other member of these organizations, and most (if not all) services are represented. Results of the theoretical work have influenced the company in developing and implementing new business strategies. Examples of implementation are the customer database, renewal of accounting and invoicing systems, an electronic bookshop, product databases and servers for electronic publishing, and corresponding internet platforms. Development work has been performed concurrently with the research. Each has influenced the other; to this extent, the approach can be regarded as an example of action research.

2 ICT-INDUCED CHANGES FOR CONSTRUCTION AND INFOMEDIARIES

In the days of what was then termed ‘computing in construction’, computer aided drafting¹ etc, many practitioners were biased against the new technology and feared many things, from losing jobs to losing control of the ability to create good design and architecture. Still, there were many areas where benefits could be achieved by this new technology (Finne 1993). A number of benefits did derive from the opportunity to send information electronically between the participants in the construction process, and even combine it. This was referred to as integrated design (Mitchell 1977). Quite soon after, it was realized that there was more to the concept than a mere collaborative production and exchange of paper documents, which led to the concept of product models or building information models¹ (BIM). It was evident that significant benefits could be achieved in many areas by the use of computers and computer programs (Gielsing, 1988, Björk 1989, Turner 1989, Eastman 1999). The architects’ work too, if divided into parts with different levels of need for creative freedom and viewed separately, could benefit significantly from computer use, in particular when combined with a product model approach (Finne 1992, 1993).

Widespread use of computers also opened up opportunities for new digital information services such as the pioneering French Minitel service, which to some extent has continued until today (Queré 1990, Wikipedia 2007). Another pre-internet online service was the Finnish Teleratas building product information services, which was not

however commercially successful due in part to the lack of a suitable delivery platform (Björk 1994).

The emergence of the internet provided such a platform, but it also changed the border conditions for infomediaries. Finne (2003) has examined this aspect and related developments among construction infomediaries. The starting point for the analysis is transaction cost theory, which helps us to understand how specialised information brokers can add value. One way of adding value is for infomediaries to employ a multi-tier architecture for their information systems in order to meet new and varying demands. This enables information to be provided in different combinations for different purposes throughout the building life cycle and, thus, construction value chain.

The activities of infomediaries in a construction value chain where information is digital, and the means by which they produce and deliver value for their customers, have been elaborated by Finne (2006). An important notion is that the construction industry’s contribution to the value chain is not only buildings but also (digital) information. Finne analyzes, through the medium of a formal graphical process model, parts of the construction value chain relevant to the pursuit of customer value. The focus of the model is not on the production of the physical building, but on the production of information and of product information in particular. The viewpoint is that of the infomediary and is based on the case of a national enterprise – the case company. The model is used to explore in detail how value is aggregated, delivered and received. It compares the creation of product information by manufacturers with that of infomediaries and proposes transaction cost theory as a tool for the analysis. It also identified many construction process activities where value could be added by the infomediary. Thus, if value is to be aggregated, delivered and received, the concept of value, or customer perceived value, needs to be better defined and understood.

3 THE CONCEPT OF CUSTOMER VALUE

Customer value is frequently referred to, but there is little or no common agreement, or mutual understanding about the concept (Woodruff 1997; Saliba & Fisher 2000; Sweeney & Soutar 2001). In several definitions, perceived value is described as a correlation between benefits and costs (Sinha & DeSarbo 1998; Saliba & Fisher 2000; Johnson & Weinstein 2004; Holbrook 2006). Saliba & Fisher illustrate it using a formula with benefits as the numerator and with costs, which they name sacrifices, as the denominator. Sacrifices and benefits are subjective measures of the customer. Value grows when the numerator grows and/or the denominator becomes smaller:

$$\text{Perceived value} = \frac{\text{Perceived Benefits}}{\text{Perceived Sacrifices}}$$

Costs or sacrifices, i.e. things to be minimized, can consist of, for example:

- exchange costs, which include transaction and transportation costs and taxes – transaction costs include time and effort to search out, negotiate and consummate an exchange – and also out-of-pocket costs;

¹ A common model ideally carries all information needed throughout the construction process.

