

The Identification of Gaps and Overlaps in the Product Portfolio

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ABSTRACT

In product development organizations, the front end of product development is usually confined to planning within business units for product families and individual products. This can pose a problem for businesses, as individual business units and development teams do not think in terms of the big picture of the company. Business units are responsible for only their market and product strategies, and are relatively unconcerned about those of other business units. Because of this, there is the potential for product offerings across business units to overlap in the marketplace, thereby wasting development resources and confusing customers with multiple offerings of similar value propositions. There is also the potential to have gaps in the marketplace, where no business units have product offerings, which can be a prime niche for competitors to introduce products to gain a market foothold and precious market share.

The purpose of this research was to “extend” the front end of the development process upward across all business units in order to understand the market relationships across the entire product-offering portfolio. This allows the company to see how its products are related across markets, and to observe the strengths and weaknesses in its competitive positions. The result is a better understanding of which markets and products should be prioritized when making investment decisions.

This thesis develops and discusses several concepts and tools, namely those of the Core Benefit Proposition and Vector of Differentiation, that are necessary in order to identify the gaps and overlaps within a product portfolio. A basic approach was developed that combines these concepts and tools into a framework for identifying gaps and overlaps. This approach was then applied and demonstrated with a case study involving the product portfolio of the Xerox Company.

Thesis Supervisor: Don Clausing

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Table of Contents

2	INTRODUCTION.....	11
4	PLANNING THE PRODUCT PORTFOLIO.....	17
4.1	THE PRODUCT PORTFOLIO.....	17
4.2	THE PRODUCT DEVELOPMENT PROCESS.....	19
4.2.1	The Product Design Process.....	19
4.2.2	The Front-End of Development	22
4.2.3	Extension of the Front End into the Business Planning Processes.....	23
4.3	PRODUCT PORTFOLIO PLANNING ACTIVITIES.....	25
4.3.1	Market Segmentation.....	25
4.3.2	The Vector of Differentiation (VoD).....	26
4.3.3	The Core Benefit Proposition.....	27
4.3.4	Product Positioning.....	28
4.3.5	The Marketing Mix.....	31
4.4	TRANSITION.....	33
6	IDENTIFYING PRODUCT PORTFOLIO OVERLAPS AND GAPS.....	34
6.1	PRODUCT PORTFOLIO OVERLAPS AND GAPS.....	34
6.1.1	Overlap/Gap Analysis.....	35
6.1.2	Product Portfolio Overlaps.....	36
6.1.3	Product Portfolio Gaps.....	37
6.1.4	Product Specific Overlaps/Gaps.....	39
6.1.5	Impact Of Portfolio Overlaps and Gaps.....	43
6.2	OVERLAP/ GAP IDENTIFICATION PROCESS FOR PRODUCT SPECIFICS.....	43
6.2.1	Levels of Overlap/Gap Analysis.....	43
6.2.2	Tracing the Core Benefit Proposition.....	51
6.2.3	Verifying the Vector of Differentiation.....	56
6.2.4	Integration.....	63
6.3	PRODUCT PORTFOLIO OVERLAP/GAP IDENTIFICATION APPROACH.....	64
6.3.1	Define the Product Portfolio.....	64
6.3.2	Key Benefits for Customers.....	66
6.3.3	Define Attributes and Product Specifications to Meet Benefits.....	67
6.3.4	Choose Datum Product.....	69
6.3.5	Determine Core Benefit Levels for Products.....	69
6.3.6	Map Core Benefits.....	71
6.3.7	Derive Vectors of Differentiation for Families/Segments/Markets.....	72
6.3.8	Identify Overlaps and Gaps.....	73
7	CASE STUDY: THE XEROX COMPANY.....	78
7.1	COMPANY BACKGROUND.....	78
7.2	OVERLAP AND GAP IDENTIFICATION	79
7.2.1	Define the Product Portfolio.....	80
7.2.2	Key Benefits for Customers.....	85
7.2.3	Define Attributes and Product Specifications to Meet Benefits.....	85
7.2.4	Choose Datum Product.....	89
7.2.5	Determine Core Benefit Propositions for Products.....	90
7.2.6	Map Core Benefits	94
7.2.7	Derive Vector of Differentiation for Families/Segments/Markets.....	96
7.2.8	Identify Overlaps and Gaps.....	98
7.3	CONCLUSIONS FROM ANALYSIS.....	129
7.3.1	General Conclusions from Case.....	129

7.3.2Next Steps	130
9CONCLUSION.....	132
9.1CONCLUSIONS FROM RESEARCH.....	132
9.2RECOMMENDATIONS FOR FUTURE WORK.....	133
11REFERENCES.....	136
12APPENDIX 1: XEROX PRODUCT PORTFOLIO.....	138
12.1SECTION 1: XEROX PRODUCTS.....	138
12.2SECTION 2: CORE BENEFIT PROPOSITION MAPS WITH FAMILY IDENTIFICATION.....	157
13APPENDIX 2: COMPETITOR PRODUCTS.....	168

Table of Figures

FIGURE 2.4.1: RELATIONSHIP BETWEEN PRODUCT AND PROJECT PORTFOLIOS.....	18
FIGURE 2.4.2: THE PRODUCT DEVELOPMENT PROCESS [ULRICH & EPPINGER, 1995, P. 9].....	20
FIGURE 2.4.3: DEVELOPMENT FUNNEL [WHEELWRIGHT & CLARK, 1993, P. 124].....	21
FIGURE 2.4.4: TIMING AND IMPACT OF MANAGEMENT ATTENTION AND INFLUENCE [WHEELWRIGHT & CLARK, 1993, P. 33].....	22
FIGURE 2.4.5: EXTENDED FRONT-END OF PRODUCT DEVELOPMENT.....	24
FIGURE 2.4.6: LENS MODEL [URBAN & HAUSER, 1993].....	29
FIGURE 2.4.7: PERCEPTUAL MAP FOR CANDY BARS.....	30
FIGURE 2.4.8: THE MARKETING MIX AND TARGET MARKET [PERREAULT AND MCCARTHY, 1996, P. 50].....	31
FIGURE 2.4.9: SPECIFIC DECISION AREAS OF 4 P'S [PERREAULT & MCCARTHY, P. 51].....	32
FIGURE 3.6.1: OVERLAPS/GAPS WITHIN PRODUCT FAMILY.....	45
FIGURE 3.6.2: OVERLAPS/GAPS ACROSS PRODUCT FAMILIES.....	47
FIGURE 3.6.3: OVERLAPS/GAPS ACROSS SEGMENTS.....	48
FIGURE 3.6.4: OVERLAPS/GAPS ACROSS MARKETS.....	49
FIGURE 3.6.5: AMOUNT OF OVERLAP/GAPS EXPECTED ACROSS VARIOUS LEVELS IN THE PRODUCT PORTFOLIO.....	50
FIGURE 3.6.6: FLOW OF CUSTOMER NEEDS TO EMBODIMENT AND VERIFICATION IN MARKET. 52	
FIGURE 3.6.7: CBP RELATIONSHIP.....	55
FIGURE 3.6.8: BENEFITS FOR PRODUCTS IN NICHE OR SEGMENT, EQUALITY IN BENEFIT LEVELS DESIRED.....	55
FIGURE 3.6.9: BENEFITS FOR PRODUCTS IN NICHE OR SEGMENT, INEQUALITY IN BENEFIT LEVELS DESIRED.....	55
FIGURE 3.6.10: RELATIVE DIFFERENTIATION [MCGRATH, 1995, P. 80].....	57
FIGURE 3.6.11: MEASUREMENT OF DEGREE OF DIFFERENTIATION.....	59
FIGURE 3.6.12: VECTOR OF DIFFERENTIATION DEFINED BY BENEFITS.....	63
FIGURE 3.6.13: RELATIONSHIP BETWEEN CBP, BENEFITS, ATTRIBUTES, AND SPECIFICATIONS. . 68	
FIGURE 4.7.1: SEGMENTS AND FAMILIES FOR XEROX.....	82
FIGURE 4.7.2: SEGMENTS AND FAMILIES FOR DOCUMENT MANAGEMENT MARKET.....	83
FIGURE 4.7.3: DOCUMENT MANAGEMENT MARKET COMPETITORS.....	84
FIGURE 4.7.4: PRODUCT MAP FOR WORKGROUP PRINTERS.....	96
FIGURE 4.7.5: VECTORS OF DIFFERENTIATION FOR WORKGROUP PRINTERS.....	97
FIGURE 4.7.6: OVERLAP B-1, WORKGROUP PRINTERS.....	101

FIGURE 4.7.7: OVERLAP B-2, WORKGROUP COPIERS.....	102
FIGURE 4.7.8: OVERLAP B-2, PRINT/COPY.....	103
FIGURE 4.7.9: OVERLAPS, DESKTOP AND WORKGROUP PRINTERS.....	104
FIGURE 4.7.10: OVERLAPS (NONE), WORKGROUP AND PRODUCTION PRINTERS.....	104
FIGURE 4.7.11: OVERLAP (C-3), DESKTOP AND WORKGROUP COPIERS.....	106
FIGURE 4.7.12: OVERLAP (NONE), WORKGROUP AND PRODUCTION COPIERS.....	107
FIGURE 4.7.13: OVERLAP (NONE), PRINT AND COPY PRODUCTS.....	108
FIGURE 4.7.14: OVERLAP (NONE), MULTIFUNCTION DEVICES.....	108
FIGURE 4.7.15: XEROX VECTORS OF DIFFERENTIATION FOR DESKTOP PRINTERS.....	109
FIGURE 4.7.16: XEROX VECTORS OF DIFFERENTIATION FOR WORKGROUP PRINTERS.....	110
FIGURE 4.7.17: XEROX VECTORS OF DIFFERENTIATION FOR PRODUCTION PRINTERS.....	110
FIGURE 4.7.18: XEROX VECTORS OF DIFFERENTIATION FOR DESKTOP COPIERS.....	111
FIGURE 4.7.19: XEROX VECTORS OF DIFFERENTIATION FOR WORKGROUP COPIERS.....	111
FIGURE 4.7.20: XEROX VECTORS OF DIFFERENTIATION FOR PRODUCTION COPIERS.....	112
FIGURE 4.7.21: XEROX VECTORS OF DIFFERENTIATION FOR DESKTOP PRINT/COPY.....	112
FIGURE 4.7.22: XEROX VECTORS OF DIFFERENTIATION FOR WORKGROUP PRINT/COPY.....	113
FIGURE 4.7.23: XEROX VECTORS OF DIFFERENTIATION FOR MULTIFUNCTION DEVICES.....	113
FIGURE 4.7.24: GAPS FOR DESKTOP PRINTERS.....	120
FIGURE 4.7.25: GAPS FOR WORKGROUP PRINTERS.....	121
FIGURE 4.7.26: GAPS FOR DESKTOP COPIERS.....	122
FIGURE 4.7.27: GAPS FOR MULTIFUNCTION DEVICES.....	123
FIGURE 4.7.28: COMPETITIVE VECTORS – DESKTOP PRINTERS.....	124
FIGURE 4.7.29: COMPETITIVE VECTORS – WORKGROUP PRINTERS.....	125
FIGURE 4.7.30: COMPETITIVE VECTORS – DESKTOP COPIERS.....	126
FIGURE 4.7.31: COMPETITIVE VECTORS – WORKGROUP COPIERS.....	127
FIGURE 4.7.32: COMPETITIVE VECTORS – PRODUCTION COPIERS.....	127
FIGURE 4.7.33: COMPETITIVE VECTORS - PRINTER/COPIER.....	128
FIGURE 4.7.34: COMPETITIVE VECTORS - MULTIFUNCTION DEVICES.....	129

2 INTRODUCTION

Before the product development process starts for a company, a great deal of planning and analysis work must be completed in order to be successful in the marketplace with products. These activities include identifying markets, segmenting the markets, identifying product opportunities in these segments, selecting target markets, performing a competitive analysis of product offerings, and creating product strategies to gain revenues and market share in the target markets. This planning is a very involved and time-consuming series of processes and analyses, but is invaluable for creating successful products. The decisions made in the planning portion of the business process make the difference between winning and losing products.

An important aspect of the planning activities and developing competitive strategies is to understand how the products in a company's portfolio are positioned in the market with respect to each other, customer needs, and competitive offerings. One analysis that aids in developing this understanding is a portfolio overlap/gap analysis. The purpose of a portfolio overlap/gap analysis is to identify areas for improvement in the product portfolio in order to make strategic investment, development, and product positioning decisions for future product offerings. This analysis is important for uncovering specific domains within the portfolio where there customers are being either over- or under-targeted with product offerings.

A product portfolio overlap can be defined as an area where a similar marketing mix for different products is offered to the same/similar customers. This could involve products with the same features or core benefit proposition, products that have similar promotion strategies, products with similar distribution methods, or products offered at similar prices. Some overlap within the portfolio may be required and/or desired, while other forms may be very sub-optimal for the portfolio.

Product portfolio overlaps can present problems for a company for several reasons. If two or more business units are producing products that meet similar needs for similar customers, this

can be an inefficient use of company resources. This can be seen along two different dimensions within the company. First, development money and employee time is spent designing, promoting, and distributing redundant products, when the same resources could be spent on products that add more variety to the portfolio. Second, overlaps can result in business units from within the company are competing against each other to sell their products in the marketplace. Resources are wasted trying to not only outsell competitors, but other internal company products as well. Portfolio overlaps can also result in confusion for the customer and the selling chain. If a company offers several different products that meet the same needs, customers will not know which one to buy. The selling chain, such as distributors and retailers, will also have difficulty because they will be unsure of the differentiation among products, and which should be recommended to particular customer groups. This can result in lost sales and unwanted complexity in the selling process.

A gap may be defined as an area in the product portfolio where a group of customers is not covered by the marketing mix of one or more products. This may involve not having the right product features or attributes that meet the needs of the customer group or not promoting the product correctly to make the group aware of the product's attributes. It may also involve not having a distribution channel that matches the expectations or needs of the group, or not offering the product at the right price. Portfolio gaps can develop in the portfolio either unknowingly or purposefully by the company. What is most important is that the company identify their existence, know why they have arisen, and determine what action to take in response to them.

Product portfolio gaps can present several opportunities for the product development company to improve its strategic position in the market. A product portfolio gap implies that a company has either no product or an inefficient offering for a specific marketplace niche. This can mean that there are customers with particular needs that are not being satisfied by the company. Closing the gaps by meeting the customer needs can offer significant opportunities for additional revenues and market share. A portfolio gap can also have a strategic significance. Gaps can be areas where competitors choose to launch products to gain a foothold in the marketplace. Once share is

captured there, they could expand to other areas, using the niche as a springboard to additional revenues. In either case, a company must have knowledge of its portfolio gaps so that it may either close them or protect them from competitors.

At the heart of determining the market positions of the various product offerings are two key concepts known as the Vector of Differentiation (VoD) and the Core Benefit Proposition (CBP). The VoD is the thematic characteristic that consistently differentiates a set of product offerings in the minds of the customers¹. It is an important characteristic of product portfolios and their associated families because a differentiation strategy can result in a source of competitive advantage, especially for high-tech products [McGrath, 1995]. The vectors of differentiation are the headlights that light the path for marketers and engineers toward a specific destination when they are developing a new portfolio of products.

A core benefit proposition is a statement that summarizes “the unique benefits that the product is to provide customers as well as those benefits required to meet and surpass the competition [Urban and Hauser, 1993]. The CBP is derived, in part, from the vector of differentiation. While the VoD sets the overall theme for the product portfolio, the CBP defines the benefits for each product that are consistent with the VoD. Once the CBP is defined, product attributes, specifications, and designs can then be developed.

With the vectors of differentiation, product and family CBP’s, and individual product specifications and attributes, the entire portfolio of products can be described. Along with information about competitive products in the marketplace, market overlaps and gaps can then be mapped and identified.

The purpose of this research is to develop a method for identifying product portfolio overlaps and gaps by specifically incorporating the portfolio’s vectors of differentiation, core benefit propositions, and product attributes and specifications. This will allow the company to see how its products are related across markets, and to observe the strengths and weaknesses in its

¹ Definition from the Xerox Company

competitive positions. The result of this method will be additional information available to managers for making product strategy decisions.

The benefits of this research are several. First, the approach used within this thesis it will allow a company to observe the consistency of the vectors of differentiation for the set of product offerings. This serves to ensure that products are differentiated in the marketplace in the direction intended. Second, it will allow the company to trace the core benefit propositions for each family of products. This will help to verify that products meet the expectations initially set during the product planning stage. Finally, by combining the VoD and CBP analyses, it will allow for the identification of gaps and overlaps in the product portfolio.

The approach for this research has several parts. First, a case study with the Xerox Company was performed. Data from Xerox's product portfolio and those of its competitors were obtained in order to demonstrate the methods developed in this thesis. Next, the core benefit propositions for both Xerox's product offerings, as well as those of competitors, were determined from available attributes and specifications. This analysis involved identifying the key benefits that customers desire from products, and determining the level of benefit each product provides. Third, the vectors of differentiation for Xerox's products were determined. This involved analyzing the differentiation of Xerox's product CBP's comparing them across market segments for consistency. Finally, the core benefit propositions and vectors of differentiation were mapped and product portfolio overlaps and gaps were observed.

This thesis is organized into five chapters. Chapter 2 presents background information that forms the foundation upon which the product portfolio analysis of this thesis is based. The chapter sets the context of the analysis and its relation to the overall product development process and product strategy of the company. This study forms the basis for the overlap and gap analysis that is the focal point of this thesis. Chapter 3 presents the method for the analysis of the identification of overlaps and gaps within the product portfolio. The chapter discusses some general and specific issues regarding overlaps and gaps, presents some basic theory behind core

benefit propositions and vectors of differentiation, and shows how they can be used to identify overlaps and gaps. Chapter 4 presents an industry case study of the Xerox Company and its products to demonstrate the overlap and gaps identification methods developed in this thesis. Chapter 5 presents some basic conclusions from this research, and proposes additional areas for investigation for further identifying overlaps and gaps in the product portfolio.

4 PLANNING THE PRODUCT PORTFOLIO

Developing the product portfolios for a company is a very complex and time-consuming process, but one that can reap great rewards if done correctly. The key to success in the marketplace for product portfolios is rigorous up-front planning where strategies for multiple product families are set that guide the overall development of the portfolio. These strategies then flow down and are used to direct the decisions made when defining the product family, where platform and derivative products are developed and delivered to customers. The purpose of this chapter is to review the key concepts and methods behind planning a product portfolio for marketplace success.

4.1 The Product Portfolio

A product portfolio is the set of related products offered to customers by a company. The products usually share one or more characteristics in common, such as parts, similar or complimentary markets, or similar customer needs. A company may have one or more product portfolios, depending on the relationship that these products have to one another. The composition of a product portfolio is constantly changing, as new products are added to it and older products are no longer produced. Thus, a product portfolio can best be described by its composition at a particular point in time.

A project portfolio is the set of development projects that, when completed, will add new products to the product portfolio. Thus, a product portfolio at some time T_1 can be defined as the product portfolio at T_0 , minus the products retired from the product portfolio between T_0 and T_1 , plus the projects completed from the project portfolio between T_0 and T_1 . Figure 2.1 shows this relationship.

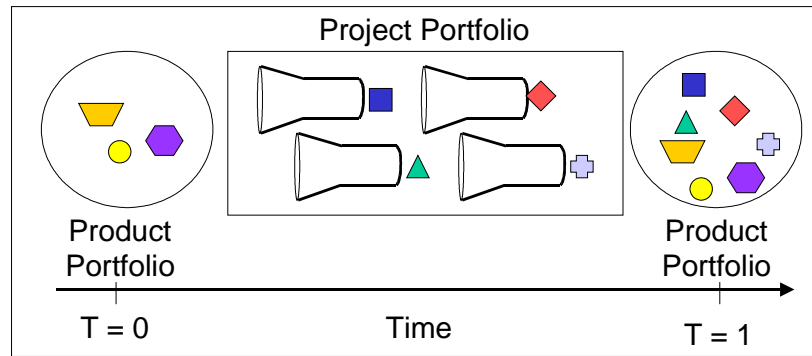


Figure 2.4.1: Relationship between Product and Project Portfolios

A product family can be defined as “a set of products that share common technology and address a related set of market applications” [Meyer and Lehnerd, 1997]. For example, a product portfolio could be the set of power tools offered by Black & Decker. Within this set, there are many families: drills, power screwdrivers, vacuums, saws, etc. Within each of these families, there are multiple products that meet the specific needs of various market niches. These products are all different in that they meet different specific needs, but they are all power tools that are targeted at generally similar customers with similar needs.

At the heart of most product families is what is known as a product platform, which is “the set of subsystems and interfaces that form a common structure from which a stream of derivative products can be efficiently developed and produced” [Meyer and Lehnerd, 1997]. The platform is usually a physical set of systems/ subsystems/ components that are shared across several products in a family, although it may also include processes and software as well. The products that use a platform as a base are known as derivative products. These products usually have a common set of features, but also a degree of distinctiveness in attributes that distinguish them from one another.

The planning process for product portfolios is more complicated than that for individual products, as it involves the planning of platforms that will accommodate a range of future products simultaneously. The interrelationships across a company’s product portfolios and their

respective families must also be taken into account in order to create an “optimized” corporate portfolio. Achieving this ideal corporate portfolio begins with the product development process.

4.2 The Product Development Process

Product development is an ongoing business process geared toward developing and delivering products to customers that have a need or desire for them. It is a process that incorporates all of the business functions, such as engineering, manufacturing, marketing, sales, finance, etc., in some way. The new product development process typically consists of the following broad steps [Urban and Hauser, 1993]:

1. Identifying revenue opportunities for new products
2. Designing a new product to meet the revenue opportunity
3. Performing experiments with the new product and its marketing strategy
4. Launching the product
5. Managing the new product’s competitive life cycle

The product development process has typically been used solely for developing individual products. However, it can be extended upward into the business planning processes in order to develop a portfolio of products. This section discusses both the single-product process as well as the portfolio development process.

4.2.1 The Product Design Process

Ulrich and Eppinger (1995) have identified a 5-phase product development process that gives a logical framework for individual development projects. The process is used to transform inputs (ideas, information, raw materials) into outputs (products) that meet the needs of some set of customers. Implementing such a process aids companies with quality assurance, the coordination of functions, planning and setting milestones, managing tasks, and making overall improvements.

The five phases in the process are as follows, as shown in Figure 2.2: Concept Development, System-Level Design, Detail Design, Testing and Refinement, and Production Ramp-Up. The Concept Development phase consists of the identification of customer needs, the generation and selection of product concepts, and the selection of target specifications. The System-Level Design phase consists of the definition of the product architecture and the subsystem requirements. Detail Design is where the specifications for each individual part/component are defined. Testing and Refinement is then used to evaluate the proposed designs and concepts, and to develop the final specifications for the product. During Production Ram-Up, the product is manufactured using the actual production system, and then finally launched.

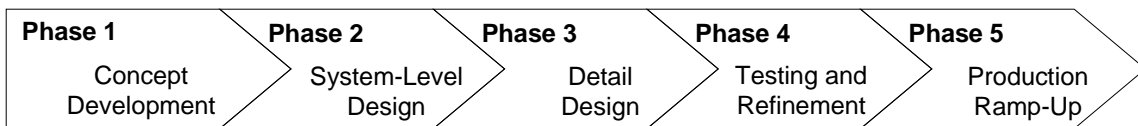


Figure 2.4.2: The Product Development Process [Ulrich & Eppinger, 1995, p. 9]

The product development process can best be viewed as a “Development Funnel” [Wheelwright and Clark, 1993], as shown in Figure 2.3. The mouth and upper third of the funnel represent the “front-end” of the development process. It is here where ideas and concepts are generated in order to develop potential winning product concepts. As the product development process proceeds, the ideas are screened and merged to sort out the best ones. After screening, the selected ideas are then developed in more detail and analyzed for fit with company goals. A final decision for go/no-go is then made at the second screening, and the winning product proposals are developed for sale to customers.

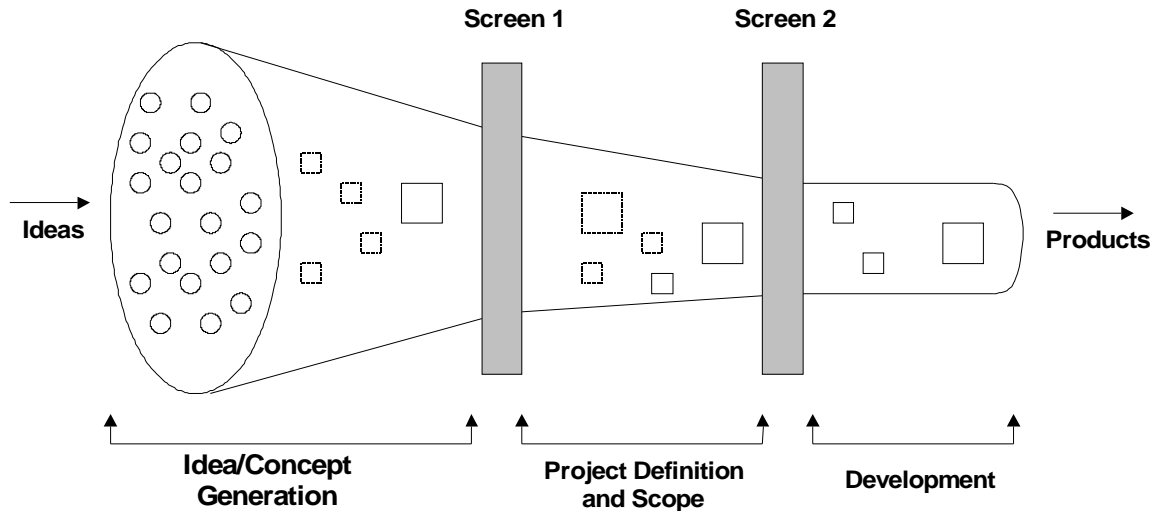


Figure 2.4.3: Development Funnel [Wheelwright & Clark, 1993, p. 124]

Traditionally, much of the management attention was given to a project late in the process as the importance of project completion intensified. Figure 2.4 shows how this relates to the ability of management to influence the outcome of each project. As the figure shows, decisions that are made early in the process have a huge ability to impact the final product. Once these decisions are made, however, it becomes harder and harder to reverse them and influence the product outcome in the later stages of product development. Decisions made early on are relatively inexpensive and can impact the project as a whole, while decisions made later in the process are costly because they may require that some of the work already completed be undone, and will only impact a limited portion of the project remaining [Smith & Reinertsen, 1991].