- start-up costs, i.e. costs to make the product operational or usable;
- post-purchase costs, i.e. costs to keep the product working (Saliba & Fisher 2000); and
- non-monetary costs, e.g. time, energy and psychological stress (Johnson & Weinstein 2004), time expended, time to receive the product and environmental impact (Keeney 1999).

Descriptions of benefits, i.e. things that should be maximized, seem to fall into two categories. In one category, value is mainly seen as something that has been created in advance and embedded in the product by its manufacturer (product attributes). In a second category, value is additionally perceived as something that emerges when a product or service is consumed (use situations). It cannot be produced in advance, and value to the customer depends on how it enhances what the customer is intent on doing. In this paper, a similar distinction has been made. To be specific, section 3.1 looks at customer value as something which resides in the product, while sections 3.2 and 3.3 follow what Woodruff (1997) defines as: ‘a customer’s perceived preference for and evaluation of those product attributes, attribute performances and consequences arising from use that facilitate (or block) achieving the customer’s goals and purposes in use situations’. In section 4, the consequences of the theory espoused in section 3 for construction information services are discussed in the light of the case company and sister companies in other countries.

3.1 Customer value inherent in the product

When value is considered as something inherent in the product, it is often seen as a part of brand building or another aspect of marketing. Value is thought of as something that can be produced and delivered as part of the product and its attributes, being handed over to the customer who pays a price for it. Research typically analyses various dimensions of product or service attributes and offers different sets of combinations as tools for value providers.

Johnson & Weinstein (2004) describe value as something that can be developed within a diamond shaped area whose edges are the parameters of service, quality, image and price, which is aptly termed an S-Q-I-P-approach. In a related description containing a 19-item measure developed by Sweeney & Soutar (2001), the dimensions are emotional, social, quality/performance and price/value for money. Han & Han (2001) describe value as enhancements by changing two components: the ‘content’ and the ‘context’, which can be broken down into: quality enhancement, cost reduction and customization. Keeney (1999) mentions maximization of product quality, convenience, privacy, shopping enjoyment and safety. Other attributes include quality and cost of logistical customer service (Holcomb 1994) or their availability, timeliness and consistency of delivery, ease of placing orders and other elements of customer service (Langley & Holcomb 1992).

Product attributes can be both intrinsic and extrinsic and include texture, quality, price, performance, service and brand name (Sinha & DeSarbo 1998). Intrinsic and ex-

trinsic can be defined using the typology in table 1 (Holbrook 2006):

Table 1. Extrinsic and intrinsic product attributes.

	Extrinsic	Intrinsic
Self-oriented	Economic value	Hedonic value
Other-oriented	Social value	Altruistic value

Another framework for value creation is the ‘value funnel’, where value is analyzed and maximized on four interdependent levels: global business community, market, organization and customers. The model represents a downward flow, with each lower level a part of the level above. The framework describes the macro issues sellers must deal with when determining customer value (Johnson & Weinstein 2004; Pohlman et al. 2000).

Relatively few researchers deal directly with customer value in construction. Wilson et al. (2001) list several values perceived by customers of corporate real estate organisations. Elements of time, cost and quality are repeatedly mentioned. Others, which are important to customers, are concerned with flexibility, ease of doing business, management of risk etc. Underwood et al. (2000) have reported an example of enhancing the construction value chain using a specification system making it possible to specify design elements using a web-based product library. The system could be regarded as adding value to either the specification system or the product library, depending on which way it is regarded.

Berry (2001) discussed the total customer experience, which he divides into five pillars:

1. solve your customers’ problems;
2. treat your customers with respect;
3. connect with your customers’ emotions;
4. set the fairest (not the lowest) prices; and
5. save your customers’ time.

According to Berry, it is imperative to appreciate that value is the total customer experience and to move away from merely thinking that value equals price. Common for these dimensions of value is that they focus on what the product (or service) provider does, not what the customer does.

3.2 Customer value in a service perspective

The research described in this section argues that customer value cannot be pre-produced. It treats value as something co-produced by the customer throughout the relationship, partly in interactions between the customer and the supplier or the service provider. When it comes to services, value is produced and consumed simultaneously. Products (or services) can only be facilitators of value.

Value generation processes are embedded in what the customers do in their everyday lives. Business customers create value when they produce and deliver products to their customers. Consumers and customers use the inputs the sellers provide in their own value-generating processes. Value springs out of use of the inputs of sellers to realize more revenue or decrease costs (time, money, inconvenience and frustration). This also implies that all firms are, in fact, service firms. The mission of the seller thus becomes to support the buyer’s value creation proc-

esses. This means that the seller must gain a thorough understanding of the customer's value generating processes and the customer's goals: he or she should determine how to improve those processes by his or her activities (Grönroos 2000). The customer value approach does not focus on the product that a customer purchases, but on the outcome he or she seeks and value derives from the ability to achieve the customer's goals (Saliba & Fisher 2000, Goodstein & Butz 1998).

Customer value might manifest in different ways, but they link together in a customer's evaluation process. The essence of customer value can be captured in a 'hierarchy model' (Woodruff 1997). One of the most important consequences of the hierarchy model is that it extends the concept of customer value beyond mere attribute-based buying criteria. The product or service possesses value only to the degree that these consequences are aligned with a customer's goals and needs (Woodruff & Gardial 1996).

According to Kano's theory of attractive quality (2001), success cannot be gained only by listening to what customers say. What needs to be gained is a deeper understanding of the customers' latent needs. He has described the factors that influence customer purchase decisions as a model with three main factors: basic (must-be), performance (more is better or one-dimensional) and delight (excitement or attractive). Additional factors are 'indifferent' and 'reverse', but these add relatively little to this context. The basic factor must be met; otherwise the customer will react with disappointment or disgust. If all basic factors are met, the customer reaction is neutral.

The performance factor is best defined by negation, since absence is likely to lead to disappointment. Performance factors can be identified by market surveys and it is important that any deficiency is quickly identified and remedied. The delight factor is something the customer does not expect and which therefore cannot be identified by market surveys: presence leads to delight. In time, performance and delight factors tend to become basic, as customer expectations grow (Wood 2004, Mello 2001). If products regularly meet or exceed the customer's expectations, especially as compared to the competition, an emotional bond emerges (Butz & Goodstein 1996).

3.3 Consequences of adopting a service perspective

Adopting a service perspective has far-reaching implications on the strategy as well as the organization of the firm or company (Crosby et al. 2002, Grönroos 2000). When companies strive to make it easier for customers to get the benefits they seek, their focus extends from the product and its attributes to the use of the product. They need to interact with their customers and even gain influence over customer behaviour in order to reduce risk in purchase and ownership (Vandenbosch & Dawar 2002). The focus of management of risk (and potential for value creation) needs to be taken forward from research and development, manufacturing and distribution to use and post-use handling. This new logic demands that the supplier, or co-producer, learns more about how customers' value creation processes work. Where focus used to be on simple buy and sell transactions, it is now on relationships with clients and on helping them in their value creation.

This means that a new value creating system is established where 'offerings now take part in the customer's value creation process delivering performance to the client'. When focus shifts from products to services, focus on risk management and, thus, value creation shifts too. It moves away from risk management of natural systems and manufacturing processes to the users' value creating processes and to human systems (Ullberg et al. 2002).

Common tools for management of natural systems and manufacturing processes, including risk, are customer surveys and total quality management (TQM). Much of this is also what Kano's levels basic and performance are about. This is often referred to as a customer value paradigm. To manage the users' value creating processes and human systems demands additional tools and the means for adopting a customer value paradigm (Saliba & Fisher 2000) or including a customer value orientation into the customer orientation dimension of TQM (Dickey 2001, Flaherty et al. 1999). The potential in striving for customer value lies in the notion that organizational performance does not correlate highly with customer satisfaction. Customers might say that they are satisfied, but they might buy elsewhere (Woodruff 1997). This does not mean that customer satisfaction as a paradigm should be abandoned. It is simply insufficient and it should be complemented by the concepts of customer value (Eggert & Ulaga 2002).