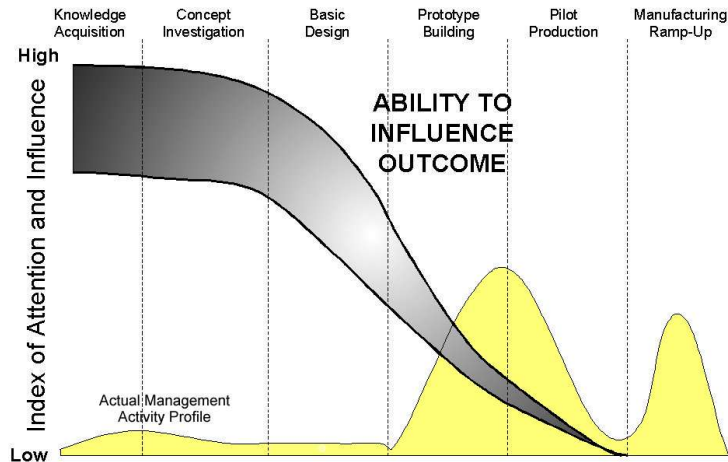


Figure 2.4.4: Timing and Impact of Management Attention and Influence [Wheelwright & Clark, 1993, p. 33]

4.2.2 The Front-End of Development

The front-end is arguably the most important phase of this process. It is here where the scope, direction, and attributes for each product are determined. The success or failure of a product in the marketplace is, in large part, determined by the decisions made here. It is often referred to as the “fuzzy” front end, primarily because of the uncertainty surrounding the transformation of ideas and company strategies into concrete development projects. A great deal of the total development time for products is spent here defining the product portfolio.

The front-end of the development process consists of all of the functions needed to establish and define the scope, attributes, and direction for each individual development project. It typically consists of a number of product planning functions, which include the following: idea generation, customer needs identification, setting target specs, competitive analysis, concept generation and selection, economic analysis, and development project planning [Ulrich & Eppinger, 1995]. In terms of the development funnel, it consists of all of the functions from the mouth through screen #2. All of the idea and concept generation takes place here, as well as constant refinement of these ideas, until project ideas can be developed, defined, and prepared for a go/no-go decision.

4.2.3 Extension of the Front End into the Business Planning Processes

The product development process described and discussed above is both adequate and appropriate for designing and developing single products. But in order to effectively plan a product portfolio or a set of related products, the front-end of the development process must be extended upward into the business planning strategies of the company. This helps to ensure three important aspects of being successful in the market: 1) flow-down of corporate strategies into the products developed and delivered to customers, 2) cost and time savings during product development by understanding project interrelationships, and 3) the understanding of market relationships among products.

At the level of multiple families (the business group), core strategies are set that link the benefits offered by products across and within families. These strategies are very important in that they guide the development of products toward specific goals to achieve marketplace success. They provide a common theme for the product portfolio, which can result in a consistent source of competitive advantage in the market. These core strategies include, but are not limited to, which customers to serve, the portfolio vector of differentiation, benefits to offer, value chain relationships, reuse of parts and platforms, and common promotional themes. Extending the front-end of the development process upward allows these strategies to be set for multiple families in order to maximize the revenue achieved by the portfolio.

The various products within families and portfolios are complex with very interdependent relationships. In order to be able to develop platforms and derivative products quickly, their relationships must be understood and planned for within the development process. These relationships include shared platforms and parts, shared resources, and money. Effectively planning these relationships can result in huge savings in terms of time and cost that will allow product to be more competitive in the marketplace.

Integral to the design of platforms and families are the benefits and attributes that these products offer. The benefits and attributes offered by products and their associated families must be

planned in order to gain maximum revenues and market share. This involves positioning the set of products in the marketplace so as to meet customer needs by providing the right mix and number of product offerings. To do this, the benefits provided by each product must be planned in relation to other products in the portfolio to provide minimal overlap without leaving gaps in customer needs coverage. Only by effective up-front planning can these overlaps and gaps be eliminated.

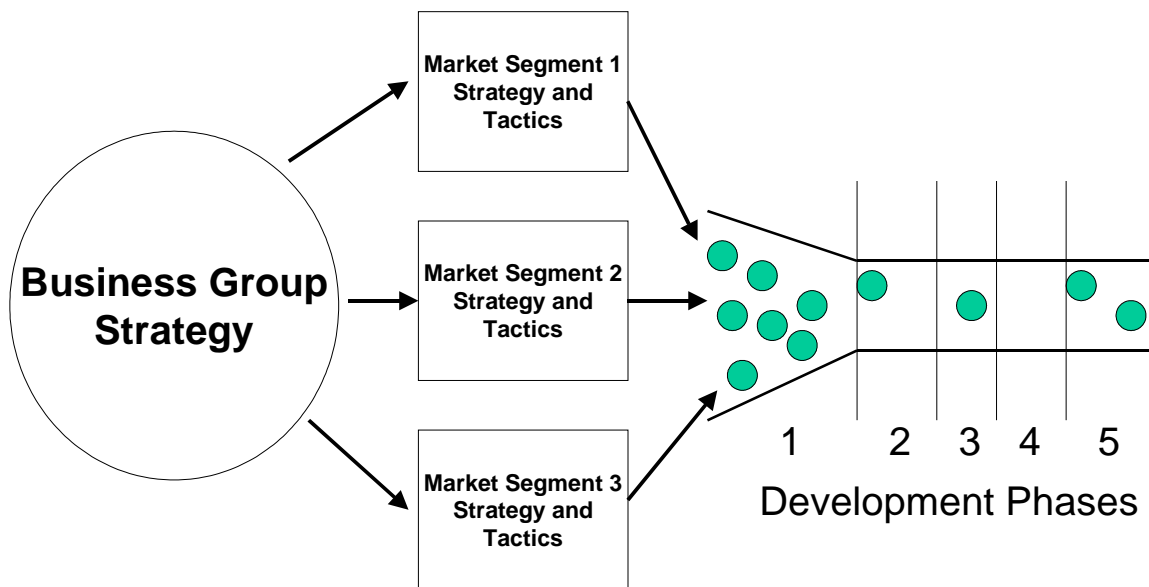


Figure 2.4.5: Extended Front-End of Product Development

Figure 2.5 shows an extended version of the product development process to include the business group and market segment levels. The Business Group Strategy sets the overall market strategy and vision for the business group. It is here where market trends are investigated, markets are segmented, competitive positioning is determined, technology trends are considered, and business goals are articulated. This sets the basic foundation for the business group and the direction for developing its product portfolio.

Once the group business strategy has been set and the market has been divided into segments, strategies and tactics for developing products for these segments can be defined. To do this, in-

depth studies of customers, competitive product offerings, technology options and trends, and market dynamics are undertaken to better understand the segment and the needs of its customers. Product platforms are defined and developed, and product families are planned based on these platforms. All of this information is then fed downstream into the product development funnel, where project development projects are defined, developed, and delivered to customers as final products.

4.3 Product Portfolio Planning Activities

The final design of a product portfolio is a result of the specification of [Urban & Hauser, 1993], [McGrath, 1995]:

1. Target market of customers
2. Vector of Differentiation
3. Core Benefit Proposition (CBP)
4. Position of product in the marketplace vs. competitive offerings
5. Product attributes and features that will meet the CBP
6. The marketing mix that is consistent with the CBP

These planning activities are vitally important and must be performed during the front-end portion of product development to ensure that a product achieves its goals in meeting customer needs and achieving market share. Each of these are described below in relation to their role in developing a successful product portfolio.

4.3.1 Market Segmentation

The number of potential buyers for a product, in theory, may include every person on Earth. However, designing and marketing a product targeted at every person in the world will not generate much revenue. This is because people have widely varying needs and requirements for various types of products. In order to break down customer needs and markets into more manageable groups, a technique known as market segmentation is employed. Market segmentation is, at the most basic level, the classification of customers into groups [Wedel and

Kamakura, 1998]. The purpose is to “aggregate individuals into some workable number of relatively homogenous target markets – and then treat each market differently” [Perreault and McCarthy, 1996]. Customers in a particular segment can be similar on any number of dimensions, such as buying habits, needs, hobbies, age group, etc. The ultimate goal is to group together potential customers that will respond in a similar fashion to product attributes, promotions, and prices. Once this has been completed, the most attractive segments (known as target markets) can then be selected where firms will introduce products.

Once the segments are selected that a company will attack with products, a more in-depth study of the customers and competing products must be made. This is to ensure that the business group understands the economics and competitive nature of the segment, and that the important customer needs have thoroughly been captured. To do this, product develop team members must understand the important dimensions along which customers perceive products, how customers perceive products currently in the market, and where new product offerings should be positioned relative to the current and expected future products. Once this has been completed, the portfolio vectors of differentiation can be set.

4.3.2 The Vector of Differentiation (VoD)

When developing competitive strategies, companies have the choice to pursue one or more options with regards to types of strategy. Two of the most common options are price-base strategies and differentiation strategies. A price-based strategy is one where the price of a product is set to strategically position a product competitively in the market. This type of strategy can be very effective, yet since prices often erode over time in most markets, is not a strong source of competitive advantage. A differentiation strategy, however, differentiates a company’s product offerings on characteristics other than price (i.e. benefits, features, etc.) The purpose of a product differentiation strategy is to distinguish the value of a product from other competitive offerings in the marketplace. It is an approach that, when successful, allows a company’s products to achieve an advantageous competitive position and possibly premium price in the marketplace.

The vector of differentiation (VoD) can be defined as a “thematic characteristic that consistently differentiates, in the mind of the customer, the set of product offerings...across all targeted segments within the market.”² The VoD can be set at any number of levels. This can be for a product family, a market segment, multiple market segments, or across an entire company. The important point of the vector is that it differentiates products *in the minds of the customers*.

Product differentiation should be managed as a vector, not as a point [McGrath, 1995]. Differentiation at a point implies some type of differentiation for a single product at one time, while a vector implies differentiation in a direction that is continuous for multiple products over time. Often when a company introduces and is successful with a differentiated product, competitors work to catch up and incorporate these differentiated features in their own product. Differentiating along a vector means that a set of products is continually differentiated around a certain theme in order to stay ahead of competitors and maintain a competitive advantage. This differentiation is usually embodied in the core benefits offered to customers by a product.

4.3.3 The Core Benefit Proposition

A statement that summarizes the primary benefits offered by a product to the target market is known as the Core Benefit Proposition (CBP). It states the benefits for a product that are a) required to meet or surpass those offered by competitive products, and b) differentiating features that are unique to the particular product in meeting customer needs [Urban and Hauser, 1993]. The Core Benefit Proposition is stated in terms of the customer’s perspective relative to the attributes that are important to the customers when making purchasing decisions. This is more than advertising; the CBP is a statement of the overall goals of the product in terms of the benefits it will give to customers. It is not a technical description either, because it doesn’t outline the specific features that the product contains. Instead, CBP specifies the subjective benefits that are expected from the product.

The CBP is derived, in part, from the vector of differentiation defined for the product portfolio. How a product is differentiated defines its position in the marketplace [McGrath, 1995]. The

² Courtesy of the Xerox Company

benefits defined by the CBP must be consistent with the VoD in order to differentiate the product from others in the market. Along with the VoD, the CBP is the foundation upon which the product design is based. Together they provide the focus for all efforts related to developing, promoting, distributing, and selling a product to customers.

In order to determine the appropriate CBP for a new product, certain aspects of the target market must be known. These include the dimensions along which customers expect important benefits to be derived from a product, as well as how customers perceive competitive product offerings along these dimensions. Both of these may be accomplished by employing product positioning.

4.3.4 Product Positioning

4.3.4.1 Customer Perception

Customers buy products based on perception. This means that people make a purchasing decision based on the expected benefits that they believe will result from a particular product. For example, a customer may be trying to decide what type of candy bar to buy. She may choose to buy a Hershey bar because it is the most “chocolatey” in taste, or she may choose to buy a Crunch bar because she believes that it is the “crunchiest.” In both cases, these product characteristics may or may not necessarily be 100% correct based on product specifications or technical measures, but what is most important is that it is what the customer *perceives* and *believes*.

Customer perceptions, such as “chocolatey” or “crunchy,” are expected product benefits that are subjective in nature. Brunswick has developed what is known as the “Lens Model” (Figure 2.6), which says that customers develop their product preferences based on subjective perceptions. The perceptions are used by customers as a “lens” to sort through and focus information they receive about the product and its features [Urban and Hauser, 1993]. A graphic depiction of this model is given in the figure below.

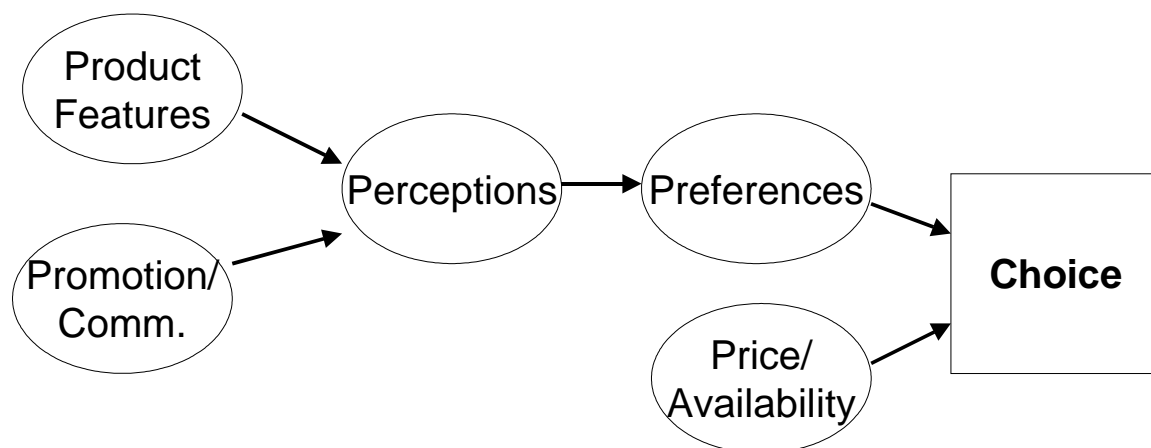


Figure 2.4.6: Lens Model [Urban & Hauser, 1993]

The model involves three “steps” of decisions from the customer. First, information is gathered about a particular product, such as product features, promotional materials, word-of-mouth reviews, etc. This information is then filtered and sorted until a customer perception is developed for that product for the subjective benefits that the customer feels are important. This is then repeated as necessary for similar products being considered. Second, once perceptions have been established, a comparison is made among products. Customers are then able to develop product preferences for what they would like to purchase. Finally, since products are not always available, or available at the same price, availability and price information is incorporated together with the product preferences to make the product buying choice.

The most important takeaway from the Lens model is that, in order to be successful with a product, a company must be able to influence the perceptions that customers have of that product. Thus, the selection of product features and the promotion of these features are decisions that must be made carefully by managers and product development teams.

4.3.4.2 Positioning Products in the Market

Product positioning is a technique that shows how customers perceive products and locate them in the market relative to one another. This usually involves identifying product benefits that are important to customers, obtaining customer perceptions of products with respect to these benefits, and then displaying these on what is known as a perceptual map. What this does is

allow the company to see how products are positioned in the marketplace, in the minds of customers, so that a strategy may be determined for the CBP as to what benefits should be offered to sell products and gain market share.

Perceptual maps usually consist of two or more dimensions that show how existing products provide benefits for the target market, according to customer perceptions. They are a graphical method that show market positions of the products in the market, relative to both one another and the benefits that they provide. Figure 2.7 shows an example of a perceptual map for candy bars. Company ABC has determined that the two most important product benefits for candy bars are “chocolatey” and “crunchy”. It would like to develop a brand new candy bar, and wants to develop a CBP to position it in the market. The company did a study of competitive offerings, found how customers perceived them with respect to these two benefits, and mapped these perceptions relative to one another. The outcome shows how customers perceive the market space of products, gives the company an idea of how it should position its new product relative to competitors.

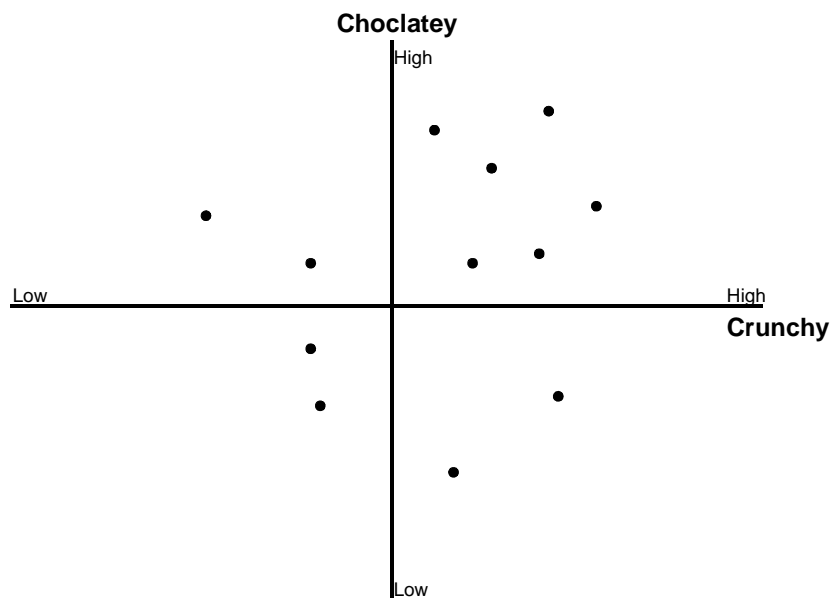


Figure 2.4.7: Perceptual Map for Candy Bars

Once the desired position for the CBP in the market has been determined, the product design and the marketing strategy must be determined in order to meet the CBP and achieve the planned market position for the product. This is achieved by controlling the company's marketing mix.

4.3.5 The Marketing Mix

The marketing mix is “the set of controllable variables that a company puts together to satisfy [a target market]” [Perreault and McCarthy, 1996]. All of these variables can be grouped into what is known as the 4 P's: Product, Place, Price, and Promotion. The customer is not a part of the marketing mix; rather, the customer is the target of a particular marketing mix. Figure 2.8 shows this relationship.

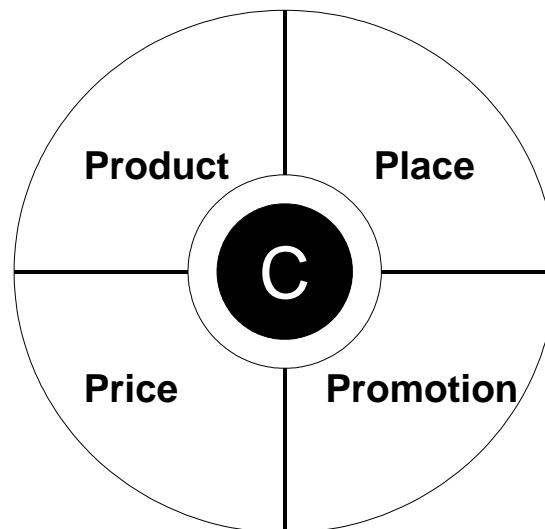


Figure 2.4.8: The Marketing Mix and Target Market [Perreault and McCarthy, 1996, p. 50]

The Product part of the marketing mix is concerned with developing the correct product for the target market. This involves selecting the right mix of product characteristics such as performance, quality, brands, warranty, product features and attributes, and services that will satisfy the needs of customers. The Place part of the marketing mix concerns getting the correct product to the correct place where the target market wants to purchase it. This is realized through the distribution channel that a company uses to transfer a product from final manufacture to the

point-of-sale for the customer. This can involve a long chain of middlemen, such as distributors, wholesalers, and retailers, or be short chain, such as a direct OEM to customer sale over the Internet.

Promotion is the part of the marketing mix that concerns communicating information about the product to the target. This involves advertising, personal selling, publicity, and sales promotion – any form of communication that gets word out about the product to potential customers. The final piece of the marketing mix, Price, involves choosing the correct price that the target market is willing to pay for goods and services. Figure 2.9 summarizes the key strategy decision areas as organized by the 4 P's that determine what the product will be, how it will be distributed and where it will be sold, how it will be promoted, and what its price will be.

Product	Place	Promotion	Price
Physical Good Service Features Quality Level Accessories Installation Warranty Product Lines Packaging Branding	Objectives Channel Market Exposure Middlemen Store Locations Transportation Storage Service Levels	Objectives Promotion Blend Salespeople Advertising Sales Promotions Publicity	Objectives Flexibility Prod. Life Cycle Geography Discounts Allowances

Figure 2.4.9: Specific Decision Areas of 4 P's [Perreault & McCarthy, p. 51]

The marketing mix should be consistent with the VoD and CBP defined early in the product development process. Because the CBP defines how the company wants the offering to be positioned in the marketplace, the marketing mix is the instrument used by the company to help form the customer's perception of the product. It tries to offer the right product, at the right place, with the right promotion, at the right price. As the Lens model stated, customer perceptions are the result of the combination of the product's features and the communications that customer

receive about these features. Thus, the marketing mix is vitally important in determining, in the minds of the customers, how the product is positioned in the marketplace relative to customers' needs and competitive offerings.

4.4 Transition

Companies influence the buying decisions made by customers through the marketing mix. With the Lens model, we have a representation of how these marketing mix variables impact the purchasing decisions of customers. We know that the Product and Promotion primarily affect the perceptions and preferences that customers develop, while Price and Place primarily affect the decision of which product to purchase. Each of these variables must be broken down even further to understand fully how they impact the buying decisions of customers. It is thus important to identify strengths and weaknesses within the marketing mix variables in order to provide a total product offering that customers will purchase. One method for doing this is to identify the product portfolio overlaps and gaps, which is the topic of Chapter 3.

6 IDENTIFYING PRODUCT PORTFOLIO OVERLAPS AND GAPS

The identification of product portfolio overlaps and gaps is an involved process, but one that is not difficult to understand. This chapter serves to present a process for identifying portfolio overlaps and gaps. First, the chapter defines and discusses the concept of product portfolio overlaps and gaps, and the basics behind the type of overlaps and gaps that are the focus of this thesis. It then introduces the tools necessary to identify overlaps and gaps, and the theories and concepts behind these tools. Finally, the chapter introduces and discusses the analysis method for identifying these overlaps and gaps.

6.1 Product Portfolio Overlaps and Gaps

As markets have become global and product development cycle-times decrease, the need for better product portfolio planning has become extremely important. Product families and platforms must be planned early in the development process in order to obtain low development costs and short development times while maintaining or increasing product quality. Before planning for the future can begin, however, a thorough analysis of the product portfolio must be conducted to uncover its strengths and weaknesses, and the opportunities that arise from them.

The purpose of product portfolio analysis is to understand the strengths and weaknesses of the set of products offered to customers so that decisions can be made for what products should be offered in the future. It consists of a number of tasks which include evaluating all aspects of the marketing mix offered to customers. This analysis allows the company to evaluate its product offerings, the promotion of those products, their distribution, and the price that they are sold for. It also allows for the determination of where the portfolio should be improved in relation to current and future customer needs.

Product portfolio analysis consists of several possible tools aimed at improving the information available when making decisions for future product offerings. These include portfolio analyses

on all levels, from higher-level investment decisions, to basic strategic analyses of markets and positions, to in-depth analyses of product and family improvement. At a high level, an approach known as portfolio management treats products and families within the portfolio as investments. The various product opportunities and alternatives are analyzed using financial criteria such as profitability, risk, and return on investment to make the decision for which products to develop [Perreault & McCarthy, 1996]. At the product and family level, various analyses can be made to increase quality and decrease time-to-market for the portfolio. One possibility for this is a reuse analysis, which looks at how parts, platforms, and manufacturing resources are used across multiple products, and how this can be improved in the future. Finally, on the strategic level of the portfolio analyses is an example that is the centerpiece of this thesis: an overlap/gap analysis.

6.1.1 Overlap/Gap Analysis

An overlap/gap analysis is important for making improvements in the product portfolio. Its purpose is to identify opportunities for improvement to offer a more attractive product portfolio to customers. This involves integrating information about market trends and customer needs, company goals, competitive products, and the company's product offerings and strategies to form a complete picture of where the company can improve its product portfolio to better meet customer needs and generate more revenue and market share.

A product portfolio overlap/gap analysis consists of two distinct parts: 1) identification, and 2) impact assessment. Identification is the process of uncovering the locations of overlaps and gaps in the portfolio. It provides insight into where weaknesses may be located so that a further in-depth analysis may be conducted. An impact assessment is the in-depth analysis into each overlap and gap to determine importance. Not all overlaps and gaps have equal importance; some may need higher priority attention than others. The impact assessment helps to set priority so that the overlaps and gaps can be dealt with accordingly.