Failure in product definition is due to insufficient customer understanding. Often, the solution is in-depth customer team interviews, sometimes repeated, using open-ended questions (Mello 2001). Questions need to be taken beyond talk about typical customer satisfaction issues to questions that develop a broader understanding of customers and what is important to them (Wilson et al. 2001; Salz 2001). Questions of the following form need to be raised (Salz 2001): "what helps you to be successful?", "what makes a great day for you", and "what keeps you awake at night?" or, as Woodruff (1997) has suggested: what do target customers value? Of all the value dimensions that target customers want, which are the most important? How well (poorly) are we doing in delivering the value that target customers want? Why are we doing poorly (well) on important value dimensions? What are target customers likely to value in the future? Data which needs to be learnt about the customer's determination process include macro-environmental data, customer complaint data, competitors' offer data, customer visits' data, salespersons' call reports' data, customer targeting data and customer value determination data.

In the digital business environment, companies need to look beyond the traditional market space and migrate to an experience space for co-production of value where they can act as nodes and pull together consumer communities, partners and suppliers into an experience environment, which actively involves consumers, as individuals and as communities. In this situation, key building blocks are dialogue, access, risk assessment and transparency, even if the specific questions that customers have will vary. The intention is not to provide a product *per se*. Instead, the goal is to enable co-creation of value where companies, customers and their networks all take part in the creation of value. The idea is that individual customers are able to co-construct their own consumption ex-

periences through personalized interaction. Products and services are means to that end. Customers can be seen as a source of competence. From this perspective, four essential responses arise:

1. customers need to be engaged in an active, explicit and ongoing dialogue;
2. communities of customers need to be mobilized;
3. customer diversity has to be managed, and;
4. personalized (not customized) experiences have to be co-created with customers.

When a value chain perspective is used, sources for value production can be extended to supply-chain partners, who can be regarded as part of an extended company, and their competencies too may be drawn upon (Pralhad & Ramaswamy 2000, 2003, 2004). Similar views have been presented by Nambishan (2002).

Wilson et al. (2001) argue that it is not enough to rely on operational effectiveness and efficiency or on written outcomes of customer surveys in order to satisfy their customers. Instead, it is important to work closely with customers and to involve them in the reviewing and revision of processes and in streamlining solutions.

In the case of customer value in construction, Sarshar et al. (2000) approach increased customer value as something that comes through continuous process improvement. This is difficult to achieve without directly addressing supply chain issues. Performance and predictability of the key process are essential, and can be enhanced by process enablers. Productivity and quality form the basis for customer satisfaction.

4 CUSTOMER PERCEIVED VALUE AND INFOME-DIARIES' SERVICES

Using a formal graphical process model as a medium, Finne (2006) has described how infomediaries produce and provide building material and product information and how their customers retrieve and use it. The model adopts transaction cost theory (Coase 1988) as a means for demonstrating customer value; consequently, that issue of decreasing costs will not be discussed further. The theories presented in this paper, describing value as something inherent in the product, deal with, and support, the actions explored in the leftmost parts of Finne's model (Figure 1); whilst, the rightmost parts describe the customers' business processes and thus offer a starting point for an analysis from a service perspective.

4.1 The product perspective

The concept of adding attributes to existing products is familiar, widely used and well-supported by electronic media as the delivery means. Typical examples are product directories and product data sheets, which have been published in printed form for decades. Today, internet and CD-ROM versions are offered, with added functionality. Examples include multi-faceted on-line search features including attribute-based searching, an abundance of add-on CAD-files, environmental declarations, and indoor air and cleanliness classifications (Figure 2). Quality assessments of manufacturers and their products, promotion of their information product brands, i.e. Rakennustieto in Finland or Svensk Byggtjänst in Sweden, are corresponding activities. SMEs consider the infomediary's brand on a product information sheet as adding credibility to the product. Other examples are products in print where CD-ROMs have been added, internet versions of paper products where the net version offers additional files, calculation facilities, databases with search facilities etc.

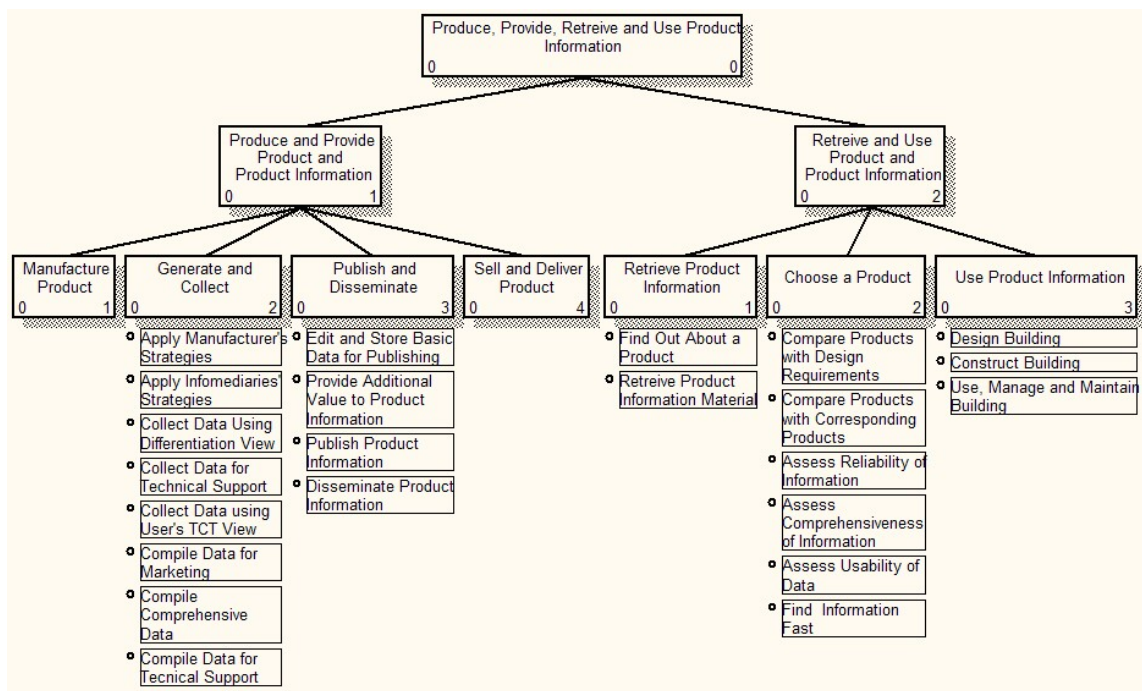


Figure 1. Finne's model, here presented as a node tree, explores how infomediaries produce their services (left) and how their customers use them (right).

Tuotteen nimi	Lusikka	Korin summa	Yhtiö	Julkaisu	Luokitus
Alyin... Alyin...	322.4	RT 722.4-36894	On-Air Oy	01.01.2003	CAD
Aalot	725.7	RT 725.7-36907	Tuulite Oy	01.01.2005	CAD
274... 274...	274	RT 274-36906	Aspeennan... Raken...	01.01.2005	CAD
453.22 Kertopuupallo	453.22	RT 345.22-36939	Finflow Oy Raken...	01.12.2004	CAD
Makropu... saumamat...	375.3	RT 375.3-36947	Hankal... Möden Oy	01.11.2004	CAD NI
Spier... korkk...	375.4	RT 375.4-36950	Insulfin Oy	01.11.2004	CAD
Upponor... kylävesip...	701.2	RT 701.2-36982	Upponor... Suomi Oy	01.11.2004	CAD
Laborator... kalusteet	653	RT 653-36951	Irvi Oy	01.09.2004	CAD
Rakennus... kattorinat...	325.4	RT 325.4-36921	Thermidol Oy	01.09.2004	CAD NI CE
Thermidol... Safe-er...	325.4	RT 325.4-36921	Thermidol Oy	01.09.2004	CAD
Thermidol... Step... Floor Heating... -eristeet	378.1	RT 378.1-36930	Thermidol Oy	01.09.2004	CAD NI

Figure 2. Screen dump from an infomediary's product directory and information sheet database service².