6.1.2 Product Portfolio Overlaps

A product portfolio overlap can be defined as an area in the portfolio where a similar marketing mix for different products is offered to the same/similar customers. This could involve products with the same features or core benefit proposition, products that have similar promotion strategies, products with similar distribution methods, or products offered at similar prices. Some overlap within the portfolio may be required and/or desired, while other forms may be sub-optimal for the portfolio.

Product portfolio overlaps are observed relative to a company's own product offerings. Overlaps represent opportunities for improving internally the coverage of a company's products and marketing mixes to extract a maximum amount of revenue from the marketplace without unwanted product cannibalization. Overlap of a company's products and marketing mixes with those of competitors is expected, and addressed with specific product positioning and strategies derived from a product portfolio gap analysis.

There are many strategic benefits to identifying portfolio overlaps. First, since the marketing mixes for any number of products may be similar, there is the possibility of leveraging these similarities in the marketplace. An example of this could be two products that are similar but are differentiated along a certain customer benefit (such as in a product family). These products could be promoted together, showing how they meet similar needs along one vector, but are differentiated along another vector. Second, overlap identification helps management to see the merging of market niches and segments. As customer needs for several different types of products begin to merge, the marketing mixes for those products will begin to overlap. Thus, overlaps may signal the need for a reorganization of development groups or selling activities to accommodate the shifts in customer needs. Finally, the identification of product portfolio overlaps can be used to help make investment decisions in new products. A company can observe the current amount of portfolio overlap, decide how much overlap is best for the portfolio, and make new product investment decisions based on the desired level of overlap.

There are both pros and cons to having product portfolio overlaps. The pros include rapidly replacing products to gain market share as well as achieving broad coverage in the marketplace. By creating overlaps in the market by rapidly introducing new products, a company can increase its share in the market and improve its positions against the market leaders [McGrath, 1995]. These overlaps tend to upset a market, or even redefine a market, and can lead to additional revenues for the portfolio. Creating an overlap by introducing a product with new technologies can also be beneficial. By being first to market with a new technology, a company can gain a competitive foothold to become a market leader. Overlaps can also serve to be useful for broad coverage of customer needs in the marketplace. By slightly overlapping products across niches, segments, or markets, companies can ensure that their product portfolios meet the demands of a wide range of customers, and that a limited number of the needs of these customers go unmet.

The cons to overlaps are several. First, overlaps can confuse customers. If the marketing mixes for products overlap in the marketplace, they may perceive that the products are very similar, and not know which one(s) meet their needs the best. Second, similar products can result in a cannibalization of revenues. This can occur when “there is not an orderly or profitable transition” [McGrath, 1995] between an existing product and its replacement product. The replacement product may be introduced too early, causing significant overlap in the portfolio and leading to lost revenues. Finally, portfolio overlap can result in wasted development resources. If potential overlaps are not identified and analyzed consistently as new product development projects are considered, resources may be wasted on developing a new product that closely resembles one already in the portfolio (again resulting in cannibalization). Whether good or bad for the portfolio, overlaps must be identified and their impact on the portfolio assessed in order to remain competitive in the marketplace.

6.1.3 Product Portfolio Gaps

A product portfolio gap may be defined as an area in the product portfolio where the marketing mix does not meet the needs of some group of customers. This group of customers can consist of two types: customers who are targeted by the marketing mix whose needs the mix does not meet,

and a group of customers that are not targeted by a marketing mix. For the first group, a gap could mean that the product does not contain the right features or offer the right benefits, the product is not promoted correctly to show that it meets customer needs, the distribution method does not meet customer expectations, or that the product price is different from what customers would like to pay. For the second group, a gap means that they have specific needs that are not being targeted by current products/marketing mixes. The identification of these portfolio gaps is very important, because they present revenue opportunities for not only the company's product offerings, but that of competitors as well.

Product portfolio gaps are observed relative to the market. Whereas product portfolio overlaps consider the portfolio's products relative to one another, a gap analysis considers the products relative to market needs and competitive offerings. The key is to uncover the differences between the product portfolio, competitive offerings, and customer needs so that these differences, or gaps, can be reduced.

The strategic advantages for identifying portfolio gaps are several. First, portfolio gaps represent possible opportunities to satisfy a group of customers whose specific needs are unmet by the current portfolio. The company can investigate the size and nature of the gap, and then make a decision if it wants to fill the gap with products and a marketing mix. The gap identification can also help with making product family planning decisions. Understanding the size and nature of a gap can aid with the decision to develop a derivative from of a current platform, or to develop a new platform and family. Finally, portfolio gaps represent market areas that a company may not attack with a marketing mix, but will want to strategically block other competitors from gaining share in that space of the market. The gap identification process helps with this, in that it enables the company observe the current weaknesses in its portfolio, and to make plans for a competitive response to protect its portfolio gaps.

The identification of product portfolio overlaps/gaps is a significant task to undertake. The overlaps and gaps in the product offerings, their promotion, the distribution system, product

prices, and the combinations of these four parts of the marketing mix can be very complicated and time-consuming to determine and understand. This thesis focuses in on a specific area of the marketing mix: the product offerings.

6.1.4 Product Specific Overlaps/Gaps

A product offering for a customer can be defined by the combination of the variables of the marketing mix. An offering is more than just the physical product that a customer purchases. It is the combination of the product, the place, the promotion, and the price. A weak link anywhere within this marketing mix can mean the difference between a customer's purchase of the company's product or a lost sale to a competitor. The overlaps and gaps considered in this thesis involve the marketing mix offered to customers.

Portfolio overlaps can be observed through the combination of the 4P's, or through the individual Product, Place, Promotion, or Price variables. Decomposing the marketing mix into its four parts and finding the strengths and weaknesses within each of these provides invaluable information for making decisions about current and future product offerings. By performing an overlap/gap analysis for the Product, the company can gain insight into the market coverage of product CBP's, how the products are differentiated from one another as well as from those in the market, and a comparison of product attributes and features in the market. For the Place variable, the overlap/gap analysis can be useful for identifying similarities and differences in the distribution chain among the portfolio products and competitive strategies. An overlap/gap analysis for the Promotion variable can be used to identify similarities among the promotion efforts within the portfolio, as well as differences in strategies among competitors. Finally, the analysis can be used for the Price variable to observe pricing strategies for various portfolio products as well as competitive offerings.

As stated in the previous chapter, customers buy products based upon preferences developed through perceptions of the subjective benefits expected from products. As the Lens model revealed (Figure 2.6), the perception that a customer develops for a product is a function of the

product features and the communications that they receive about the product. The Lens model also indicates that both the distribution method/source and price come into play when customers make a choice for purchase, but do not necessarily affect their perception of the product. Thus, the core benefits that customers believe that they will receive from a product are, for the most part, derived from half of the marketing mix: the product and the promotion.

The core benefit proposition is used to define the benefits that customers should receive from a product offering, which when combined with communications to customers about these product benefits, should help define the product's position in the marketplace. These benefits must then be decomposed into product features and specifications so that a product can be designed and developed to meet these benefits. These product features provide the foundation on which the customer perceptions of the product are based. While communications (promotions) are used to reinforce that these features will solve the needs of customers, developing the right product to meet the CBP is the first stepping stone along the path toward a successful marketing mix and marketplace success.

The focus of this thesis is identifying product-specific portfolio overlaps and gaps. This entails understanding how the product attributes and specifications that meet the various product CBP's relate within the portfolio as well as to other competitive offerings. It also involves observing the portfolio vectors of differentiation, their consistency within the portfolio, and the characteristics of these vectors relative to those of competitors.

There are several direct benefits for product portfolio planning that can be gained from identifying product-specific portfolio overlaps and gaps. First, the analysis enables a company to see how its product portfolio compares with competitive offerings in the market, and how these products compare in terms of benefits offered, attributes, and specifications. The company will then be able to relate this comparison to customer perceptions of these products and their positions in the market. This should result in an understanding of how the benefits a company expects to provide with a product differs from what customers perceive are the benefits from the

same product. A product-specific overlap/gap analysis also allows the company to observe the vectors of differentiation within and across not only the company's portfolio, but across competitive products and the market portfolio as well.

The definitions given earlier for portfolio overlaps and gaps applied generally to the consideration of the products in the portfolio in terms of the overall marketing mix. A further discussion of the definitions of product-specific overlaps and gaps must be pursued before the analysis of such can begin.

6.1.4.1 Product-Specific Portfolio Overlaps

A product-specific portfolio overlap can be defined as the set of products that offer similar benefit propositions to customers. These overlaps can result in products that provide the same relative "amount" of benefit along a certain product dimension, or a combination of attributes and features that give the relative same combined amount of benefit along several dimensions.

Another type of overlap involves the vectors of differentiation for the product portfolio. Ideally, if the portfolio has been designed with differentiation strategies in mind, a common differentiation theme will be present across multiple products. The overlap occurs because several families of products will be differentiated in a similar manner, thus "overlapping" in their theme of differentiation. Vector of differentiation overlaps can best be seen through the verification process, as discussed later in this chapter.

Two types of analysis can be performed to identify overlaps: a static analysis and a time-based analysis. A static analysis observes all of the products in the portfolio at a specific point in time, and looks for overlaps in the product benefit propositions among only these products. A time-based analysis looks at the product portfolio at several points in time simultaneously to understand how the portfolio has evolved or is projected to evolve, and the overlaps that have arisen/will arise from this. This analysis is an extension of the static analysis, as it creates several static analyses for different points in time, and making comparisons across these points in time to

identify the overlaps. Both CBP and vector of differentiation overlaps can be found for both types of analysis.

6.1.4.2 Product-Specific Portfolio Gaps

A product-specific portfolio gap can be defined as a niche, segment, or market where market needs are similar to those of portfolio customers, but whose needs are not covered by the core benefit propositions of one or more portfolio products. Gaps in the portfolio can also occur with the portfolio vectors of differentiation. Customers may prefer a differentiation vector of a certain direction, while various competitors in the marketplace may pursue varying vectors of differentiation for their products. Thus, a vector of differentiation gap occurs when one company's VoD is different from that of what the market demands, or from another company that is more successful with its products.

Product-specific gaps can be identified for two different time frames. First, they can be identified relative to the current market. This means that the gap analysis is performed to analyze the portfolio relative to the current³ customer needs and competitive offerings in the marketplace. This is used to identify gaps between the current product portfolio and the current market to uncover short-term portfolio adjustments that can be made to capture additional market share. One example of this would be to find a market niche with unsatisfied needs that could be met by quickly developing a derivative product. Second, the gap analysis can be performed for the future product portfolio, customer needs, and competitive offerings. With this analysis, the current product portfolio is compared with the projected longer-term future market state, and gaps are identified as the difference between the current product portfolio and what the future product portfolio will need to be to maintain or improve market share.

³ "Current" is a relative term that depends upon the product life-cycles in the marketplace. Current needs for high-technology products such as computers and wireless communication devices may involve a time of 6-months, while for longer cycle-time products such as cars, current may mean 1-2 years or more.

6.1.5 Impact Of Portfolio Overlaps and Gaps

Once portfolio overlaps and gaps have been identified, their impact on the portfolio's competitiveness must be evaluated. This involves investigating identified overlaps and gaps in order to assess their impact on both short- and long-term profitability and competitiveness. Overlaps and gaps must be prioritized according to potential financial impact on the company, and alternatives must be developed in order to deal with the higher-priority overlaps and gaps.

The assessment of overlap and gap impact on the portfolio is beyond the scope of this thesis. Since this thesis focuses on the identification and overlaps and gaps, impact assessment will not be discussed in further detail.

6.2 Overlap/ Gap Identification Process for Product Specifics

So far in this thesis, the foundation has been laid for the basic concepts and reasoning behind performing a product portfolio overlap/gap analysis. The next step toward identifying overlaps and gaps is to develop some specifics of how to use the concepts outlined thus far and how they can further be applied. This section develops these specifics as a support structure for performing the analysis.

6.2.1 Levels of Overlap/Gap Analysis

A product portfolio overlap/gap analysis can be performed on several levels. These include performing the analysis for the products within a family, for multiple families within the same segment, across segments within the same market, and across markets. The following discussion takes the approach that every product in the portfolio is a member of a product family, which in turn is associated with a particular market segment. Each market segment is then a division of a specific market.

6.2.1.1 Overlaps/Gaps within Families

By definition, the products within a product family are very similar. They are usually derived from the same platform, and can have virtually any percentage of attributes in common. The higher the percentage of common attributes and features, however, the less that the products are differentiated from one another. Typically, the products within a family will have overlap in the core benefits and features that they provide, and a relatively small amount of differentiation in the same benefits and features. Thus, overlaps within a family are generally not strategically important for identification.

Gaps within a family can occur “between” the products in the family, or “outside” of the products. For example, the product portfolio for a TV manufacturer may consist of a 24-inch screen TV and a 30-inch screen TV. A gap “between” products may occur if customers desire a 27-inch TV, while a gap “outside” of the family would occur if customers wanted a 33-inch TV.

A visual example for observing gaps within the product family is given in Figure 3.1. The black dots in the figure represent customer-desired products in terms of the benefits desired. The line that encloses the products represents the boundary of the product family, and products within the boundary of the line represent products that are offered by the company. The products outside of the family boundary are desired products that are not offered by the company. Both types of gaps discussed above are represented in the figure.

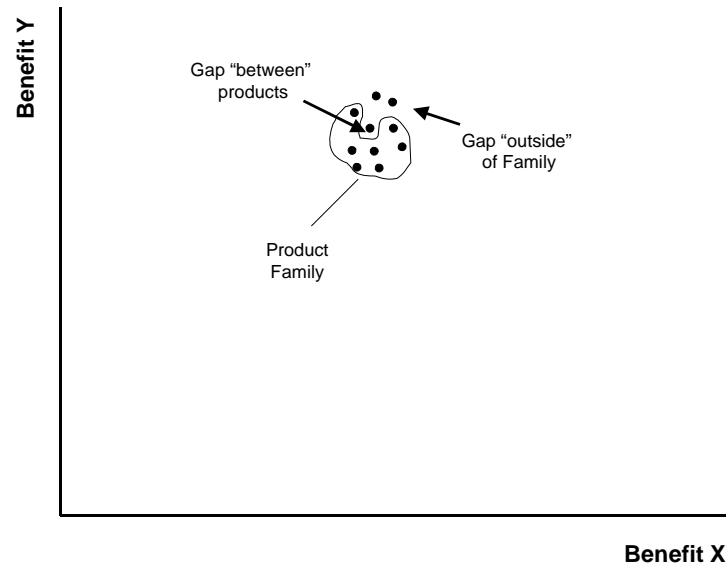


Figure 3.6.1: Overlaps/Gaps within Product Family⁴

6.2.1.2 Across Families/within Segments

Product families within the same market segment usually have some similarities, such as satisfying similar customer needs or providing similar benefits to customers. They are also different, however, in that also satisfy some extent of different customer needs, or provide a different level of benefit for the customer along the same dimensions. Thus the possibility to have overlaps and gaps between families arises.

Overlaps occur along the “edges” of families, or the benefit boundaries of the products in families. Companies will typically want to cover a full range of customer needs in a niche that a family is designed for, so the benefits offered by a family may come close to those offered by another family. A company also runs the risk of creating gaps between families, as customers may desire products with benefits that fall between the offerings provided by two or more families. Gaps “within” the family, as discussed earlier, also remain gaps, since the needs have

⁴ The products represented here are based on two benefits only. The overlaps and gaps discussed here could be analyzed on any number of dimensions. Two dimensions were chosen here for simplicity in explaining the concepts.

not been met by any of the families in the market segment. An example will help to illustrate these points.

Going back to the TV case discussed earlier, suppose a company has identified two segments within the overall television market: small-screen TV's and large-screen TV's. Further supposed that small-screen TV's have screens of 20-inches or less, while large-screen TV's are 20-inches or more. The small-screen family produces TV's of 12, 14, 16, and 18 inches, while the large-screen produces TV's of 20, 24, and 30 inches. Say the group responsible for the small-screen family decided that they could produce a 22-inch TV very cheaply and make a decent profit. If produced, an overlap across product families would result, as the small-screen group is now producing a product that is within the range of the benefits provided by the large-screen family. The gaps from within the families would still be gaps, as no solution is offered for the 27-inch or 33-inch screens. Another gap could arise if customers desire a 19-inch TV. The small-screen family produces no such TV, and neither does the large-screen family.

Figure 3.2 gives a visual example of portfolio overlaps and gaps across product families. The figure shows four product families that make up a market segment. The segment tries to satisfy all of the customers that desire the products/benefits within its boundary. The overlap occurs when the products of one family offer similar benefits as the products of another family. As the figure shows, the "edges" of the product families overlap. Gaps are also observed in the segment, which are desired products that do not fall within the boundary of either a family or a segment.

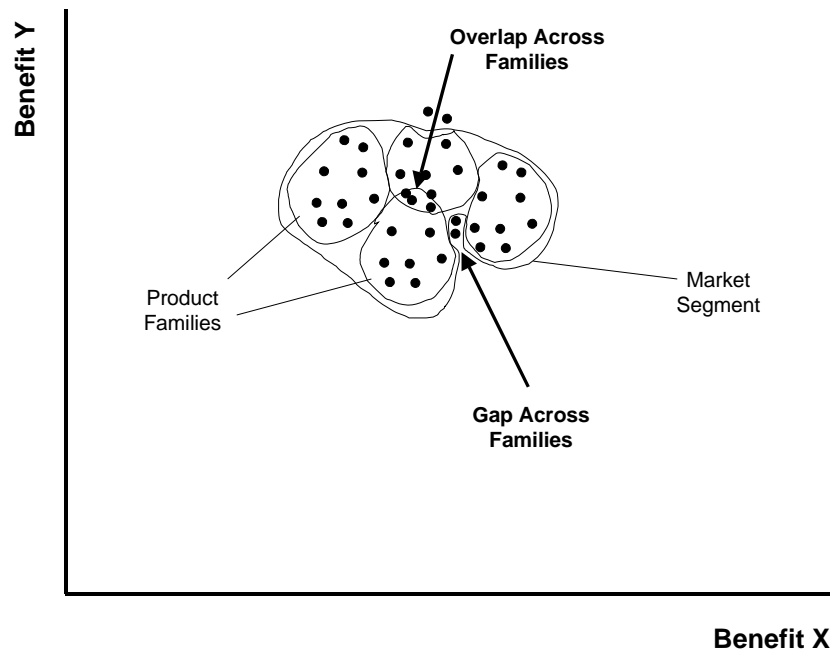


Figure 3.6.2: Overlaps/Gaps across Product Families

6.2.1.3 Across Segments

Overlaps and gaps across market segments are very similar to those across product families within a segment. Once again, overlaps will tend to occur at the boundaries where two or more market segments meet. This is to ensure full market coverage between segments so that the needs of all customers are met. Gaps can also occur between segments if the edges of the segment boundaries do not meet to cover the needs of all customers. Gaps within a product family also result in gaps across families and across market segments, since these are needs that have not been met.

An example of these types of overlaps and gaps can once again be explained using the TV example. Suppose one segment of the TV market calls for a high-quality picture, while another segment calls for a low-quality, more cost-effective picture. Thus there are two market segments, each with a large-screen and a small-screen family. There is the potential for product overlap to occur at the boundary where the lowest-quality high-quality picture TV approaches the highest-quality, low-quality picture TV. Overlap could occur if the picture quality of a low-quality TV meets or surpasses that of the lowest-end high-quality TV. Possible gaps across segments could

exist if there is a picture quality-level that lies between the lowest of the high-end and the highest of the low-end TV's. Figure 3.3 gives a visual example of how overlaps and gaps across market segments occur.

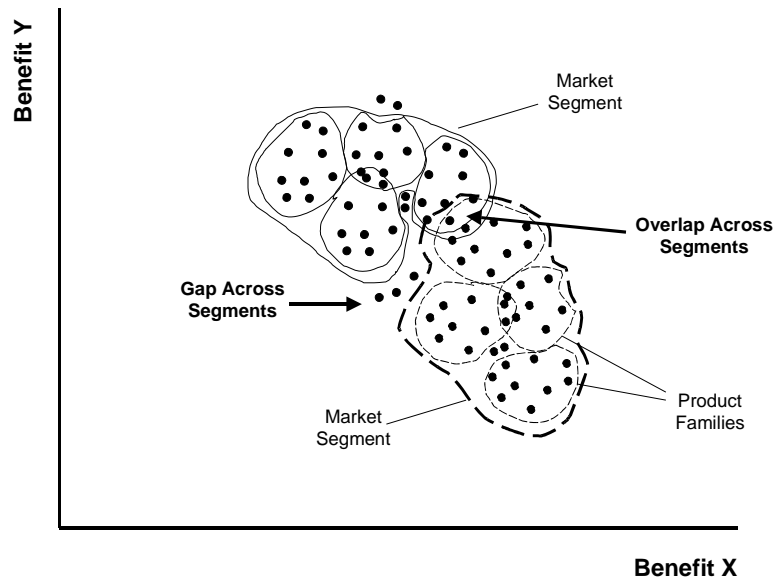


Figure 3.6.3: Overlaps/Gaps across Segments

6.2.1.4 Across Markets

The portfolio overlaps and gaps analyzed across markets is very similar to that of those discussed in sections 3.2.1.2 and 3.2.1.3. Overlaps should occur at the boundaries between markets, as companies try to gain sufficient coverage between markets. Gaps may occur as customer needs near these boundaries are not met.

An example of overlaps and gaps across markets would involve televisions and computer monitors. These products are similar in that they provide an electronic, visual picture of images and information, but are very different in the applications that they are used for. Suppose a company produces both televisions and computer monitors. The company realizes that as hardware and software becomes more advanced, consumers begin to use their monitors, through their computers, to watch various types of video. In this case, the boundary between televisions and monitors has closed. An overlap could occur if the company was to begin to produce

monitors that could display television signals, or televisions that could be used as monitors. Gaps could occur if there is a demand for such a device that could be used for displaying both computer and television, but not having such a device in the portfolio. Figure 3.4 shows a visual example of overlaps and gaps across markets.

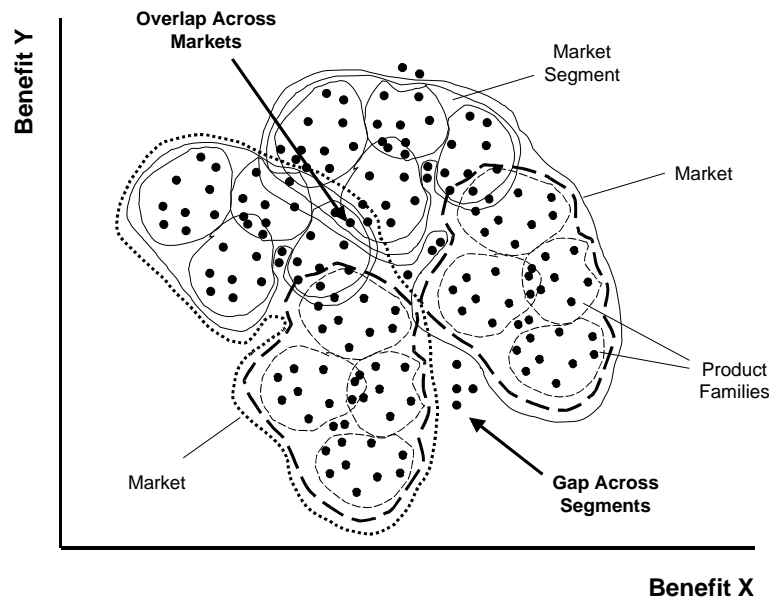


Figure 3.6.4: Overlaps/Gaps across Markets

6.2.1.5 Generalizations about Overlaps and Gaps at the Levels of Analysis

From the levels of analysis discussed above, some generalizations can be drawn about what to expect for overlaps and gaps for the various levels. Simply stated, as the analysis level moves from within a family to across markets, the relative amount of overlap should decrease, while the relative amount of gaps should increase. Figure 3.5 shows this relationship.

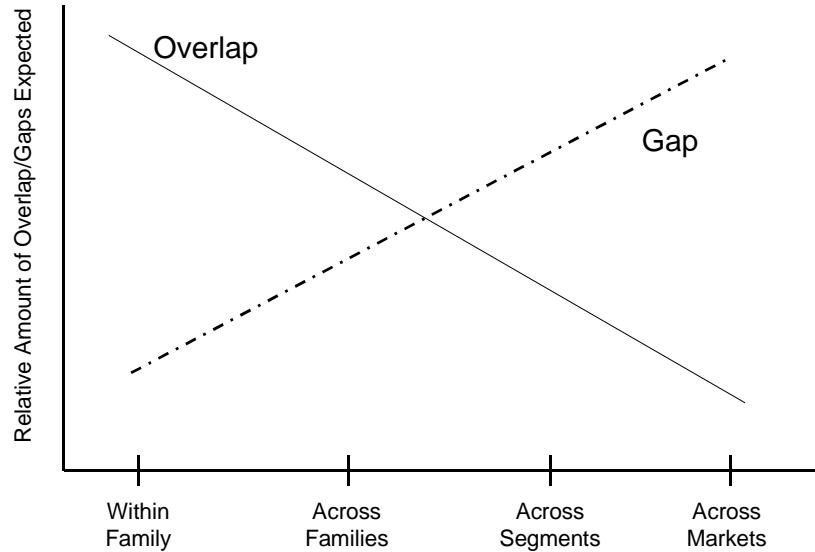


Figure 3.6.5: Amount of Overlap/Gaps Expected across Various Levels in the Product Portfolio

As mentioned, products within a family are highly similar and thus overlap a great deal. Thus the expected amount of overlap at this level is very high. Across families, where the products from one family to the next are differentiated to a larger extent from one another, the expected amount of overlap among products is significantly less. For the products across market segments, where products in one segment are substantially differentiated from those in another segment as customer needs are more dissimilar, the expected amount of overlap among products across the segments is again relatively lower than for either within families or across families. Finally, the products across markets will have the least amount of overlap, where the benefits and/or level of benefit that they provide are radically different from one market to the next.