In the production and provision processes of (product) information, Kano's factors – basic and performance – are widely applied among infomediaries. Quality systems and TQM, have been in use on a regular basis and for more than decade. The same goes for customer and reference group surveys, which are undertaken systematically and repeatedly. In recent years, the Balanced Scorecard (Kaplan & Norton, 1996) has been taken into routine use, and basic as well as performance level factors have been incorporated into it. The need to remedy deficiencies quickly is also recognized and has been made part of the quality system. All these factors prevail and continue to be crucial, but are not sufficient tools for value production and delivery. The narrowness of customer surveys was demonstrated by the outcomes of some recent workshops, which showed that most of what the customers themselves were able to identify was already known to the infomediary.

4.2 The service perspective

The idea of a service perspective, as described in section 3, is little known among infomediaries, but has been received positively. The idea of customer orientation is widely adopted, but mostly it manifests as customer (satisfaction) surveys. It is based on the belief that by asking the customer what he/she wants success can be gained. This is however, as discussed above, too limited a viewpoint. Thus, the need for additional tools for value definition is apparent, and the adoption of a service perspective offers one solution, which shifts the focus from infomediary to include the customer.

The adoption of a service perspective opens up a new set of dimensions for exploration. Additional sources for value production can be sought in that part of the model describing what the customers do, i.e. their business processes. The theory is described in sections 3.2 and 3.3, and customer processes are pictured in the rightmost parts of

the model in figure 1, as well as in the upper oval(s) in figure 3, where Finne's model has been transformed and simplified into the same format as Woodruff's (1997) hierarchy model mentioned in the previous section

Examples from parts of the model that describe the architects' work are: composing masses, looking for building materials, comparing building materials, making drawings, writing specifications, compiling product models, solving construction details and composing facades. Corresponding information services include: architecture books, product directories, product datasheets, CAD-files, specification writers, object libraries and technical standards.

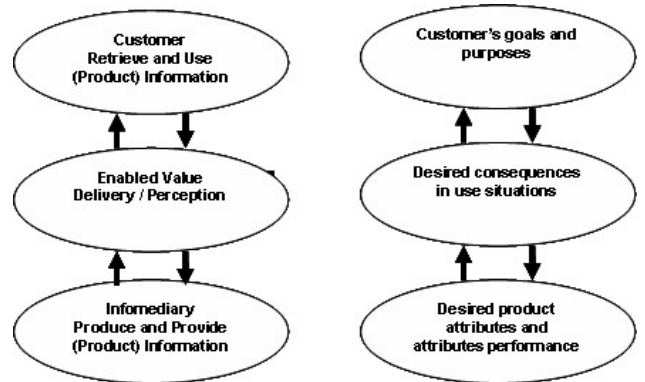


Figure 3. Finne's (2006) model (left) compared with Woodruff's (1997) schema (right).

The case company has taken some steps towards a service perspective. As part of the development of a new quality management tool for customers in civil engineering, product definition workshops have focussed on what the customers want to be able to do with the product, instead of the product and its features and attributes, which has been the normal way. In the development of add-ons to the product information, focus has moved from delivering CAD files alone to delivering files with calculation modules, which are compatible with the customers' systems (Figure 3). The product data sheets published under the brand of the case company are considered as a form of quality assessment of the product itself by many of its smaller clients, even if it only presents the data in a standardized way (Finne 2003). They claim it gives them added credibility in the eyes of their own customers. For instance, indoor air emission classifications reduce health problems and environmental declarations help to reduce environmental damage. A series of monthly discussion events has gained in popularity when customers were engaged in formulating discussion themes and inviting speakers.

The need to extend beyond regular customer surveys in a way proposed by Mello (2001), Wilson et al. (2001) and Salz (2001), and which has been discussed in section 3.3, has also been recognized and successfully carried out. During 2005, a series of in-depth customer team interviews was undertaken. This resulted in such an abundance of new initiatives that it far exceeded the resources needed for implementation.

² www.tarviketieto.net. Search possibilities include classifications, firm names, product names and product attributes. Search results are (from left): name of product sheet, classification, sheet ID, company and publication date. Additional service attributes are listed in the rightmost column.