As the expected amount of overlap decreases as the analysis is conducted from within a family to across markets, the relative amount of gaps expected should increase. Within a family, the expected amount of gaps is relatively small, as the range of benefits offered by the product family should be sufficient to cover customer needs within that market niche. Across families, there is a greater chance for portfolio gaps, as the dissimilarities in products grow, so does the potential to miss customer needs along the transitional areas between families. Across market segments, once again the potential for a relatively larger amount of gaps grows. Customer needs

vary greatly across these segments, resulting in products that are even more relatively differentiated compared with products within and across families. There can be wide dissimilarities between the needs of these segments, which can result in a transitional area between provided benefits that can be overlooked. Finally, the amount of expected gaps across markets is greater than the other three levels, as customer needs vary even more across markets that can be very different in terms of desired benefits from products.

6.2.2 Tracing the Core Benefit Proposition

There are two types of analyses with regards to the Core Benefit Proposition: verification and tracing. Verification of the CBP is a process by which the CBP defined for a product is analyzed and tested for its correctness with respect to customer needs. Tracing the CBP is a process where the product is analyzed for its consistency in meeting the CBP that was defined. These two analyses are closely related, as verification of the CBP is often achieved through the correct trace of specifications, features, and attributes from the product to the CBP. This section will discuss both types of analysis.

6.2.2.1 CBP Verification

Verifying the benefit propositions for products is an important part of ensuring the commercial success⁵. Verification of the CBP is often performed not only once a product is completed, but at each step of the product development process. This helps to guide the development effort down the path toward sufficiently meeting customer needs, and helps to ensure that the product provides the benefits as defined in the CBP. A graphical depiction of the overall CBP verification process is given in Figure 3.6. The process begins with the front-end of product development. Customer research is conducted to determine which benefits are most important and what needs should be satisfied. This research is then combined with competitive and market analyses to define the core benefit proposition for the product. Once the CBP has been defined,

⁵ Information regarding the verification of the benefit propositions taken from conversations with Mr. Bill Kane at the Xerox Company

product development teams work to define the important product attributes, features, and specifications that will allow the product to embody the defined CBP. As the development process progresses, the CBP and the product design are verified with customers as to how well they will meet customer needs. Once the product is completed and launched, the CBP is further verified in the market.

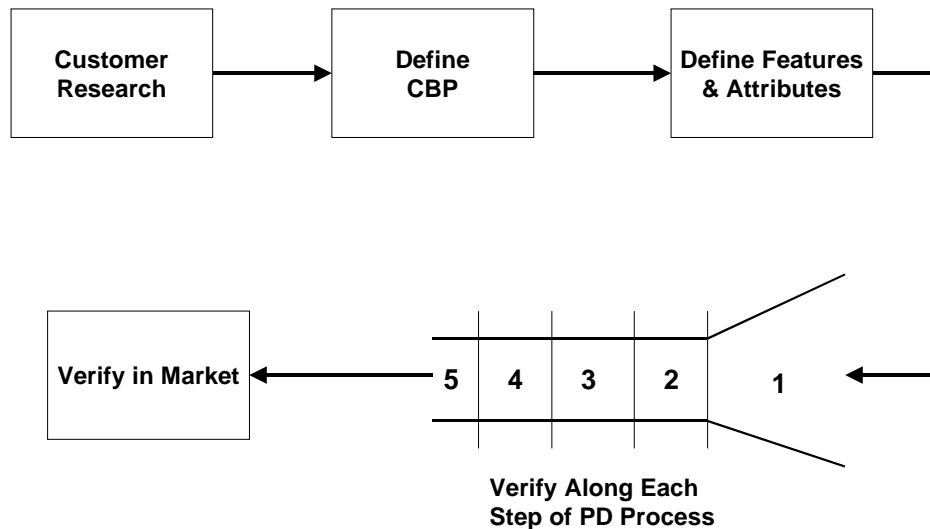


Figure 3.6.6: Flow of Customer Needs to Embodiment and Verification in Market

Market verification of the benefit proposition can be measured in two ways: through satisfaction and loyalty surveys, and through monetary return. Satisfaction measures how well a product meets the expectations of customers, while loyalty measures whether or not customers will continue to purchase the product. Ultimately, though, the CBP for a product is verified by the profit that it makes in the marketplace, or its monetary return.⁶

6.2.2.2 CBP Tracing

Tracing the benefit propositions in products is important for two reasons: 1) it allows a company to determine if the defined CBP for a product has indeed been designed into the product, and 2) it allows the company to make comparisons of products across both the company's portfolio and the market portfolio. Thus tracing the CBP in products is essential to identifying overlaps and gaps within the product portfolio.

⁶ Taken from discussions with Mr. Bill Kane from the Xerox Company

The process for tracing the CBP in the product is very similar to verifying the same CBP. Tracing of the CBP first begins when the CBP is decomposed into the benefits, attributes, and specifications that will define the product. Thus, early on in the development process, the CBP is determined to guide the design of the product. However, as the development process progresses, various design tradeoffs often must be made for the product that can alter how well/to what extent the product is able to embody the CBP. Thus, the CBP for the product must be traced at every phase of the development process in order to ensure that tradeoffs are made in a manner such that the product will meet the goals set forth in the product plan.

6.2.2.3 Tools for Tracing the CBP

Urban and Hauser, as discussed in Section 2.3.3, defined the CBP as having two parts: the benefits required to meet/surpass those offered by competitive products, and the differentiating features unique to the product for meeting customer needs. The authors then go on to identify three types of customer needs: basic needs, articulated needs, and exciting (unarticulated) needs. Basic needs are those needs that customers expect a product to satisfy. Articulated needs are needs that customers can identify and explain easily, and are usually met by one or more current solutions in the marketplace. Exciting needs are those that will delight and surprise a customer if they are met. They are not usually easily identified by customers, and often are not met by current product offerings. Over time, a need will often pass through these 3 types. A need may begin as an exciting need, then once met, become an articulated need, and then finally become a basic need as all products incorporate a solution for the benefit [Urban & Hauser, 1993]. An example of this would be a built-in cup holder for a car. When first introduced, the cup holder was an exciting need that delighted its customers. As more people heard about this cup holder, it became an articulated need as more people identified that this was something that they desired. On certain cars today, a cup holder is a basic need, as many customers expect the need for a cup holder to be satisfied.

With the discussion from the previous paragraph, we can describe the CBP with the following relationship:

$$CBP_{\text{Product}} = \text{Minimum Level of Benefits} + \text{Differentiating Benefit Level} \quad (3.1)$$

Like the basic needs that customers expect from a product, so too may they expect a certain level of benefits. Thus, every product sold must provide some sort of minimum benefit level to the customer. Differentiating benefits are similar to the articulated and unarticulated needs. While customers expect at least some minimum level of benefits from a product, they often expect more (differentiating benefits) to satisfy their particular needs. Thus, the combination of various levels of benefit past the minimum benefit level provides a differentiation among products. This can be a prime competitive characteristic in the marketplace for products: the level of differentiating benefits provided.

Relation 3.1 can best be described graphically, as shown in Figures 3.7, 3.8 and 3.9. These figures show where a product can fall in a market relative to other products. For each set of benefits shown, there is some minimum level of benefit that customers expect from a product. Assuming that a higher level of each benefit is preferred over a lower level of the same benefit for the same price, a minimum benefit combination frontier can be constructed that defines the minimum set of benefits that customers will buy to satisfy their particular needs. There will also be a maximum benefit combination frontier, which signifies the maximum level of benefit combination currently offered for the market niche or segment. These “frontiers” can be viewed as iso-benefit curves as in Figure 3.8, along which all products provide the same benefit-level to customers, or as inequality curves, along which is the minimum combination of benefits expected by customers..

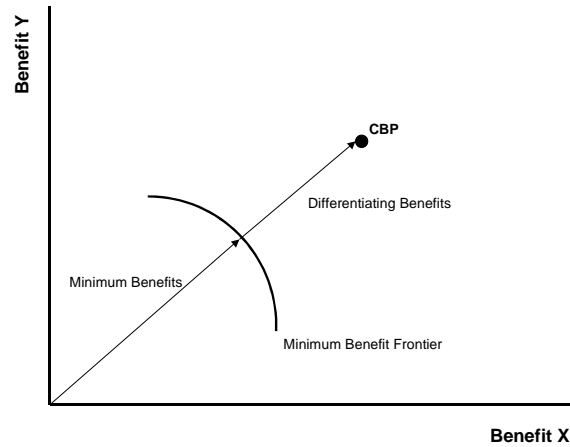


Figure 3.6.7: CBP Relationship

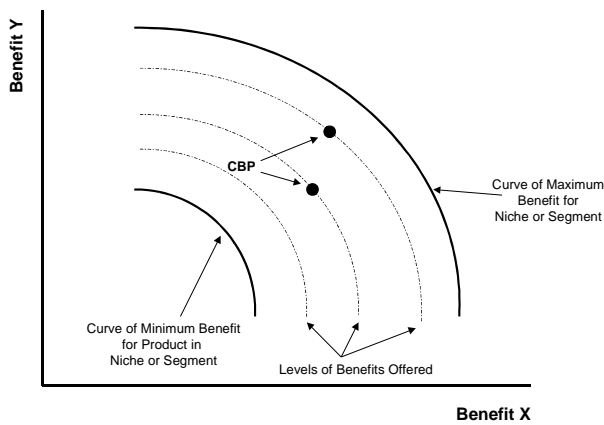


Figure 3.6.8: Benefits for Products in Niche or Segment, Equality in Benefit Levels Desired

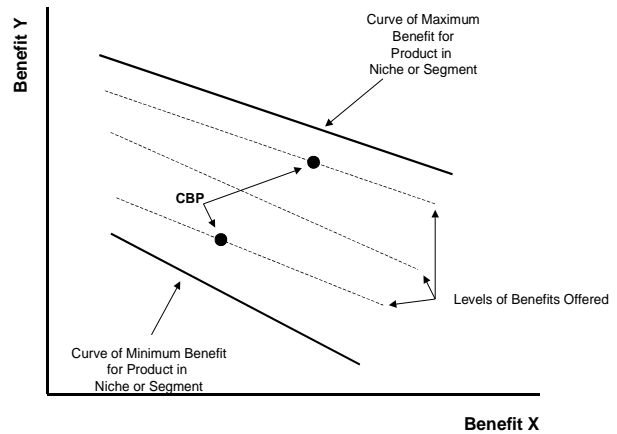


Figure 3.6.9: Benefits for Products in Niche or Segment, Inequality in Benefit Levels Desired

Given that there is a minimum and maximum benefit combination frontier, all other products within the specific market or segment under consideration must fall somewhere within these two frontiers. Wherever these products fall between these two frontiers represents their differentiation in the features and benefits offered to customers. Products can be differentiated in both the relative levels of each benefit offered and the combination of the levels of benefits offered to customers.

Over time, the minimum and maximum benefit frontiers move outward on the graph toward higher levels of benefits offered. This is often due to better technologies, cheaper methods of production, better product designs, and the generally increasing demands of customers that desire more and higher levels of benefits for their money. These frontiers do not necessarily move at equal rates; the maximum benefit frontier may expand much more rapidly than the minimum frontier, and vice versa. The average level of benefit for the market/segment may be expanding at still a different rate. Thus, the products in the portfolio must improve in the benefits offered at a rate equal to or faster than the difference between the expansion rates of the minimum/maximum benefit frontiers, or the average benefit frontier, in order to remain competitive in the marketplace.

The frontiers are not limited to two dimensions; they can be constructed across as many dimensions as desired to achieve the correct frontier “surface.” By limiting the benefits compared to two or three, however, allows for a meaningful observation with graphical displays of the relationships.

6.2.3 Verifying the Vector of Differentiation

Verifying the vector of differentiation is an important process for the product development company. As mentioned, products in the portfolio are differentiated in some manner, as defined in the CBP, from each other as well as from others in the marketplace. Instead of differentiating multiple individual products in multiple different ways, companies often desire to differentiate a set of products in a consistent manner so as to develop and constantly improve a competitive advantage for the individual products as well as for the entire portfolio. The vector of differentiation provides some direction in the form of a “theme” along which these multiple products will be continually differentiated.

Verifying the vector of differentiation is the process whereby the differentiation of multiple products is analyzed to ensure that the “theme” of the differentiation is consistent across the product set. VoD verification can be performed for any level of product set, including the

product family, multiple families, market segment, market, or even across the entire company. The vectors can be defined for any of these levels.

6.2.3.1 The VoD and Differentiating Strategies

McGrath [1995] defines the vector of differentiation in terms of the relative differentiation of a product and its relative price in the marketplace. Differentiation cannot be described absolutely for an individual product; it can only be judged in relation to other products. Thus only a relative value for differentiation can be determined. Figure 3.10 shows the relationship between the relative differentiation, relative price, and a differentiation strategy.

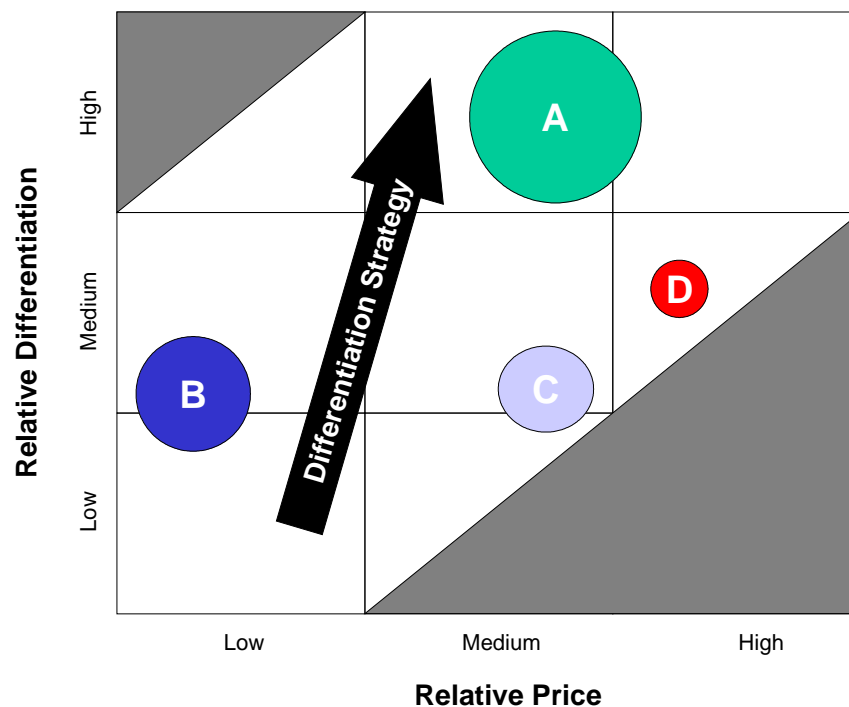


Figure 3.6.10: Relative Differentiation [McGrath, 1995, p. 80]

The figure above shows a number of products in a market segment (circle size denotes relative market share). The strategy for the vector of differentiation is to move products up and to the right on the graph [McGrath, 1995]. This essentially says that as the relative differentiation for a product is increased, the relative price that can be charged increases as well. In order to move in this direction, however, a product must be improved at a faster rate than competitive products in order to maintain a relative advantage in differentiation.

McGrath [1995] has identified some generic strategies for differentiating products in the marketplace. Any one or several of these can be used to define the vector of differentiation.

These strategies include differentiating with:

- unique features
- increased customer benefits
- improved productivity
- protection for the customer's investment
- lower costs of product failure
- higher performance
- unique fundamental capabilities
- better design
- total solutions
- lower cost of ownership
- brand name or service

Although these strategies appear to be somewhat distinct, they all have one common theme: all are strategies that differentiate based on the benefits provided to customers. Thus, the vector of differentiation generally describes how products will be differentiated from one another and the market in terms of the benefits that these products provide. This insight has an important impact in that it provides the foundation for a comparison among products based on provided benefits.

6.2.3.2 Measuring Degree of Differentiation

Two key concepts were introduced in the section 3.2.3.1. First, that differentiation for a product is measured relative to other products, and second that product differentiation can be measured in terms of the benefits provided. These two points, along with the discussion around the core benefit proposition, are the keys to being able to measure the differentiation among products.

As discussed for the CBP, there exists a minimum benefit frontier for products that defines the minimum benefits that customers expect from a product. There also exists a maximum benefit frontier that is defined by the product(s) in the marketplace with the highest levels of benefit for the niche or segment. If we define the minimum benefit frontier as the reference line (as 0% differentiation), and define the maximum benefit frontier as 100% differentiation from the reference, the CBP's of the products that fall between these two frontiers can all be described by a differentiation percentage between these two references. Figure 3.11 demonstrates the measurement of the degree of differentiation among products graphically.

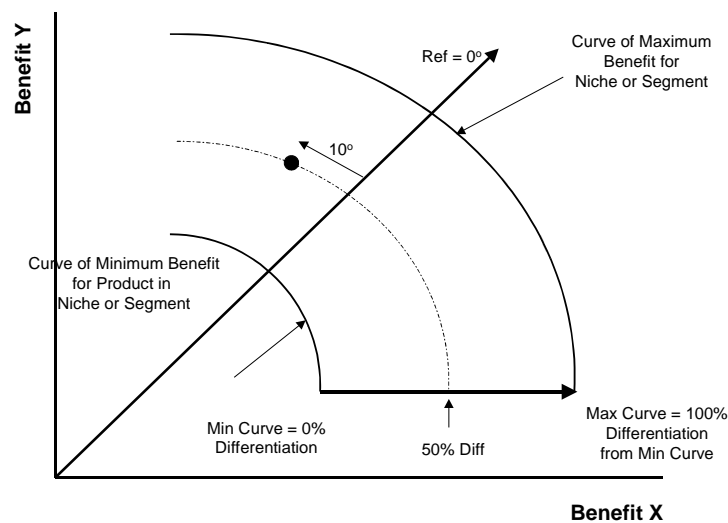


Figure 3.6.11: Measurement of Degree of Differentiation

The degree of differentiation between products can also be measured along each “differentiating curve.” By striking a reference line extending from the origin outward, the angle between the reference line and a product can be found. Thus, a measure of differentiation between products at the same benefit level can be described, and comparisons among products with the same level of benefit can be made.

An average measure of differentiation can also be derived using the same type of analysis. By observing the levels of benefits offered by the products in the niche of a segment, a profile of the “average” benefits offered to the market by products can be described. Similar measures of

differentiation can then be defined between the maximum benefit frontier and the average, or the minimum benefit frontier and the average, to supply a more informative picture of where a product's CBP is positioned in relation to the market.

Over time, as both the minimum and maximum benefit frontiers move outward on the graph, any individual product will become less and less differentiated in the marketplace. Thus it becomes imperative for companies to be continually introducing new products to the market to remain relatively differentiated in the market.

6.2.3.3 *Defining the Vector*

Given that a product's CBP can be described by its differentiation from other products, a vector of differentiation can be defined by expanding the concepts introduced thus far. The relation describing the CBP for a product indicated that the position of the CBP was defined by the minimum level of benefits demanded by the market, plus the differentiating benefits that comprise the product. Given this relation, the following relation can also be made:

$$CBP_{\text{Family}} = (\text{Minimum Level of Benefits})_{\text{Family}} + \text{Average Diff. Benefits}_{\text{Products}} \quad (3.2)$$

This relation says that the benefit proposition for a family is defined by be the minimum level of benefits demanded by customers, plus the average of the differentiating benefits of the products within the family. The average differentiating benefits can be defined as the sum of the differentiating benefits of each product in the family divided by the number of products.

A relation can also be defined for the market segment:

$$CBP_{\text{Segment}} = (\text{Minimum Level of Benefits})_{\text{Segment}} + \text{Average Diff. Benefits}_{\text{Families}} \quad (3.3)$$

This relation says that the benefit proposition for the products throughout the entire segment are defined by the minimum level of benefits demanded by customers, plus the sum of the differentiating benefits for those products.

A vector can be described by two variables: magnitude and direction. The direction of the vector is what can determine the success of the products in the portfolio. It defines the trajectory along which products will be defined in terms of their benefits. Multiple competitive products can be differentiated along different vectors in the marketplace; however, the vector that customers desire the most usually wins. The direction of the vector of differentiation can be defined as follows:

$$\text{Direction}_{\text{VoD}} = \angle(\text{Horizontal and Best Fit Line through CBP's}) \quad (3.4)$$

This relation says that the direction for the vector of differentiation is defined by the angle between the horizontal axis and the best-fit line through the product CBP's. Thus, a best-fit line is struck through the CBP's in question on the graph, and the angle that this line makes with a line parallel to the horizontal axis define the Vector's direction

Magnitude, which is the length of the vector, can be defined in the following manner:

$$\text{Magnitude}_{\text{VoD}} = \text{dist}(\text{CBP}_{\text{max diff}}, \text{CBP}_{\text{min diff}} : \text{along vector angle}) \quad (3.5)$$

The equation says that the magnitude is simply the distance from the product with minimum differentiation to the product with maximum differentiation, but along the direction of the vector of differentiation. In essence, the magnitude of the vector is defined by the levels of benefit that it passes through. Thus, the magnitude can be defined as the difference between the maximum level of benefit and the minimum level of benefit provided by products in the family or segment.

A more intuitive way for defining the vector magnitude may be in terms of products or families. For example, a vector may be defined as “30 degrees for 6 products”, or “10 degrees for 3 families.” A measure of time may also be involved to add even more clarity and meaning. For example, the VoD could be “20 degrees for 4 families for 2 generations.” The type of analysis performed will dictate the metrics used to define the VoD magnitude, and are thus to be determined by those performing the analysis.

The magnitude for a vector, which defines the extent to which a specific vector has been followed for products, will vary depending on how long a company chooses to follow the vector. This often depends upon how successful the products following the vector are in the marketplace.

Figure 3.12 shows the relationship between the vector of differentiation and its magnitude and direction. The figure shows that the magnitude of the vector is the distance between the maximum and minimum CBP's, while the vector direction is the angle between the best-fit line and the horizontal. This information regarding the vector magnitudes, and more importantly the vector directions, will be invaluable in determining the consistency of the portfolio vectors of differentiation.

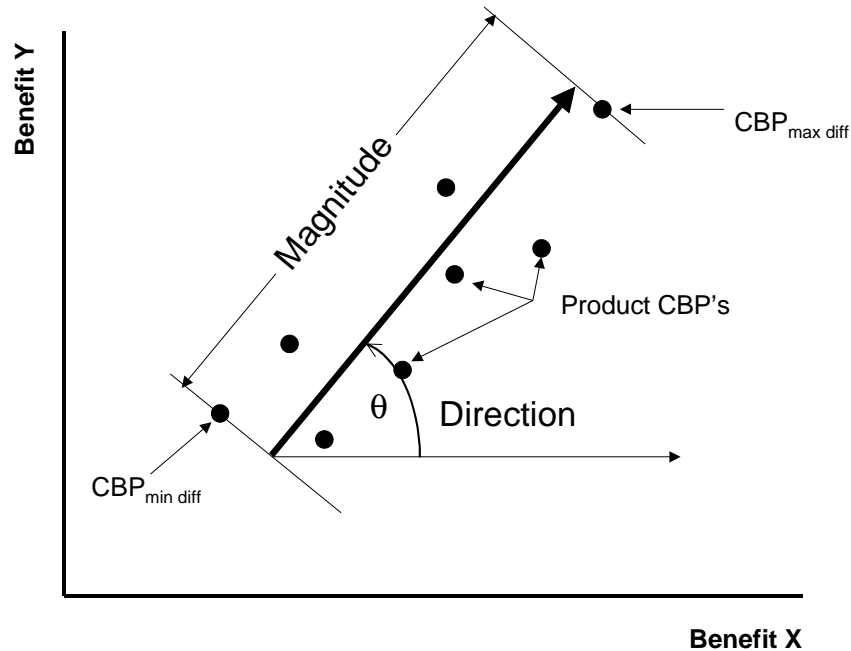


Figure 3.6.12: Vector of Differentiation Defined by Benefits

6.2.4 Integration

In order to fully identify and describe product portfolio overlaps and gaps, the tools and concepts developed in Section 3.2 must be integrated together to form an approach for overlap/gap identification. The keys to this approach involve being able to measure product Core Benefit Propositions in some manner, and then subsequently deriving the appropriate vectors of differentiation from these CBP's. Such an approach will allow for the tracing of product Core Benefit Propositions, a verification of the consistency of the portfolio Vectors of Differentiation, and ultimately the identification of portfolio overlaps and gaps. The next section describes this approach in detail.

6.3 Product Portfolio Overlap/Gap Identification Approach

The basic approach for identifying the product portfolio overlaps and gaps builds upon the earlier discussions presented in this thesis. This approach consists of the following steps:

1. Defining the product portfolio
2. Understanding key benefits for customers in markets
3. Defining attributes and product specs that meet the benefits
4. Choosing a datum product
5. Determining Core Benefit Levels for Products
6. Mapping core benefits
7. Derive the vector of differentiation for segments/families
8. Identifying Overlaps and Gaps

By following and completing this process, three outcomes will be achieved: a determination of the traceability of product CBP's, a measure of the consistency of the vectors of differentiation, and the identification and assessment of product portfolio overlaps and gaps. Chapter 4 provides an example application of the process described here.

6.3.1 Define the Product Portfolio

The first step toward identifying product portfolio overlaps and gaps is to define exactly what the product portfolio consists of. There are two key portfolios that must be considered: the company portfolio and the market portfolio.

The company portfolio consists of all the related products that the company sells and produces, or plans to sell and produce. "Related" means that the products have something in common with respect to the market needs that they satisfy, the benefits they provide, or the tasks that they perform. How the boundaries are set for the market and portfolio at the discretion of the company performing the analysis, as many companies define their portfolios differently. The competitive market portfolio can then be defined similarly, as all of the products in the

marketplace that compete directly (or indirectly) with the products that the company offers in terms of needs targeted, benefits provided, or tasks performed.

Defining the product portfolio for the company performing the analysis should be a relatively easy task, simply because a company knows its own products well. However, a more difficult task involves defining the product portfolio of competitor companies. The following discussion for defining the product portfolio can be used for the company, but may be more appropriate for analyzing competitors.

The first step in defining the product portfolio is to define the markets that will be considered. This serves to set the boundaries for the portfolio and establishes the set of products included within the portfolio. The market is then further broken down into segments, with the products being grouped within these segments accordingly. There are many methods that can be used for segmenting a market ([Berrigan & Finkbeiner, 1992), [Datta, 1996]), but these will not be covered in this thesis. Both markets and segments are usually well defined throughout the industry, as they are the focus for competition in the marketplace.

The final step in defining the product portfolio is to group the products in each segment into product families. This can be difficult, as developing a working knowledge of the families (products that share a common platform) for the various products of competitors is a difficult task to undertake. By taking a market/customer view of products, however, families can be suitably determined. Within each market segment, customer needs can be grouped into niches, where similar products satisfy similar needs. Products within the portfolio can then be matched with these needs and assigned to product families. Products grouped in this manner may not result in product families that share the same platform, but they will be grouped according to what customers want, which provides a basis for which to compare products across companies.

6.3.2 Key Benefits for Customers

Once the company and market portfolios have been defined, the next step toward identifying portfolio overlaps and gaps is to define the key benefits for each segment and niche/family that customers expect from a product. Products compete in the marketplace based on how well they provide the benefits that customers desire. Thus, the purpose of this step is to understand the drivers that form the basis of competition in the marketplace.

The benefits to be defined are very broad qualitative criteria against which customers judge products. They are not specific needs; rather, they are large categories into which basic, articulated, and unarticulated needs can be grouped. Benefit categories may include descriptions such as “performance,” “reliability,” or “easy-to-use.” These criteria are how customers perceive products, and are used when customers develop their product preferences.

The first task is to define what these benefits are for the families for the company’s own product portfolio. Each product within the family should provide these benefits in some manner, but will satisfy them to different degrees. This information should be relatively easy to aggregate for the company performing the analysis, as most companies have this information from the marketing research performed for product development.

The next task is to then combine the sets of family benefits to define more generic market segment benefits. This should provide a cross-section of the benefits that the segmented groups of customers expect from their products, and will allow for the comparison of products across multiple families. The final task is to then combine the segment benefits into a set of market benefits that span all of the segments. This will provide the basis for a comparison of products across segments.

These categories can further be broken down into more specific product attributes, and finally transformed into product specifications. This process is discussed in the next approach step.

6.3.3 Define Attributes and Product Specifications to Meet Benefits

Once the key benefits for the customer segments and niches have been determined, the next task is to decompose these benefits into attributes and specifications to understand how these benefits are met. Again, this information should be relatively simple for a company to aggregate, as this kind of information is produced during the development of products.

Attributes are basic product characteristics that generally describe how a benefit is achieved and what the product does. When customers develop their perceptions of products, they are based on the benefits received from the product attributes. As an example, for a computer some attributes would be speed, graphics capability, and storage capability. A benefit from the combination of these attributes could be “performance.”

Specifications are “the precise description of what the product has to do” [Ulrich & Eppinger, 1995]. They define actual targets for the product toward which it is designed. Each specification consists of a metric and a value for the metric. The values may consist of a specific number, a range, or an inequality. As an example, a metric could be “maximum pressure” and the value could be “32 psi.” Specifications are grouped together to define the levels of attributes provided by the product.

The relationship between the CBP, benefits, attributes, and specifications is shown in Figure 3.13. The CBP results from the combination of the benefits that the product offers to customers. This can be broken down into the specific benefits that customers use to form their perceptions of products. Benefits can be decomposed into attributes, which together give a certain level of benefit to the customer. Attributes can be decomposed into product specifications, which give specific targets that the design of the product should meet.

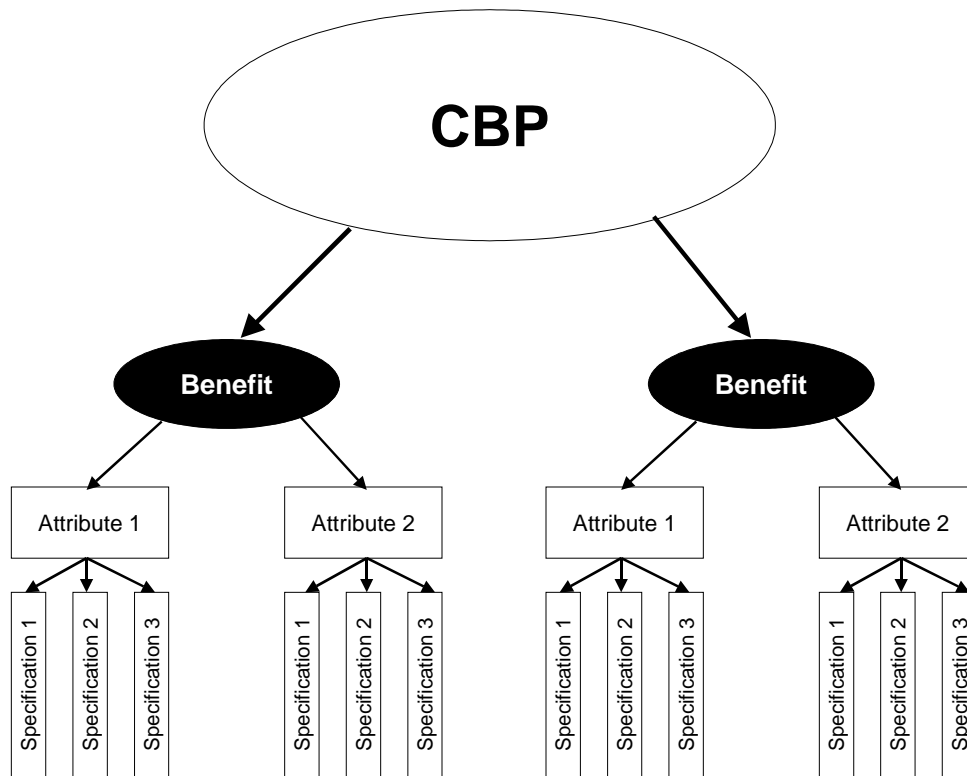


Figure 3.6.13: Relationship between CBP, Benefits, Attributes, and Specifications

The above relationship can be demonstrated by an example. For this we will use an automobile. Some of the benefits offered by a car include driving performance, safety, quality, and comfort. The driving performance can be broken down into several attributes: acceleration, speed, handling, and fuel mileage. Each of these can then be broken down into specifications that form targets for the car to meet. For acceleration, specifications may be horsepower (300 hp), car weight (2300 lbs.), and drag coefficient (.7).

Product specifications and attributes have varying levels of importance depending upon the preferences of the customer groups involved. While one customer group may place a higher importance on attribute A than B, another customer group may place more importance on attribute B than A. Thus, the analyses involved must be tailored to specific customers and the attributes that they value in order to achieve meaningful results from the analysis.

6.3.4 Choose Datum Product

The next step in the product portfolio overlap and gap identification process is to choose a reference product as the datum. This will allow for a comparison of products to one another both across the product portfolio and against competitor products by making the comparison in terms of another product.

In his discussion of the Pugh Concept Selection Process, Clausing [Clausing, 1993] suggests that the datum concept chosen, when selecting among new product development concept alternatives, be one of the better concepts in order to produce more insight into the concept comparison. This same line of thought can be applied for this process. The datum product chosen should be one of the “better” products, meaning that it should offer a high level of benefits, attributes, and product features relative to other products in the portfolio. This will allow for a meaningful comparison for products that provide lower levels of benefit, as well as those with higher levels. This reference product may be either a competitive offering or within the company’s own portfolio.

6.3.5 Determine Core Benefit Levels for Products

Once the datum has been set, the core benefit propositions for the products in both the company and market product portfolios can be defined. This process should be performed so that a benefit score is obtained for each product under consideration, for each key benefit identified. Defining these core benefit propositions is a six-task process:

1. Get weights for specifications to define attributes
2. Get customer weights for importance for attributes to benefits
3. Set reference score for datum specs
4. Rank specs according to relationship to datum
5. Combine to get scores for attributes
6. Get scores for benefits for products

The first task is to define the relationship between the product specifications and their related attributes. This involves determining how much of an impact each specification has on determining the level of the attribute. One way to do this is to assign a percentage to each specification for an attribute, with the percentages for all of the specifications summing to 100%. The percentage for each specification would determine the impact of each specification on the level of attribute provided. These percentages can be determined in one of two ways. Engineering can develop the relationships through scientific/physical/simulated models, or they can be developed through customer perceptions of these relationships.

The next task is to determine the relationships between attributes and their respective benefits. Once again this involves assigning percentages, this time to each attribute to signify the attributes' individual importances in determining the level of benefit received from a product. For this task, however, the percentages should be assigned to the importances that *only* customers put on the attributes when deciding the levels of benefits they believe that they will receive from a product.

The third task is to set a reference score for the specifications of the datum. The value chosen will be used for all of the specifications of the datum, and allows for a normalization of the specification values. An example of this would be for the automobile example discussed previously. If the datum specification for engine power were 200 hp, this value would be normalized to equal 100.

The fourth task is to normalize all of the specifications of each product in relation to the datum. This will allow for a non-dimensional comparison of products to one another in terms of the comparative relation to the datum product. Continuing with the car example, if a product in question has 150 hp, the normalized score for this product would be $(150 \text{ hp}/200 \text{ hp}) * 100 = 75$. A product with 250 hp would have a score of $(250/200)*100 = 125$.

The fifth task is to determine the levels of each attribute for each product. This can be accomplished by multiplying each normalized specification score by its impact percentage to get a “spec impact score”, and then summing the spec impact scores to get an “attribute score.” The final task in this process is to determine the “benefit scores” by multiplying the attribute scores by their impact percentages to get “attribute impact scores”. These attribute impact scores are then summed to arrive at the respective benefit scores.

6.3.6 Map Core Benefits

Once the benefit scores for each product have been identified, these scores can then be mapped to determine the core benefit propositions of each product. According to Wheelwright and Clark, the objective for mapping is to “capture the driving forces of the business and the functions, and portray their implications for competition graphically” [Wheelwright & Clark, 1992]. The purpose of mapping here is to be able to understand the benefit propositions of products and their relationships in the marketplace.

Mapping is useful in that portrays the core benefit propositions graphically, allowing a company to see the relationships between products visually. This can usually be achieved with two- or three-dimensional charts, where each axis represents a benefit. These methods are excellent when the number of core benefits considered number two or three, but may pose problems when considering more benefits. In this case, several two- or three-dimensional maps may have to be created in order to show the relationship among product core benefits.

Once the core benefits have been mapped, the product families and segments should be identified on the benefit map. This is achieved by marking the boundaries of each family and segment. This can be performed for both the company and competitors’ portfolio, as necessary.

6.3.7 Derive Vectors of Differentiation for Families/Segments/Markets

Once the core benefit propositions for the products have been mapped, the next step is to derive the appropriate vectors of differentiation for the families and segments in question. This involves defining both the vector direction and magnitude for the appropriate product groups.

6.3.7.1 Product Family Vectors

The direction of the vector of differentiation for a family of products can be defined simply as the angle between the best-fit line (linear regression) for the family products and the horizontal axis. This should provide a direction along which the differentiation of the products has progressed. The magnitude can then be determined using appropriate metrics as discussed earlier in Section 3.2.3.3.

6.3.7.2 Cross-Family Vectors

Once product family vectors have been defined, “cross-family” vectors can then be derived. These vectors show relationships between families of products within a segment that have strong relationships with one another. An example of this would be a low-end family of kitchen blenders with a higher-end family of kitchen blenders. Both are in the home kitchen segment, but may be based on different platforms and provide different levels of performance and blending ability. Thus a differentiation vector would be useful to show how this group of families are differentiated from one another.

6.3.7.3 Product Segment Vectors

The final step is to observe the vectors for each entire segment. In order to define the direction in this case, a best-fit (least squares regression) line is fit for all of the products in the segment. The angle that this line makes with the horizontal axis is then used to determine the vector direction.

The magnitude of the segment vector can be determined in a similar fashion as that for the individual families. It can be defined based on the differences between the minimum benefit frontier and maximum benefit frontier, the number of families, or the number of products on the segment. The appropriate metrics can be determined as necessary.

6.3.8 Identify Overlaps and Gaps

As discussed earlier, the identification of overlaps involves a comparison of products and vectors across one company's product portfolio, while the identification of gaps involves comparing a company's product portfolio against the market portfolio. Both of these processes are explained in detail here.

6.3.8.1 Overlaps

The overlap identification process consists of two key parts: CBP comparisons and VoD comparisons. The CBP comparison analyzes the product CBP's in relation to one another, while the VoD analysis compares the vectors of differentiation derived from these CBP's.

6.3.8.1.1 CBP comparisons

In section 3.1.4.1, a product-specific overlap was defined as the set of products that offer similar benefit propositions to customers. More specifically, what this means is that the levels of benefit offered by a product CBP are in close proximity to those of one or more other products on the core benefits map. A defined benefit range for "close proximity" can vary for different products, families, companies, or industries. Its exact meaning is best left to be defined on a case-by-case basis and interpreted by the company performing the analysis.

Overlaps can exist on several possible levels of analysis. Thus, a comparison of CBP's should be made and scrutinized within families, across families, and across market segments in order to uncover any similarities in benefit propositions offered by products. These comparisons are best made by examining the mappings of the CBP's. This serves as an important first-pass analysis to identify product CBP's that may overlap in some way.

Once potential overlaps are identified, a more in-depth analysis can take place. The second-pass analysis involves examining the specifications of the products in question to understand to what extent they are similar or different. They may also be compared on price in order to see how they compare on "value" for the customer. The outcome of this second-pass analysis should be a

recommendation on whether a further analysis is necessary to assess financial impact and develop strategies for dealing with the overlap.

6.3.8.1.2 Vector of Differentiation Comparison

A vector of differentiation comparison is made to observe the consistencies with which the products within the portfolio are differentiated from one another in the core benefits that they offer, and to verify the vector with what was planned. This can be made at three levels: a comparison of family vectors of differentiation, a comparison across related families, and a comparison of segment vectors of differentiation. A consistent set of vectors is defined as the repeated vector direction along which products are differentiated for multiple groups of products. An example of this would be for several sets of product families. Each family is differentiated along a vector, and consistency in these differentiation vectors would mean they the vectors all have similar directions.

Verification of the vectors of differentiation can be achieved by comparing the measured vector directions and magnitudes with those planned during the front-end of the product development process. The result of this comparison will determine whether or not the planned vector direction, and to what extent, has been embodied in the set of products delivered.

6.3.8.2 Gaps

Similar to the overlap analysis, a gap analysis makes comparisons among CBP's as well as vectors of differentiation. As mentioned, however, these comparisons are made of the product CBP's across companies and the market. The process is similar to that of identifying overlaps, but with some subtle differences.

6.3.8.2.1 CBP Comparison

Gaps in the product portfolio are defined here as areas on the product benefit map where there is a market need for a certain level of CBP that a company does not offer. This need can be identified in one of two ways. For the current market portfolio, a gap can be defined as an area

where one or more competitors have a product CBP offering, while the company in question does not. For the future market portfolio, a gap may be defined as an area on the product benefit map where a product CBP is desired by customers but is not yet offered by the company.

Both of these types of gaps can be identified visually by observing the product benefit maps. A comparison between the location of the company's product CBP's with those of competitors and market needs will result in the identification of potential portfolio gaps. Once these first-pass gaps have been identified, a second-pass analysis can be made that examines these gaps more closely. This analysis compares the competitor products in the "gap" with the products in the portfolio in order to understand the differences among them, such as specifications, technologies, price, etc. The result of this second-pass is to determine whether a plan of action should be made to either close the gap or contain its potential impact on the company's portfolio.

6.3.8.2.2 VoD Comparison

A vector of differentiation comparison for the gap analysis involves comparing the company's market segment vectors with those of competitors in order to observe the differences. Gaps may be defined here as the differences in the vector directions among the companies competing in the segment. Companies will usually choose to differentiate their products in manners contrary to those of competitors in order to add some distinctiveness to their products in the eyes of customers. Thus it is valuable competitively to understand the vector directions of competitive products in order to gain competitive advantages in the marketplace with a superior vector of differentiation.

The vector of differentiation comparisons should be primarily made for the market segments. Companies will usually define their product families in different manners, thus rendering possible family differentiation vectors meaningless. A comparison of segment vectors, however, is meaningful in that it shows the relative directions along which companies differentiate their products from one another. Once the differences are identified, a further analysis of these vectors

can be performed to understand the impact of the various companies' strategies in the marketplace and how they can be countered competitively.

7 CASE STUDY: THE XEROX COMPANY

In order to demonstrate the product portfolio overlap and gap identification process outlined in the previous chapter, a case study with the Xerox Company has been performed. This chapter follows the portfolio overlap and gap analysis process step-by-step, showing how each step is completed by using the Xerox product portfolio as an example. The ultimate result is the identification of overlaps and gaps within this portfolio.

7.1 Company Background

The Xerox Company is a large multi-national corporation that develops, manufactures, distributes, and sells a wide array electro-mechanical hardware products and software. With sales of around \$20 Billion annually, it is a worldwide leader in several of its markets. The company is known for its technological leadership and world-class product development and manufacturing capabilities.

Xerox is known as the Document Company, due to its strategic intent to be a leader in the global document market. The company's goal is to produce document solutions to enhance business productivity. As a result of this goal, the company sells and produces products encompassing one or more of four main types of document management functions: copying, printing, faxing, and scanning. Xerox also sells supplies and various services that support the use of these products.

A copier may be defined as a hardware device that is used to produce a replica of a hardcopy (paper) document as another hardcopy. The most common technologies for this include analog (image transferred directly from one paper to another) and digital (electronic image created and then transferred). A printer may be defined as a hardware device that is used to convert documents from electronic to hardcopy (paper) form. Common methods for this include inkjet, bubble jet, and laser technologies.

A facsimile machine may be defined as hardware device that is used to create an electronic copy of a hardcopy document, and then transfer this electronic copy across communication lines to another geographic location. A scanner may be defined as a hardware device that is used to convert documents from hardcopy to electronic form, enabling editing, electronic distribution, and digital document management with a computer or other hardware/software combination.

Recent trends with the document management market involve multifunction peripherals (MFP) [U.S. Industry & Trade Outlook, 1998]. MFP's are products that combine two or more of the product functions mentioned above. This combination allows customers to obtain more functionality for their money, and gives companies a way to leverage their technologies across multiple product functions.

7.2 Overlap and Gap Identification

This section follows the product portfolio overlap and gap identification approach introduced in Chapter 3 step-by-step. This section builds on the approach by describing specific applications of the methods described. There may be several ways to accomplish the approach introduced for different companies or markets; however, the applications used within this case study are the most appropriate for the document management industry considered here.

The analysis approach here uses only the current (as of June 1999) product portfolios for the identification of overlaps and gaps. The approach could be extended to consider a much larger amount of information, such as product offerings under development, a time-based analysis, or trends in the market and customer needs. However, the purpose of this case is to demonstrate the methods, and not to perform a complete industry and portfolio analysis.

The products and markets considered in this case study are focused on the United States. Those products offered by companies that are not available in the U.S. have been excluded from the analysis. Most of the data used to perform the analysis within this case study has been

quantitatively based. In those cases where only a qualitative measure was available, efforts have been made to assign quantitative values to those data points that are consistent across products.

7.2.1 Define the Product Portfolio

7.2.1.1 Xerox Product Portfolio

The general market that Xerox competes in is the document management market. This market consists of producing products designed to create both hardcopy and electronic documents through the combined use of software and hardware. Thus, Xerox's product offerings include the functions of copying, printing, faxing, and scanning. Many of the same parts and technologies are used across these products, and some offerings combine the functions of two or more of these product types.

Xerox has divided the document management market into three segments: desktop products, workgroup products, and production products:

- **Desktop products** are those that are designed for a small number of users, such as an individual or small home or office. They typically are designed to provide relatively low performance (1-30 pages per minute) and low-volume document management. Products are typically priced under \$2500.
- **Workgroup products** are those that are designed for the office environment where they will be accessed by multiple users. This means that they typically provide relatively mid-level performance and volume document management. Prices range from around \$1000 to \$65,000.
- **Production products** are those that are designed for commercial use where high-speed performance and high volumes are required. These products are often located in corporate data centers. Prices begin at \$35,000.

The basic products offered involve copying or printing, a combination of copying and printing, or some combination of printing, copying, faxing, and scanning. There are several types of marketed product groups within which products provide similar types of benefits to customers. These include:

- **DocuPrint** – printers
- **Copiers** – both analog and digital copying products
- **Workcenter** – low-end multi-function products
- **Document Center** – mid-range printers, copiers, and multi-function products
- **DocuTech** – products focused toward high-speed publishing
- **Bookmark** – copiers specifically for library use
- **DocuImage** – standalone scanning
- **DocuColor** – products that focus on printing and copying documents where color capabilities are a priority

While the discussion of product families in Chapter 2 focused on “engineering” families, the above list of products families indicates that Xerox groups its products in a different manner with respect to selling and marketing its products. For these “marketing” families, products appear to be grouped according to common functions and benefits provided, rather than according to common platforms or parts. This can be beneficial for customers, as most will not care what common technologies or parts are shared, but will likely be interested in which set of similar products are relevant when making a buying decision to satisfy some set of needs. Thus there can be two sets of family identifications within a portfolio: engineering families and marketing families.

For the families within this analysis, the products have been grouped by the functional benefits provided by copiers, printers, and products with some combination of copying, printing, scanning, and faxing features. Many of the marketed product groups consist of products that span several of the market segments, as well as several of the families. The families defined here were

chosen to group products according to needs. For example, customers have a need to make a copy of a hardcopy document. Thus, one of the families consists of copiers. Another group of customers desires the use of multiple document management functions; thus the all-in-one family. Figure 4.1 shows the relationship between the market, the segments, and the families.

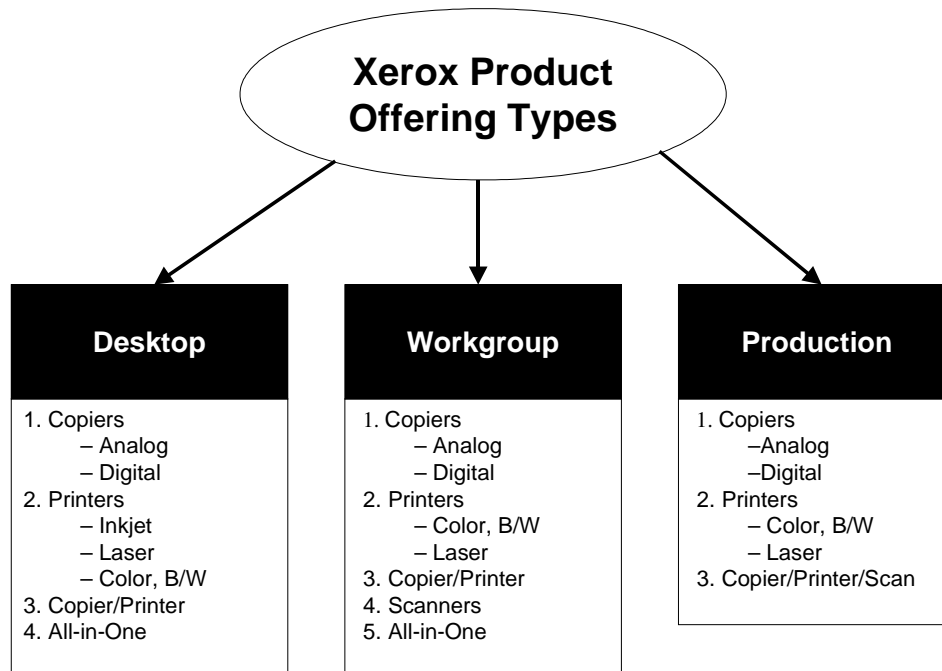


Figure 4.7.1: Segments and Families for Xerox

The product portfolio for Xerox currently consists of approximately 132 products. These products were taken from the offerings listed on Xerox World Wide Web page at www.xerox.com. The full breakdown of Xerox’s products into its families and segments is given in Section 1 of Appendix 1.

7.2.1.2 Market Portfolio

The competitive market portfolio of products in the document management market is very broad. Within each segment, there is a wide range of products that fulfill a wider range of customer needs and use many different technologies. The niches that reflect these wide ranges in each segment are shown in Figure 4.2.