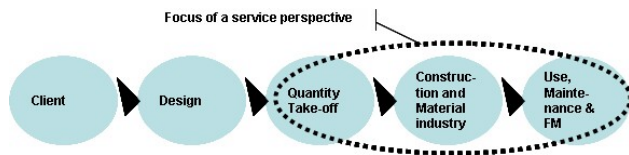


Figure 4. A Service Perspective Extends and Moves the Focus of Value Production Forwards in the Value Chain.

When focus on value creation moves from products to what customers do for their own customers, the potential for value creation moves forward in the value chain (figure 4) (Ullberg et al. 2002). Many infomediaries have traditionally provided services primarily for design. When focus is put on the rightmost parts of the value chain, it moves to territory yet under-exploited by the infomediaries, who at present focus mainly on design. It also covers a much larger volume since new supply accounts for just one percent of the housing stock (Barker 2004). Observations from the case infomediary support this. Users and building owners have now been identified as a promising customer segment where additional resources are allocated. Recently, a large project for developing common and general quality specifications for facility management and maintenance has been initiated. Additionally, the board of the company has begun a revision of the company's consumer strategy. Special emphasis is to be put on the reduction of mainly quality risks following decision-making on maintenance and renovation by people who are not professionally qualified in the construction sphere.

Figure 4 can also be used to demonstrate the cause of a problem, which continues to hinder realization of the full benefits from the use of ICT in construction. If the provider of value and the consumer of it do not meet in a business transaction, because they are too far apart in the value chain or if there is no delivery (ICT) platform, it is hard to motivate the producer to provide anything. To some extent, this might explain why some actions that would be of great benefit late in the value chain are not undertaken in the earlier phases. As an example, in Finland designers do not produce models of real benefit for 'quantity take-off' purposes unless they are paid for it separately, which is seldom the case unless he/she is hired by the construction company. If these shortcomings are to be overcome, research is needed; in particular, research is needed into information delivery and monetary risk compensation in a product modelling environment. A recent customer survey performed by the case company for the Finnish funding agency, Tekes, supports the observation.

5 CONCLUSIONS

Most information handling in the construction value chain has become digital. So has the value chain of infomediaries. The internet has become an increasingly important delivery platform, as well as a competitor for infomediaries. In the pursuit of sustainable competitive advantage, a deeper understanding and implementation of customer value is one important and, to some extent, still under-exploited element. The findings suggest that infomediaries

have much to gain by adopting a customer value approach, and a service perspective.

Customer value can be defined as a trade-off between costs and benefits. Less cost and/or more benefits, bring more value. Costs should be understood in a much wider sense than mere out-of-pocket expenses, and include time and effort expended. This is territory where infomediaries traditionally have offered services such as standards, product databases and search facilities and where the internet has provided a platform that is now widely utilized.

Theories of how to provide benefits can be divided into two categories. The first deals with the product and with what the service provider does. The underlying idea is that the more attributes and properties a product is provided, the greater its value will be.

In the second category, value is seen as something that comes from the use of the product by the customers. It cannot be produced in advance, but springs out of use of the inputs of the sellers to realize more revenue or decrease costs. This also implies that all firms are or could be service firms. Hence, it is referred to as a service perspective. This perspective is not as well established as is the first category, but steps towards it can be observed. In addition, the brand of the infomediary on product data sheets is considered to add credibility for smaller clients in the eyes of their customers. Risk reduction in the value chain is another issue brought along by this perspective; for example, infomediaries' indoor air emission classifications reduce health problems and environmental declarations help to reduce environmental damage for the clients of architects. Tools such as TQM and customer surveys continue to be important, but are not enough. A more profound knowledge about customer processes is required. Service providers must bother to 'understand their customers' processes better than the customers themselves'. The literature suggests in-depth team interviews and open-ended questions as one method: evidence from the case company supports this view. In addition, the need to re-build the organization of the service providers for the identification of customer needs, as well as service provision, is seen as crucial.

The findings suggest that infomediaries have much to gain by adopting a service perspective. There seems to be a wealth of under-developed, as well as new, business opportunities. This requires an approach where the focus is extended to include support for, and risk management of, the customers' activities. As this also implies that all firms could be service firms, it could contribute some interesting perspectives to the on-going discussion about construction turning into a service industry.

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