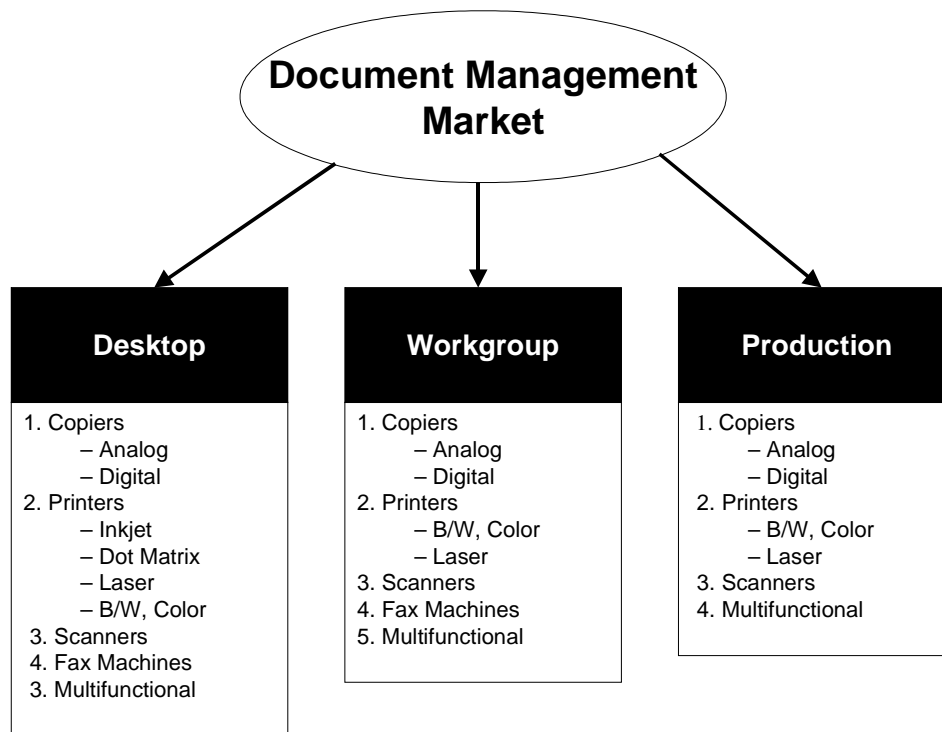


Figure 4.7.2: Segments and Families for Document Management Market

Within this market, companies have specific foci on particular segments and niches within each segment. For example, one company will produce only printers in the desktop segment. Xerox does not offer products for all of the niches for each segment, as reflected by a comparison between Figures 4.1 and 4.2. Xerox does not produce dot matrix printers or standalone fax machines, and produces only one standalone scanner, that being in the Workgroup segment. This is contrasted with the market, where products are produced along all niches and segments, as shown in Figure 4.2.

The competitors in the document management market are shown in Figure 4.3, arranged in approximate descending order of market share based on shipments. For copier production, Xerox is the market leader with a 20% share while Canon is second at 17% and Sharp is third at 12% [Appliance, 1996]. In printers (US market), Hewlett-Packard is the market leader at 52% and Epson is second at 8.7%, followed by Canon at 7%, Lexmark at 5.5%, and Xerox at 4.7% [Computer Reseller News, 1998]. Brother leads fax machines at 25%, Sharp at 25%, and

Panasonic at 15% [*Appliance*, 1996]. Scanners are led by Hewlett-Packard, Mustek, and Umax, each at approximately at 25% market share [*Computer Retail Week*, 1998]. A complete listing of competitors' products that fall within the boundaries of the document management market is located in Appendix 2.

Document Management Market				
Copiers	Printers	Scanners	Fax	Multi-function
Xerox Canon Sharp Ricoh Konica Panasonic HP	HP Epson Canon Lexmark Xerox Okidata Brother Panasonic Apple Ricoh Konica	HP Mustek Umax Epson Panasonic Polaroid Ricoh Canon Xerox	Brother Sharp Panasonic Ricoh HP Canon	Xerox HP Canon Sharp Ricoh Konica Panasonic

Figure 4.7.3: Document Management Market Competitors

The list of competitors provides a large portfolio of product offerings to customers in the document management market. In order to simplify the analysis to a more manageable level, the products considered in this analysis have been limited to a more reasonable set of the market leaders. Thus, only the products of the competitors in bold in Figure 4.3 are used for this analysis. The competitive set considered with this analysis is reduced even further by looking at those specific areas in which Xerox competes. Xerox predominantly offers what we will define as printers, copiers, printer/copiers, and multifunction products (print, copy, scan, and fax). Thus, a comparison of products within these categories is appropriate for identifying overlaps and gaps in the product portfolio. No comparisons among standalone scanners or fax machines will be made.

7.2.2 Key Benefits for Customers

Since the products under consideration for this analysis involve the document management market, there are some basic benefits that customers may look to receive. Below are some of these benefits:

- **Performance** – throughput of documents and information in system
- **Document/Image Quality** – caliber of document or image produced
- **Flexibility** – ability to be adapted to a wide range of customer demands
- **Reliability** – ability to consistently provide promised performance and quality

The products within the document management market are differentiated from each other, both within a company's portfolio and across the market portfolio, primarily across the Performance (P) and Document/Image Quality (DIQ) dimensions. Because of this, and the ready availability of product information along these dimensions, for the purposes of this research, the Performance and Document Quality benefits will be used to demonstrate the methods for the portfolio overlap and gap analysis here.

7.2.3 Define Attributes and Product Specifications to Meet Benefits

Given that the customer benefits considered for this analysis involve product Performance and Document/Image Quality, a rating for each product must be determined for both benefits. This can be achieved by the decomposition of these benefits into their specific attributes and specifications.

7.2.3.1 *Define Attributes*

As discussed earlier, the document management market consists of four basic functions: printing, copying, scanning, and faxing. The benefits defined for this market can be applied across all of these functions, although each basic function will require a different set of attributes and specifications.

The Document Image Quality attributes for Printing, Copying, Scanning, and Faxing and shown in Table 4.1. For all functions, “paper size” refers to the size of the media that the device can handle, “Color” refers to the ability of the device to generate documents in color, and “Resolution” refers to the image resolution output of the device. For printers, “Technology” refers to the type of print technology used (inkjet or laser), while for copying it refers to the image acquisition and input/output technology used (analog or digital). “Zoom” refers to the reduction and enlargement ability of a copier. Finally, for faxing, “Paper Type” refers to the type of paper used for the document.

Printing	Copying	Scanning	Faxing
Paper Size Score	Paper Size Score	Paper Size Score	Paper Size Score
Color	Color	Color	Paper Type
Technology	Technology	Resolution	Resolution
Resolution	Resolution		
	Zoom		

Table 4.7.1: Document Image Quality Attributes

The attributes for Performance are shown in Table 4.2. For all functions, “Throughput” refers to the velocity at which hard copy or electronic documents are produced using the device. “Network” refers to the ability of the device to be used in a networked environment. Finally, “Paper handling” refers to the paper handling capabilities of the device.

Printing	Copying	Scanning	Faxing
Throughput	Throughput	Throughput	Throughput
Network	Network	Network	Newtork
Paper handling	Paper Handling		

Table 4.7.2: Performance Attributes

7.2.3.2 Define Specifications for Each Attribute for Respective Benefits

Much of the information pertaining to product attributes can be obtained through extensive benchmark tests that companies perform for their own as well as competitive products. For this case study, though, the analysis is limited to those listed product specifications in company literature and on web sites. The specifications (both metric and unit) and their relations to their respective attributes and benefits are provided for printers, copiers, scanners, and fax machines in Tables, 4.3, 4.4, 4.5, and 4.6, respectively.

Printing			
Metric	Unit	Benefit	Attribute
max paper width	inches	DIQ	Paper Size
max paper length	inches	DIQ	Paper Size
Color	y/n	DIQ	Color
technology	inkjet/laser	DIQ	Tech
print resolution width	dpi	DIQ	Resolution
print resolution length	dpi	DIQ	Resolution
max B/W print speed	ppm	P	Throughput
max color print speed	ppm	P	Throughput
Monthly volume	#	P	Throughput
Memory	MB	P	Throughput
Networkable	y/n	P	Network
max input sheets	#	P	Paper handling
maximum output	#	P	Paper handling
paper trays	#	P	Paper handling

Table 4.7.3: Printing Specifications

Copying			
Metric	Unit	Benefit	Attribute
max paper width	inches	DIQ	Paper Size
max paper length	inches	DIQ	Paper Size
Color	y/n	DIQ	Color
technology	digital/analog	DIQ	Tech
copy resolution width	dpi	DIQ	Resolution
copy resolution length	dpi	DIQ	Resolution
minimum reduction	%	DIQ	Zoom
maximum enlargement	%	DIQ	Zoom
max B/W copy speed	ppm	P	Throughput
max color copy speed	ppm	P	Throughput
Monthly volume	#	P	Throughput
Networkable	y/n	P	Network
Warm-up time	Sec	P	Throughput
first copy out	sec	P	Throughput
max multicopy amount	#	P	Throughput
auto duplex speed	ppm	P	Throughput
max input sheets	#	P	Paper handling
maximum output	#	P	Paper handling
paper trays	#	P	Paper handling

Table 4.7.4: Copying Specifications

Scanning			
Metric	Unit	Benefit	Attribute
max paper width	inches	DIQ	Paper Size
max paper length	inches	DIQ	Paper Size
Color	y/n	DIQ	Color
scan resolution width	dpi	DIQ	Resolution
scan resolution length	dpi	DIQ	Resolution
maximum B/W scan speed	spp	P	Throughput
max color scan speed	spp	P	Throughput
two-sided scanning	y/n	P	Throughput
monthly volume	#	P	Throughput
Networkable	y/n	P	Network

Table 4.7.5: Scanning Specifications

Faxing			
Metric	Unit	Benefit	Attribute
max paper width	inches	DIQ	Paper Size
max paper length	inches	DIQ	Paper Size
Paper Type	T/P	DIQ	Paper Type
fax transmission resolution width	dpi	DIQ	Resolution
fax transmission resolution length	dpi	DIQ	Resolution
fax receive resolution width	dpi	DIQ	Resolution
fax receive resolution length	dpi	DIQ	Resolution
modem speed	kbps	P	Throughput
Networkable	y/n	P	Network
speed dial presets	#	P	Throughput
pages stored in memory	#	P	Throughput
transmission speed	spp	P	Throughput

Table 4.7.6: Fax Specifications

For most of the specifications listed here, a higher value (or in some cases, a “yes”) is defined as being more desirable. This applies to all of the specifications, with the exception of copier minimum reduction, copier warm-up time and first copy out, scanner scan speed, and facsimile transmission speed. For these specifications, a lower value is more desirable.

7.2.4 Choose Datum Product

As mentioned in the previous chapter, the datum should be chosen as one of the “better” products. For the products in the document management market, several criteria were desired:

- A multifunctional (all-in-one) product
- A relatively high level of performance
- A relatively high level of document/image quality
- A product with a relatively high number of the common features

Given these criteria, the Xerox Document Centre 340ST was chosen as the datum. This product is a multifunction/all-in-one product that prints at 40 ppm at 600x600 resolution. The product

offers a good cross-section of features that are common to many of the products in the Xerox portfolio. Table 4.7 presents the datum's specification data.

Document Image Quality						Performance				
Printing										
Benefit	Attribute	Metric	Unit	Value	Score	Benefit	Attribute	Metric	Unit	Value
DIQ	Paper Size	max paper width	inches	11	100	P	Throughput	max B/W print speed	ppm	40
DIQ	Paper Size	max paper length	inches	17	100	P	Throughput	max color print speed	ppm	0
DIQ	Color	Color	y/n	N	100	P	Throughput	Monthly volume	#	400000
DIQ	Tech	technology	inkjet/laser	L	100	P	Throughput	Memory	MB	64
DIQ	Resolution	print resolution width	dpi	600	100	P	Network	Networkable	y/n	Y
DIQ	Resolution	print resolution length	dpi	600	100	P	Paper handling	max input sheets	#	4000
						P	Paper handling	maximum output	#	1500
						P	Paper handling	paper trays	#	5
Copying										
DIQ	Paper Size	max paper width	inches	11	100	P	Throughput	max B/W copy speed	ppm	40
DIQ	Paper Size	max paper length	inches	17	100	P	Throughput	max color copy speed	ppm	0
DIQ	Color	Color	y/n	N	100	P	Throughput	Monthly volume	#	400000
DIQ	Tech	technology	digital/analog	D	100	P	Throughput	Warm-up time	Sec	100
DIQ	Resolution	copy resolution width	dpi	600	100	P	Throughput	first copy out	sec	4
DIQ	Resolution	copy resolution length	dpi	600	100	P	Throughput	max multicopy amount	#	2000
DIQ	Zoom	minimum reduction	%	25	100	P	Throughput	auto duplex speed	ppm	0
DIQ	Zoom	maximum enlargement	%	400	100	P	Network	Networkable	y/n	Y
						P	Paper handling	max input sheets	#	4000
						P	Paper handling	maximum output	#	1500
						P	Paper handling	paper trays	#	5
Scanning										
DIQ	Paper Size	max paper width	inches	11	100	P	Throughput	maximum B/W scan speed	spp	40
DIQ	Paper Size	max paper length	inches	17	100	P	Throughput	max color scan speed	spp	0
DIQ	Color	Color	y/n	N	100	P	Throughput	two-sided scanning	y/n	Y
DIQ	Resolution	scan resolution width	dpi	400	100	P	Throughput	monthly volume	#	400000
DIQ	Resolution	scan resolution length	dpi	400	100	P	Network	Networkable	y/n	Y
Faxing										
DIQ	Paper Size	max paper width	inches	11	100	P	Throughput	modem speed	kbps	33.6
DIQ	Paper Size	max paper length	inches	17	100	P	Throughput	speed dial presets	#	200
DIQ	Color	Paper Type	T/P	N	100	P	Throughput	pages stored in memory	#	150
DIQ	Resolution	fax transmission resolution width	dpi	400	100	P	Throughput	transmission speed	spp	3
DIQ	Resolution	fax transmission resolution length	dpi	400	100	P	Network	Networkable	y/n	Y
DIQ	Resolution	fax receive resolution width	dpi	400	100					
DIQ	Resolution	fax receive resolution length	dpi	400	100					

Table 4.7.7: Datum Product Specifications

7.2.5 Determine Core Benefit Propositions for Products

A variety of customer groups are possible as the focus of this analysis. While some may value an attribute such as color printing very highly and place a low importance on speed, another group of customers may think that speed is highly important and color printing not at all important. This case study focuses on only one particular set of customers and the importance that they place on the attributes within the document management market.

1. Get weights for specifications to define attributes

A group of hypothetical customers were chosen to serve as the basis for the product comparisons in this case study. This hypothetical customer group believes that the specifications are related to

The same set of customers that were used to set the specification/attribute weights are used again to set the importance weights for each attribute with respect to their corresponding benefit provided. For each function, the attribute scores sum to 1. Table 4.9 presents this data.

Document Image Quality			Performance		
Printing	Paper Size Score	0.1	Printing	Throughput Score	0.7
	Color Score	0.3		Network Score	0.1
	Tech Score	0.25		Paper Handling Score	0.2
	Resolution Score	0.35			
Copying	Paper Size Score	0.2	Copying	Throughput Score	0.6
	Color Score	0.2		Network Score	0.1
	Tech Score	0.2		Paper Handling Score	0.3
	Resolution Score	0.2			
	Zoom Score	0.2			
Scanning	Paper Size Score	0.2	Scanning	Throughput Score	0.8
	Color Score	0.4		Network Score	0.2
	Resolution Score	0.4			
Faxing	Paper Size Score	0.25	Faxing	Throughput Score	0.9
	Paper Type	0.05		Network Score	0.1
	Resolution Score	0.7			

Table 4.7.9: Attribute Weights

As Table 4.9 shows, the customer groups considered for this case believe that both color and resolution are important in determining the Document Image Quality. The table also shows that the same customers believe that throughput is the most important attribute for determining product performance.

3. Set reference score for datum specs

All of the specifications for the datum have been set to a reference level of 100. This was shown earlier in this section in Table 4.7. This is sufficient for all quantitative data, but some assumptions had to be made about the qualitative specs. These qualitative specifications include printer color and technology, copier technology, scanning color capability, fax machine paper type, and the networkability of each device. For printer, copier, and scanner color, meaning that the documents are produced in more than just black and white, a 'yes' was assigned a score of

200, while a ‘no’ was given a 100. For printer technology, meaning inkjet or laser technology, inkjet was assigned a score of 50, while laser was 100. For fax machines, the paper type could either be ‘Thermal’ or ‘Plain’. Thermal was assigned a value of 50, while plain was assigned 100.

4. Rank specs according to relationship to datum

The specifications for all of Xerox’s products, as well as those of its competitors, were ranked according to their relationship with the datum’s specifications. For example, for the Xerox DocuColor 40 CP, the product’s monthly volume is 1,000,000 copies, while the datum’s volume is 400,000 copies. Thus, the 40 CP’s score for monthly volume is $(1,000,000/400,000)*100 = 250$. This was performed for all products considered for this case study. The specification reference scores for Xerox products are found in Appendix 1, while those for competitor products are in Appendix 2.

5. Combine to get scores for attributes

Once the specification scores were found, they were multiplied by their corresponding specification weights to find the specification impact score. The specification impact scores within each particular attribute were then summed in order to arrive at the product attribute scores. Table 4.10 shows an example of this using the DocuColor 40 CP. The attribute scores for all products can be found in Appendices 1 and 2.

Specification	Value	Ref Score	Weight	Spec Impact Score
max paper width	12	109.1	0.5	54.5
max paper length	18	105.9	0.5	52.9
Attribute Score				107.5

Table 4.7.10: Attribute Score for Paper Size Attribute of 40 CP

6. Get scores for benefits for products

Once the attribute scores have been found, they are then multiplied by the attribute weights and summed to arrive at the product's benefit scores. Table 4.11 shows an example of this, again for the 40 CP. The benefit scores for all products can be found in Appendices 1 and 2.

Attribute	Attrib Score	Weight	Attrib Impact Score
Paper Size Score	107.49	0.1	10.7
Color Score	200	0.3	60
Tech Score	100	0.25	25
Resolution Score	66.67	0.35	23.3
Benefit Score			119.1

Table 4.7.11: Benefit Score for DIQ Benefit for 40 CP

7.2.6 Map Core Benefits

The core benefit propositions for the products considered in this case consist of two measures: the Document/Image Quality Score and the Performance Score. When combined together, these scores present a quantitative number for the level of benefit offered by a product. Thus, a mapping of these scores versus one another on a 2-dimensional graph shows the relative benefits offered along each dimension, as well the Core Benefit Proposition for the product (defined as the DIQ score multiplied by the Performance score). The products for this case study were mapped with the Performance score along the vertical axis, and the Document/Image Quality score along the horizontal axis.

The mappings for the products were performed in two steps. First, the products were divided into their market segments: Desktop, Workgroup, and Production. The products were then mapped according to all of the functions that they provide. For example, if a desktop product both prints and copies, then it was present on three separate product maps: all desktop products that print, all desktop products that copy, and all desktop products that both print and copy. This provides the basis for a comparison across products that perform the same functions, as discussed later in this chapter.

Once the products were mapped, the families of products within each segment were identified. To identify families, several criteria were considered:

- The family group as identified within Xerox literature (found in Appendix 1 and earlier in this chapter)
- The relation between the relative CBP positions
- Common technologies
- Functions/operations performed

By combining these criteria qualitatively, a decision could be made as to the relationship of products within families.

Once the families were identified on paper, they were then identified on the CBP maps. Figure 4.4 shows an example of one of these maps. The CBP's that represent products are the individual dots on the graph, while the dots falling within the dark outlined shapes signified by letters and a number are the product families. The family identifications on these CBP maps were defined by the researchers and have nothing to do with Xerox family identifications. Product and family maps of all Xerox products, as well as the identification of the products within each family, are given in Section 2 of Appendix 1.

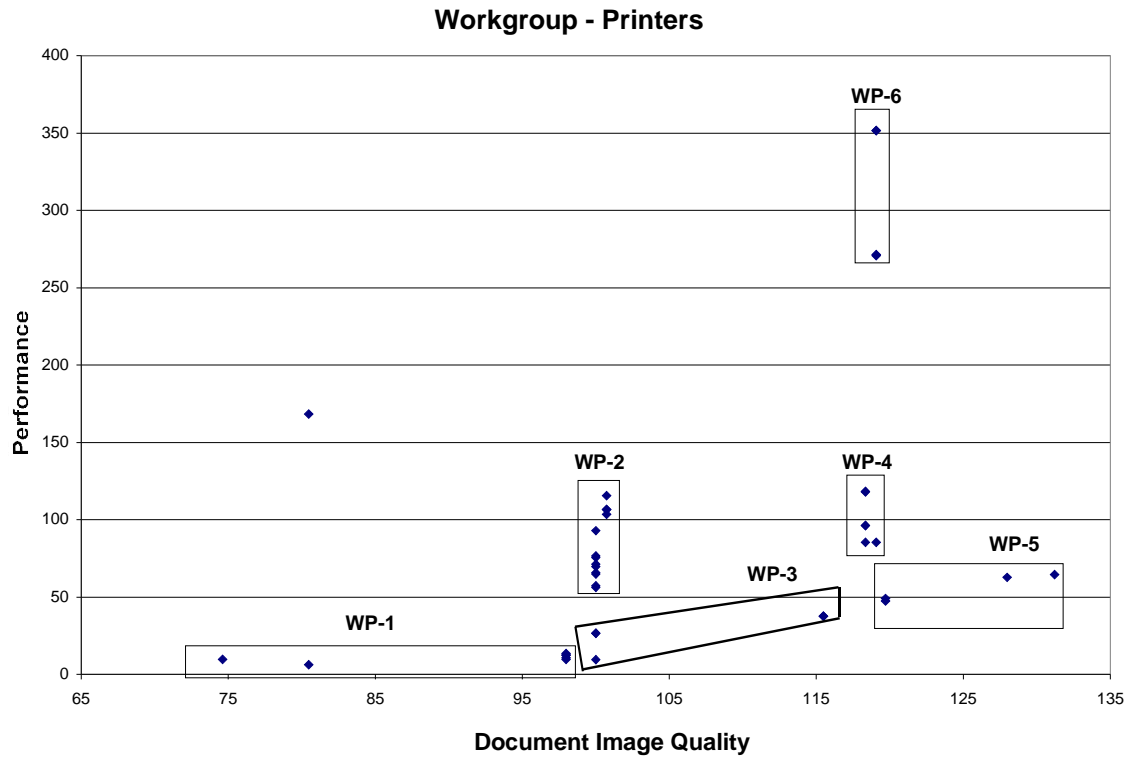


Figure 4.7.4: Product Map for Workgroup Printers

7.2.7 Derive Vector of Differentiation for Families/Segments/Markets

7.2.7.1 Product Family Vectors

The first task for defining the product family vectors was to signify the direction of differentiation for each family. This involved defining a best-fit, least-squares regression line for each product family. Once this was found, its angle with respect to the horizontal axis was measured, and this direction was defined in degrees. Next, the magnitudes for each vector were defined in terms of the benefit levels spanned by the vector as well as the number of products in the family. The spanned benefit levels are defined as the difference between the minimum product CBP and the maximum product CBP in the family.

Figure 4.5 shows an example of the vectors of differentiation for Workgroup Printers. Each family (WC-1, WC-2, ..., WC-6) has a graphical vector that defines the direction of differentiation. The magnitude is also defined by the length of the vector displayed. Graphs of

the vectors for all functions/segments are displayed in the VoD overlap analysis in section 4.2.8.1.2.

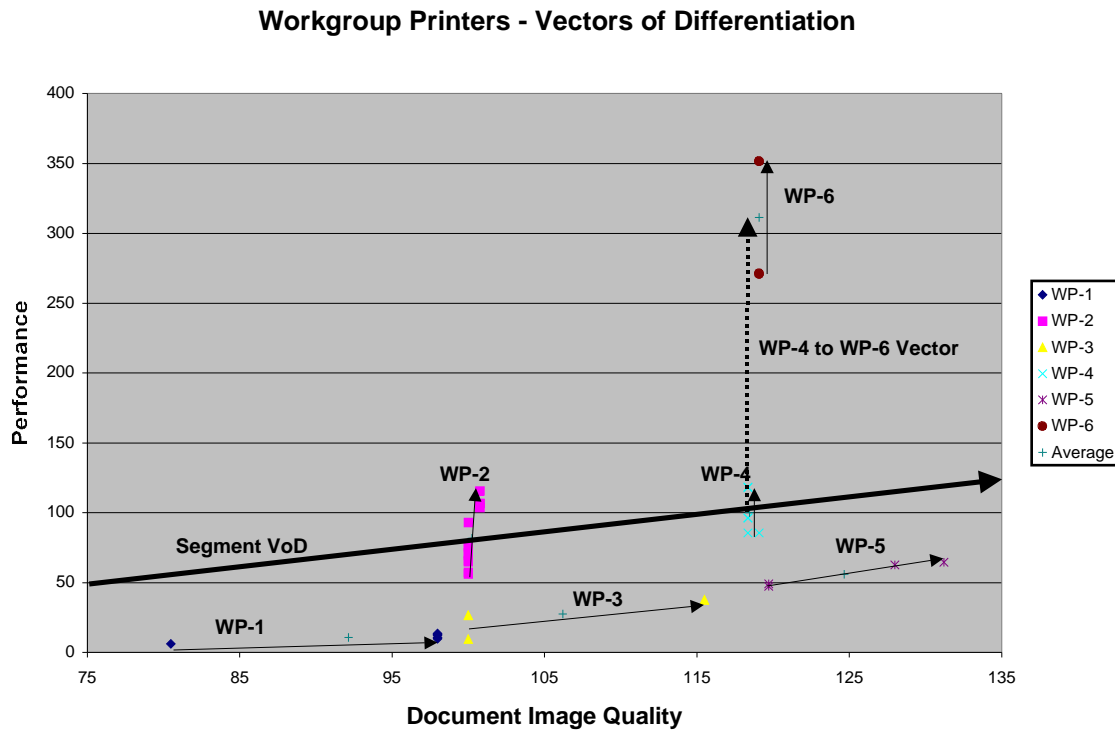


Figure 4.7.5: Vectors of Differentiation for Workgroup Printers

7.2.7.2 Cross-Family Vectors

Defining the cross-family vectors is very similar to that of defining family vectors. The first step is to define the families that are similar or related. For the Xerox case, this has several meanings. Related families are those that perform similar functions, such as families in a segment that both print and copy, or families that have similar types of technologies in use, such as color printer products. Once these relationships are identified, the next step is to define the Family CBP's by finding the average CBP of all of the products of each family. The vector is then defined by striking a line between the Family CBP's of two families.

A cross-family vector is demonstrated above in Figure 4.5 by the dashed vector for families WP-4 and WP-6. The products in WP-4 and WP-6 are color products that both print and copy. The

vector was struck between the average CBP's of each family, and is measured at approximately 90 degrees. This means that, for the color printers/copiers in this segment, all of the products are differentiated along the performance benefit only. Cross-family vectors for the Xerox portfolio are displayed in section 4.2.8.1.2.

7.2.7.3 Product Segment Vectors

Defining the market segment vectors of differentiation was also performed in a way very similar to that of the product family VoD's. Once again, the vector direction was defined first. This was found by performing a least-squares regression on the CBP data to find the best-fit line for the segment. The angle between this line and the horizontal axis was then measured and defined in degrees as the vector direction.

Next, the vector magnitude was defined, this time taking into account three variables. The first was the benefit range spanned by the segment. This measure is defined as the difference between the maximum segment product CBP and the minimum segment product CBP. The next variable used was the number of products in the segment, and the final was the number of families in the segment. Together these variables give an idea of the extent to which the vector has been followed for new product introduction.

A graphical example of the segment vector of differentiation can be found in Figure 4.5 on the previous page. The large, dark arrow on this graph signifies the segment vector for the Workgroup Printers segment. It has an angle of 39 degrees, and a magnitude of a 50,375 benefit range, 34 products, and six families. Table 4.13 in the overlap analysis lists the segment vector of differentiation data for the entire Xerox product portfolio. All segment VoD's are displayed in section 4.2.8.1.2.

7.2.8 Identify Overlaps and Gaps

7.2.8.1 *Overlaps*

In order to be able to observe overlaps within the product portfolio, the Core Benefit Propositions of Xerox's products have been mapped against one another based on function. By analyzing the relationships between the products in each segment and across segments, the product portfolio overlaps in both CBP's and the vectors of differentiation will be identifiable.

7.2.8.1.1 Core Benefit Propositions

To fully identify the overlaps within the Xerox product portfolio, three levels of analysis are observed. These include 1) within families, 2) across families (within a segment), and 3) across segments.

1. Within families

A large amount of overlaps of this type are expected, as the products within families will be very similar. Some families have a large range of product performance and document image quality, while others have a much lower range of product variety. Table 4.12 summarizes the overlaps within families throughout the Xerox product portfolio. These overlaps will not be discussed in depth because of the expected similarities. The purpose of the table is for identification of the relevant overlaps, and to show how Xerox has chosen to slightly differentiate some of its products within families.

Overlap	Products	Price	Families	Differentiation
A-1	XE80	\$ 450	DP-1, DC-3, PCD-2	Paper handling, copies per minute
	XE82	\$ 450	DP-1, DC-3, PCD-2	
	XD100	\$ 550	DP-1, DC-3, PCD-2	
	XD102	\$ 530	DP-1, DC-3, PCD-2	
	XD103f	\$ 680	DP-1, DC-3, PCD-2	
A-2	N17	\$ 1,249	WP-3	Built-in networking
	N17b	\$ 1,000	WP-3	
A-3	C20	\$ 800	WP-5	Networking, paper, memory
	NC20	\$ 1,200	WP-5	
A-4	5765	\$ 8,000	WP-4, WC-4, PCW-4	Performance
	5760	\$ 8,000	WP-4, WC-4, PCW-5	
	5750	\$ 22,000	WP-4, WC-4, PCW-6	
	Office 6	\$ 22,000	WP-4, WC-4, PCW-7	
A-5	5790	\$ 34,000	WP-4, WC-4, PCW-4	Monthly volume, 1st copy out
	5799	\$ 30,000	WP-4, WC-4, PCW-7	
A-6	30 CP	\$ 99,000	WP-6, WC-5	Networking, software enhancements
	30 Pro	\$ 85,000	WP-6, WC-5	
A-7	40 CP	\$ 135,000	WP-6, WC-5	Networking, software enhancements
	40 Pro	\$ 117,000	WP-6, WC-5	
A-8	220	\$7,170	WC-3	Performance, functions offered
	230	\$8,675	WC-3	
	240	\$17,950	WC-3	
	255	\$25,950	WC-3	
	265	\$41,750	WC-3	
	220ST	\$12,000	WP-2, WC-3, PCW-2, MFP-3	
	230LP	\$9,450	WP-2	
	230ST	\$15,550	WP-2, WC-3, PCW-2, MFP-3	
	240ST	\$26,950	WP-2, WC-3, PCW-2	
	255LP	\$29,200	WP-2	
	255ST	\$36,950	WP-2, WC-3, PCW-2	
	265ST	\$48,750	WP-2, WC-3, PCW-2	
	265LP	\$40,950	WP-2	
	332DC	\$11,595	WC-3	
	332ST	\$15,100	WP-2, WC-3, PCW-2, MFP-3	
340DC	\$15,695	WC-3		
340ST	\$18,695	WP-2, WC-3, PCW-2, MFP-3		
A-9	135 LMX	\$ 535,000	PP-1	
	4135	\$ -	PP-1	

Table 4.7.12: Portfolio Overlaps within Families

2. Across families

There appear to be only two potential overlaps where products from two or more families overlap. These overlaps have been labeled as B-1 and B-2 and are shown in Figures 4.6 and 4.7.

Overlap B-1 consists of the Workcenter Pro 745, 745 DL, and 745 SX, and the DocuPrint 4512 and 4508 printers. These products have similar benefit propositions in the workgroup printers

segment. Figure 4.6 displays this relationship. If customers were looking for only a printer, than these two products may compete. However, the Workcenter 745 product line consists of multifunction devices, while the 4508 and 4512 are only printers. Thus while these products are similar along the printing function, the core benefit proposition for the 745 line is actually much higher due to its added functionality. Thus, overlap B-1 does not appear to be a relevant overlap to be concerned with.

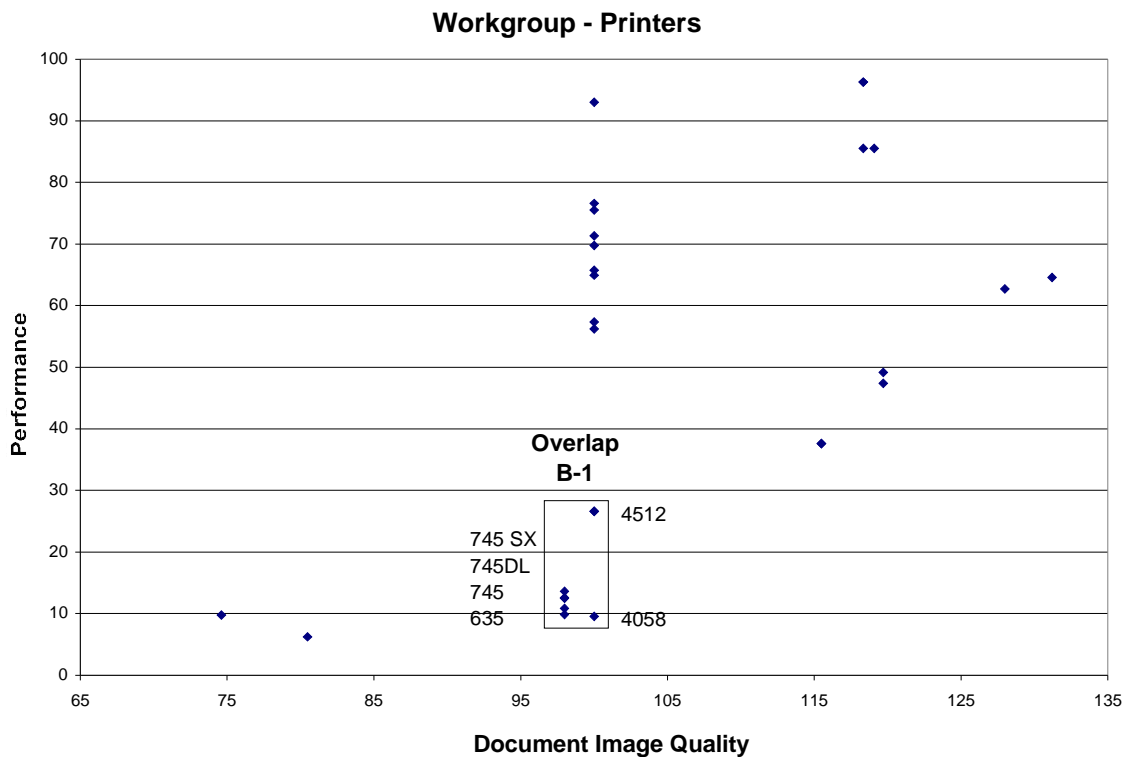


Figure 4.7.6: Overlap B-1, Workgroup Printers

Overlap B-2 consists of products in the workgroup copiers segment. Products include those from family WC-3 (265ST, 255ST, 265, 255, 240), and products from WC-4 (5799, 5790, 5760, 5765, 5750, and Office 6). Figure 4.7 shows this relationship graphically. All of these products appear to be similar in the benefit propositions that they present for workgroup copiers. However, the 265, 255, and 240 are the only products in the group that only copy. The rest of the products are both printers and copiers, and thus have higher CBP's and should be judged on that basis.

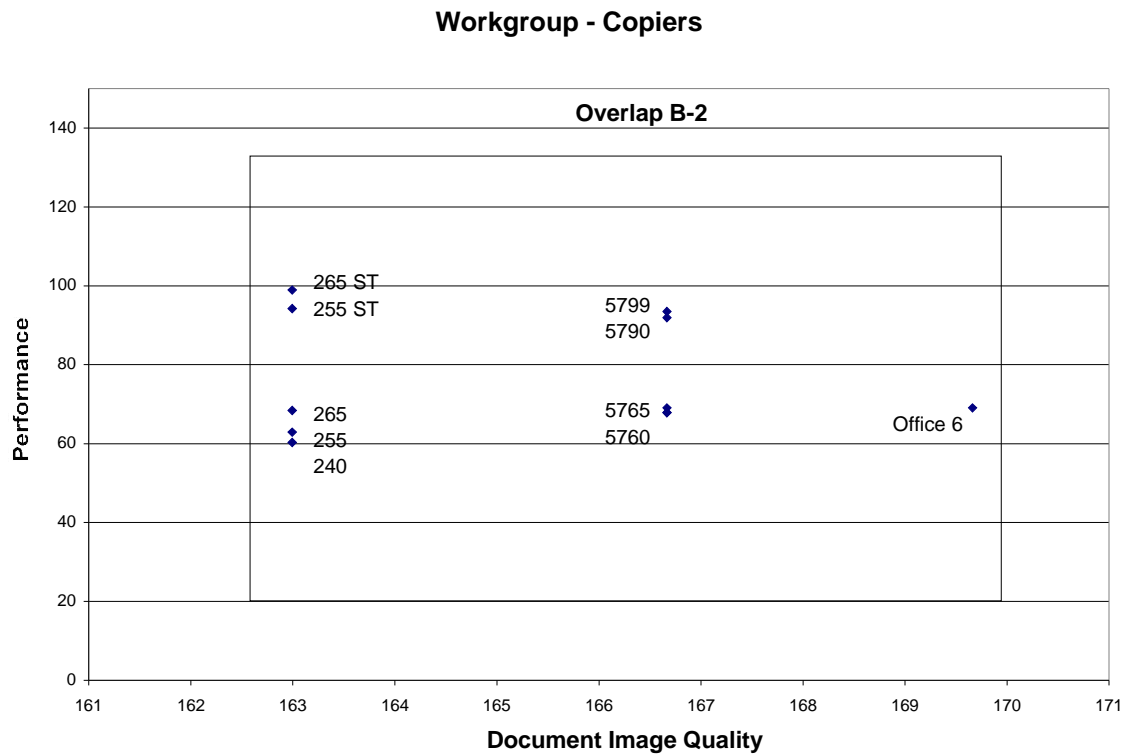


Figure 4.7.7: Overlap B-2, Workgroup Copiers

The 255ST and 265ST are B/W printers/copiers that print at 600x600 dpi, have print/copy speeds at 55 ppm and 65 ppm, and are priced at \$36,000 and \$48,000, respectively. The 5799, 5790, 5760, 5765, 5750, and Office 6 are color copiers/printers with 400x400 dpi, speeds between 24-36 ppm B/W and 6-9 ppm color, and a price range from \$8,000 to \$34,000. Thus, these products do not appear to very similar at all. Figure 4.8 shows a comparison for the 265ST, 255ST, 5799, 5790, 5760, 5765, 5750, and Office 6 for the print/copy functions. As the figure shows, there are less similarities between the products than originally thought, and thus overlap B-2 also does not to truly be an overlap of family CBP's.

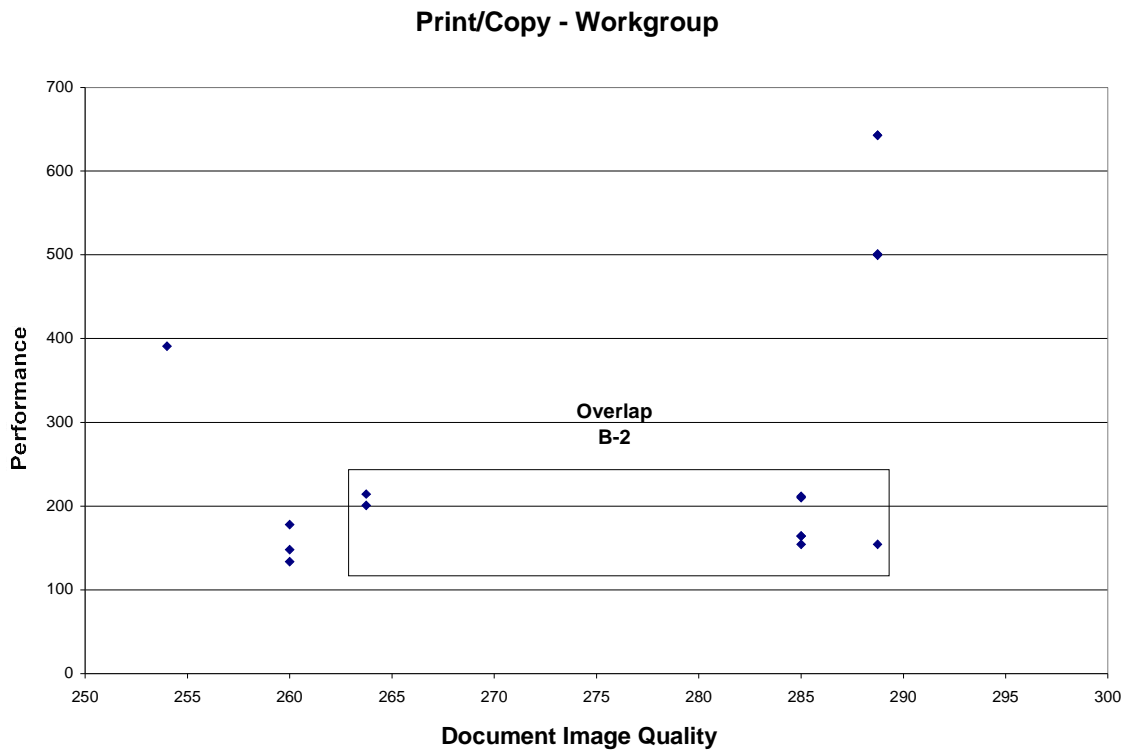


Figure 4.7.8: Overlap B-2, Print/Copy

3. Across segments

In order to be able to observe the overlaps of products across segments, the benefit propositions of products across the segments must be mapped together. This allows for a comparison of products and shows graphically the product CBP's that are similar.

Figures 4.9 and 4.10 show the cross-segment comparisons for printers. As the figures show, there appear to be two overlaps for printers, both in the Desktop/Workgroup segment comparison (C-1 and C-2). Overlap C-1 consists of 10 desktop products, or product family DP-1 (385, XD155f, XD102f, XD105f, XD103f, XD102, XD100, XE82, XE80, P8e), and six workgroup products (Pro 645, 657, 745, 745 DL, 745 SX, 4508). All of the XD- and XE- products are print/copy devices, the 4508 and P8e are DocuPrint printers, while the 645, 657, 745's, and the 385 are multifunction products. Since all of the XD- and XE- products are print/copy products, the real comparison is between the printers (desktop P8e and workgroup 4508), and the multifunction products (desktop 385 and workgroup 645, 657, and 745's).

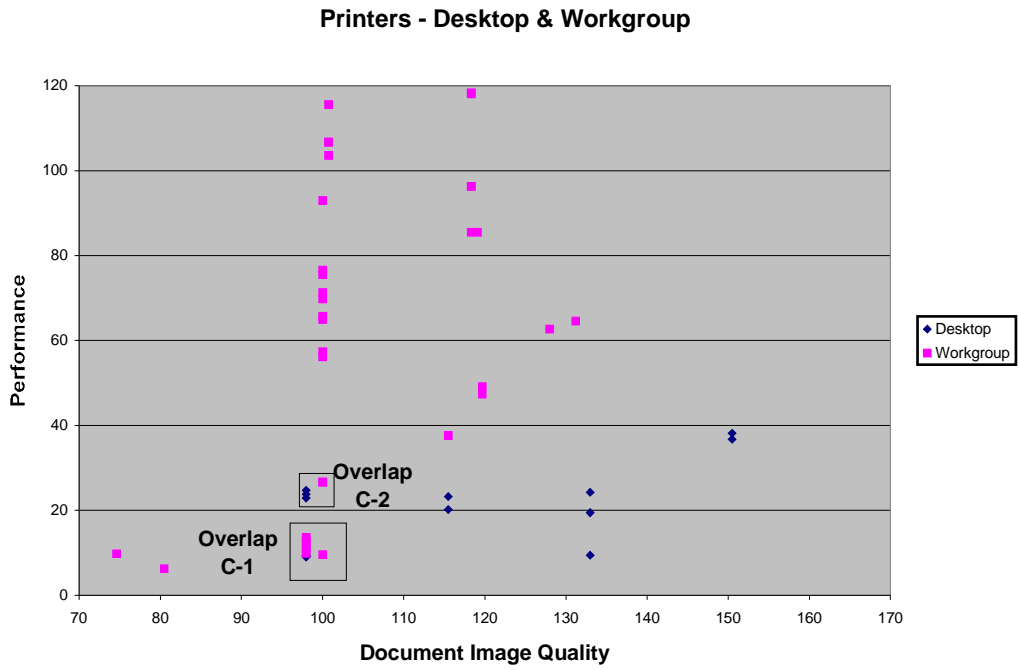


Figure 4.7.9: Overlaps, Desktop and Workgroup Printers

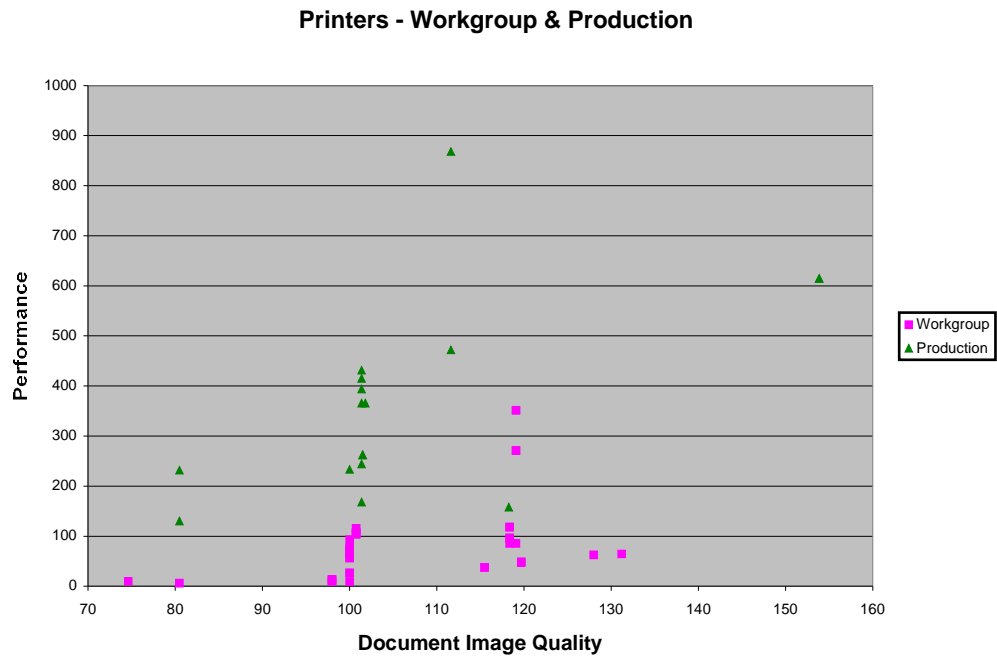


Figure 4.7.10: Overlaps (none), Workgroup and Production Printers

Table 4.13 shows a comparison of the overlap C-1 products. As the table shows, an overlap exists between the 4508 and the P8e and 385. The P8e offers better document image quality than the 4508 with roughly the same performance for \$250 less, while the 385 offers four functions at about the same document image quality and performance for only \$50 more than the 4508. There is no overlap involving the 385 and the 645, 657, and 745's because these products offer much higher CBP's within the multifunction market.

Function	Benefit	4508	P8e	385	645	657	745	745 DL	745 SX
	Price	\$ 550	\$ 300	\$ 600	\$ 2,000	\$ 2,400	\$ 3,000	\$ 3,500	\$ 3,500
Print	DIQ	100	132.9813	97.98	97.98	97.98	97.98	97.98	97.98
	Perf	9.56375	9.42	10.48	9.86	10.88	12.48	12.59	13.61
MF	DIQ			376.66	385.65	385.65	392.13	392.13	392.13
	Perf			150.70	190.21	211.20	193.90	195.75	211.78

Table 4.7.13: Overlap C-1 Product Comparison

Overlap C-2 consists of 3 desktop products (212, 214, and P12) and 2 workgroup products (4512, 4512N). The 212 and 214 products both print and copy, while the P12, 4512, and 4512 N are all DocuPrint printers. Table 4.14 shows the true overlap that exists for C-2 that involves the P12, 4512, and 4512N. For a few hundred dollars less with about the same document image quality and performance, a customer can purchase a P12 instead of a 4512 or 4512 N. The 212 and 214 are not a part of this overlap because of their dual print/copy functionality and significantly higher prices.

Benefit	212	214	P12	4512	4512N
Price	\$ 2,065	\$ 2,525	\$ 500	\$ 875	\$ 1,150
DIQ	97.98	97.98	97.98	100.00	100.00
Perf	22.89	24.70	23.81	26.63	26.63

Table 4.7.14: Overlap C-2 Product Comparison

Figures 4.11 and 4.12 show segment comparisons for copiers. As the figures show, there appears to be only one overlap, labeled C-3, for the desktop/workgroup segments. Overlap C-3 consists

of 4 desktop products (212 copier, 214 copier, 212 printer/copier, 214 printer/copier), and two workgroup copier products (5624 and 5626). The 212 and 214 are 12- and 14-cpm, respectively, digital copiers and copiers/printers, while the 5624 and 5626 are 24- and 26-cpm, respectively, analog copiers. Table 4.15 shows the relationship between these products.

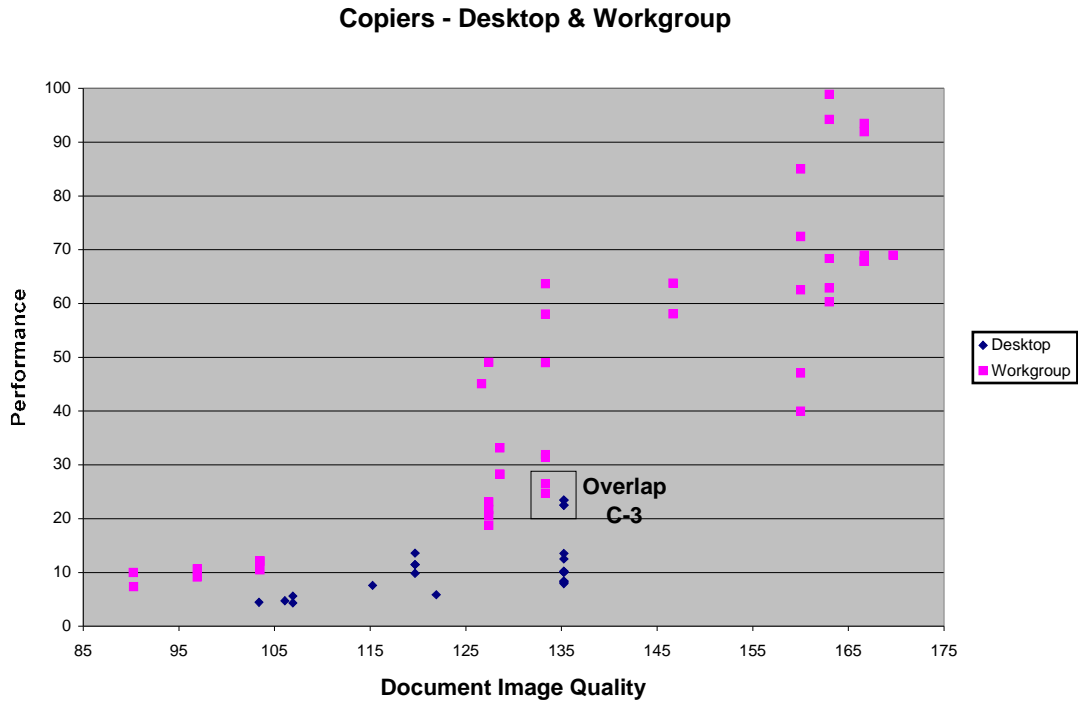


Figure 4.7.11: Overlap (C-3), Desktop and Workgroup Copiers

Copiers - Workgroup and Production

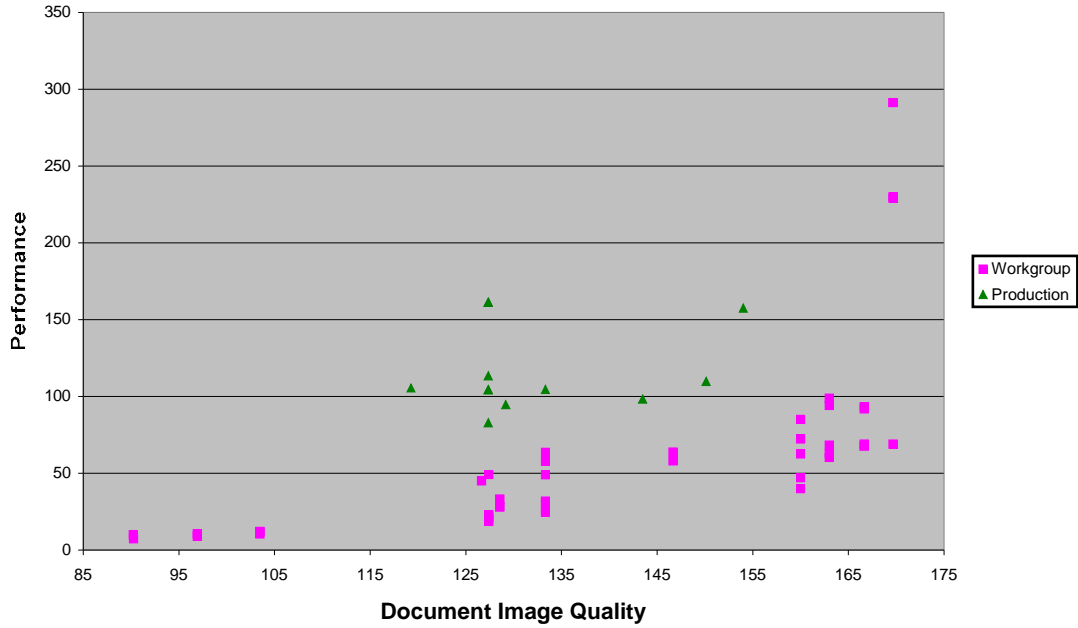


Figure 4.7.12: Overlap (none), Workgroup and Production Copiers

Benefit	212 C	214 C	212 P/C	214 P/C	5624	5626
Price	\$ 1,695	\$ 1,930	\$ 2,065	\$ 2,525	\$ 2,900	\$ 6,845
DIQ	135.26	135.26	135.26	135.26	133.33	133.33
Perf	22.49	23.44	22.49	23.44	24.71	26.51

Table 4.7.15: Overlap C-3 Product Comparison

As Table 4.15 shows, for much less money a customer can purchase a 212 or 214 copier, or a 212 or 214 copier/printer that has slightly better document image quality and slightly lower performance than the 5624 and 5626. Thus, an overlap exists for these products.

Figures 4.13 and 4.14 show the product comparisons for print/copy product and multifunction devices, respectively. As the figures show, there do not appear to be any cross-segment overlaps in either case.

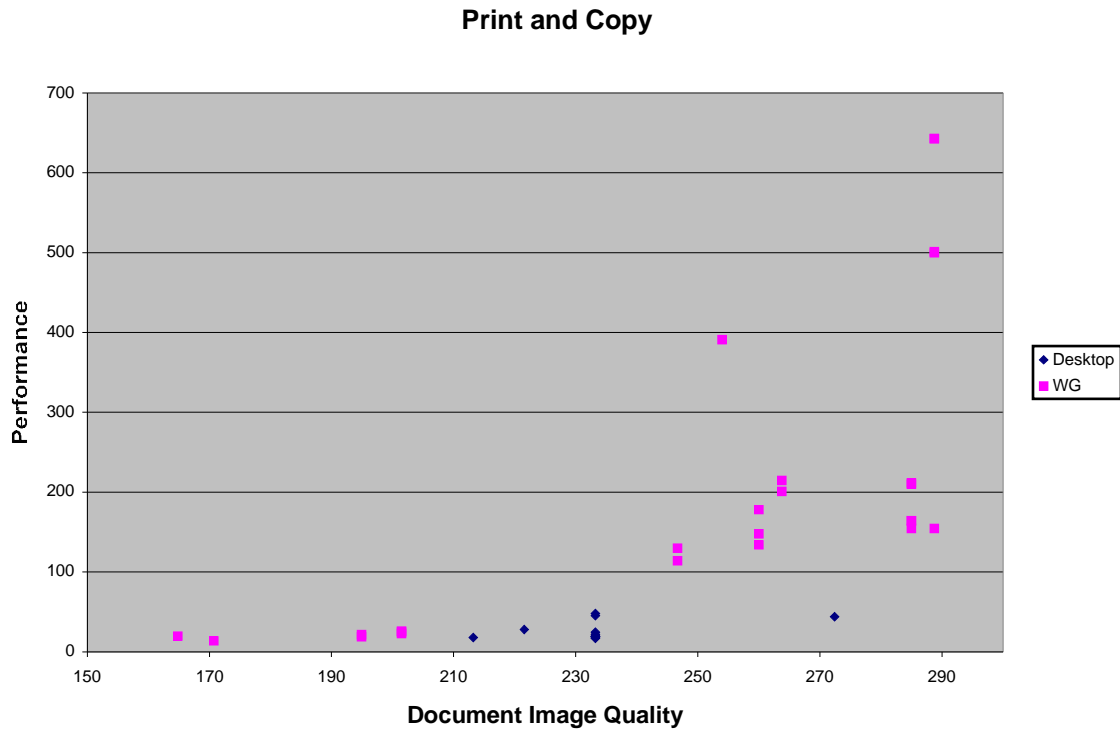


Figure 4.7.13: Overlap (none), Print and Copy Products

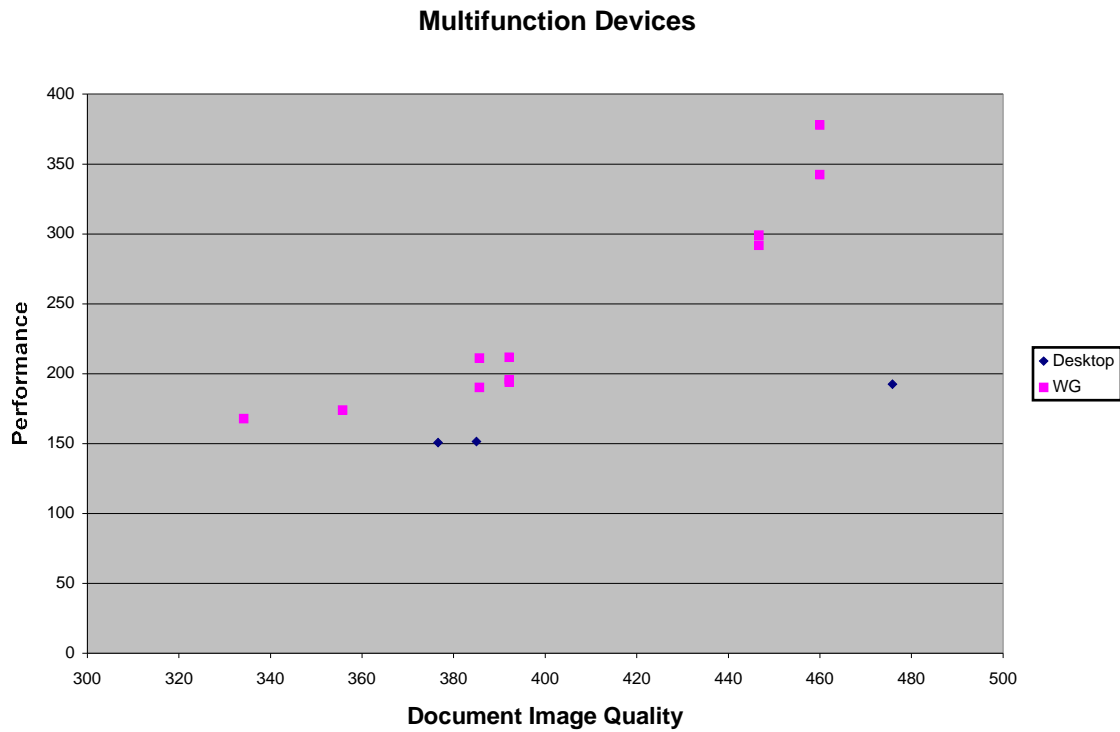


Figure 4.7.14: Overlap (none), Multifunction Devices

7.2.8.1.2 Vector of Differentiation

The focus of the vector of differentiation analysis here is on consistency of the vectors of differentiation. Since the researchers do not have knowledge of the planned vectors of differentiation, verification of these vectors cannot be made. Figures with all of the calculated vectors of differentiation are presented first and discussed in the paragraphs immediately following the figures.

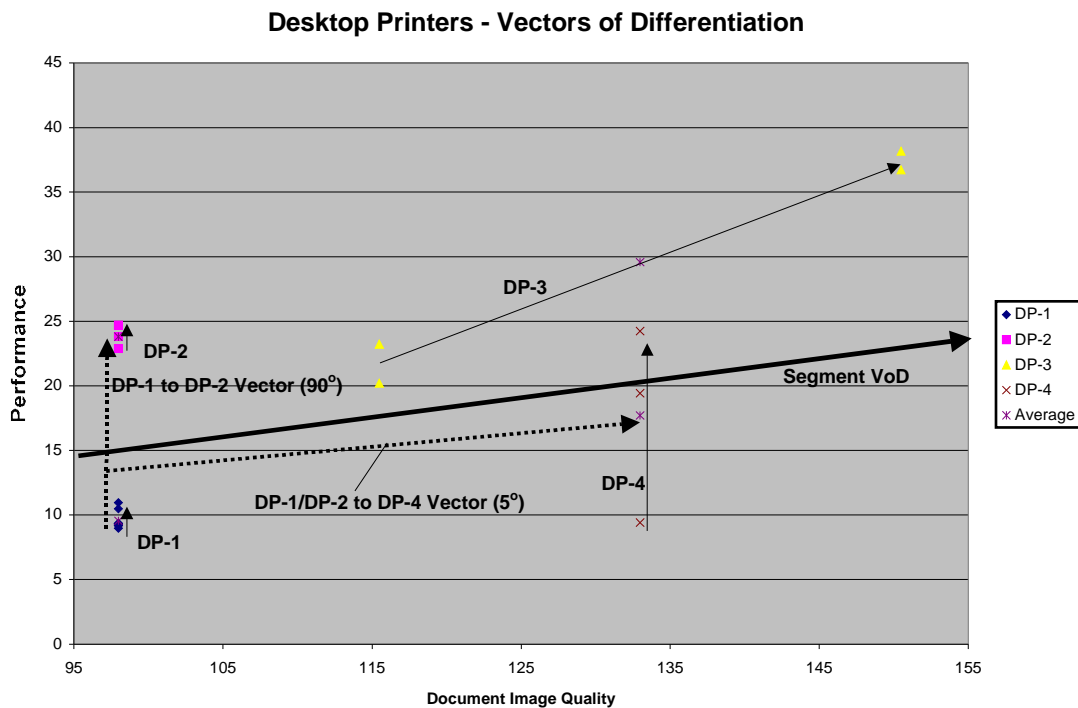


Figure 4.7.15: Xerox Vectors of Differentiation for Desktop Printers

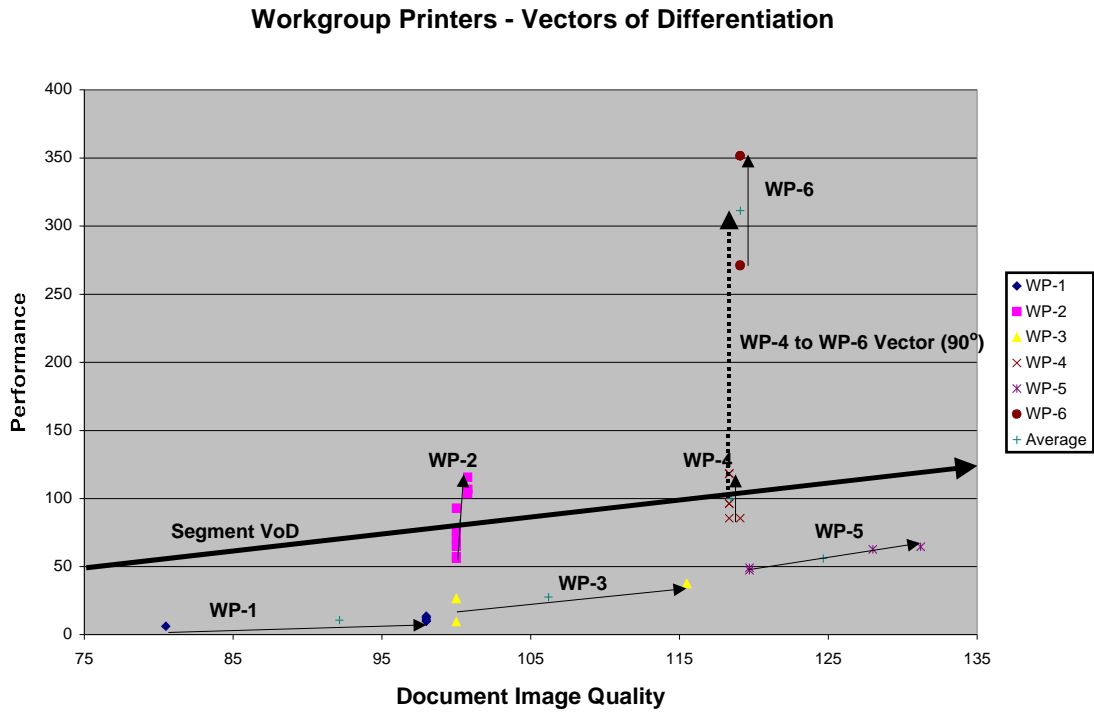


Figure 4.7.16: Xerox Vectors of Differentiation for Workgroup Printers

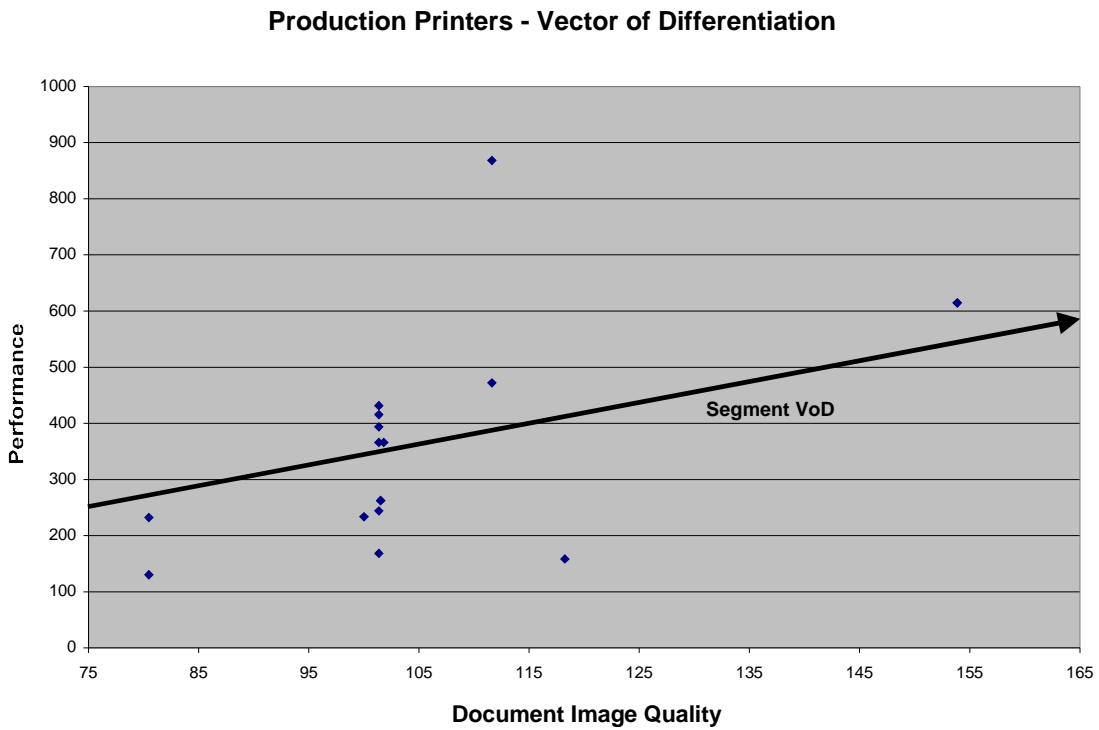


Figure 4.7.17: Xerox Vectors of Differentiation for Production Printers

Desktop Copiers - Vectors of Differentiation

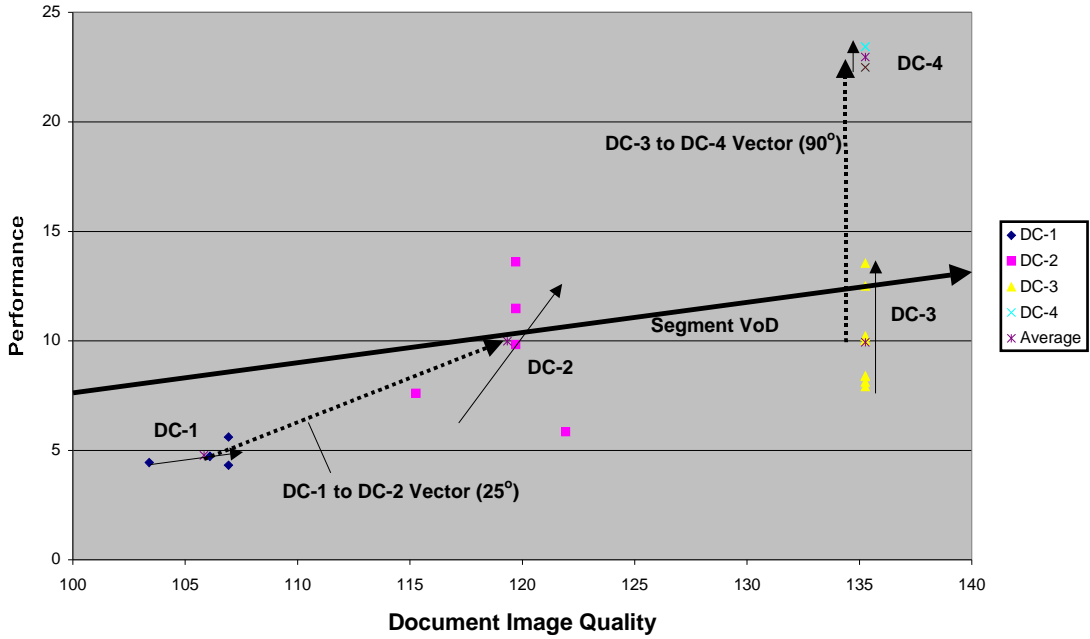


Figure 4.7.18: Xerox Vectors of Differentiation for Desktop Copiers

Workgroup Copiers - Vectors of Differentiation

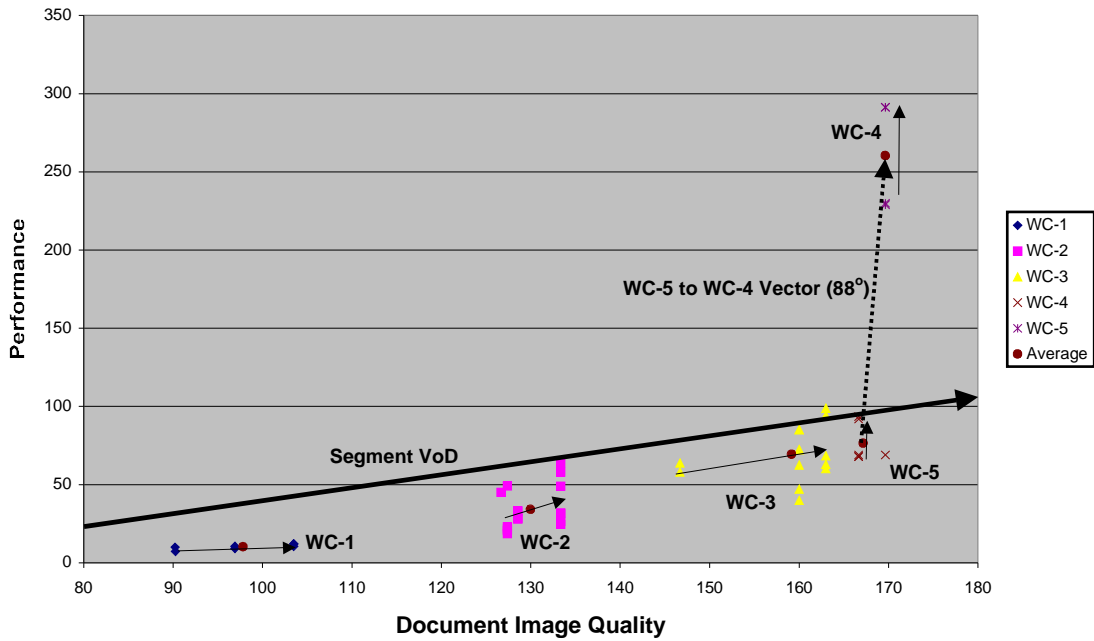


Figure 4.7.19: Xerox Vectors of Differentiation for Workgroup Copiers

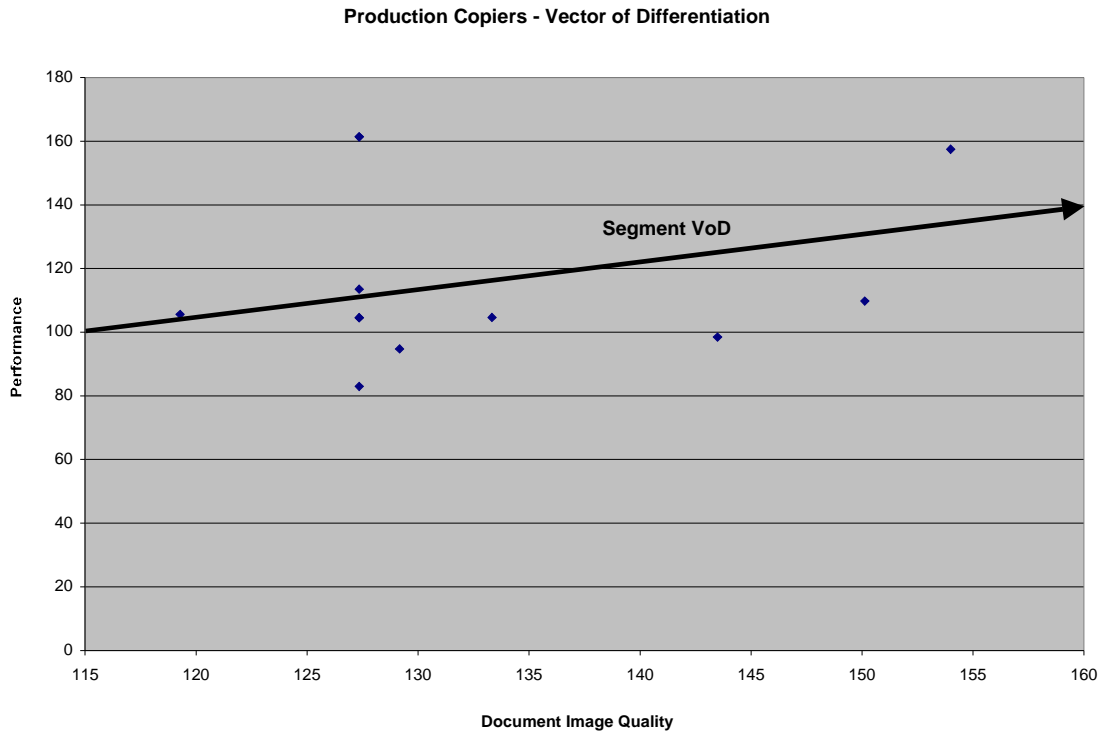


Figure 4.7.20: Xerox Vectors of Differentiation for Production Copiers

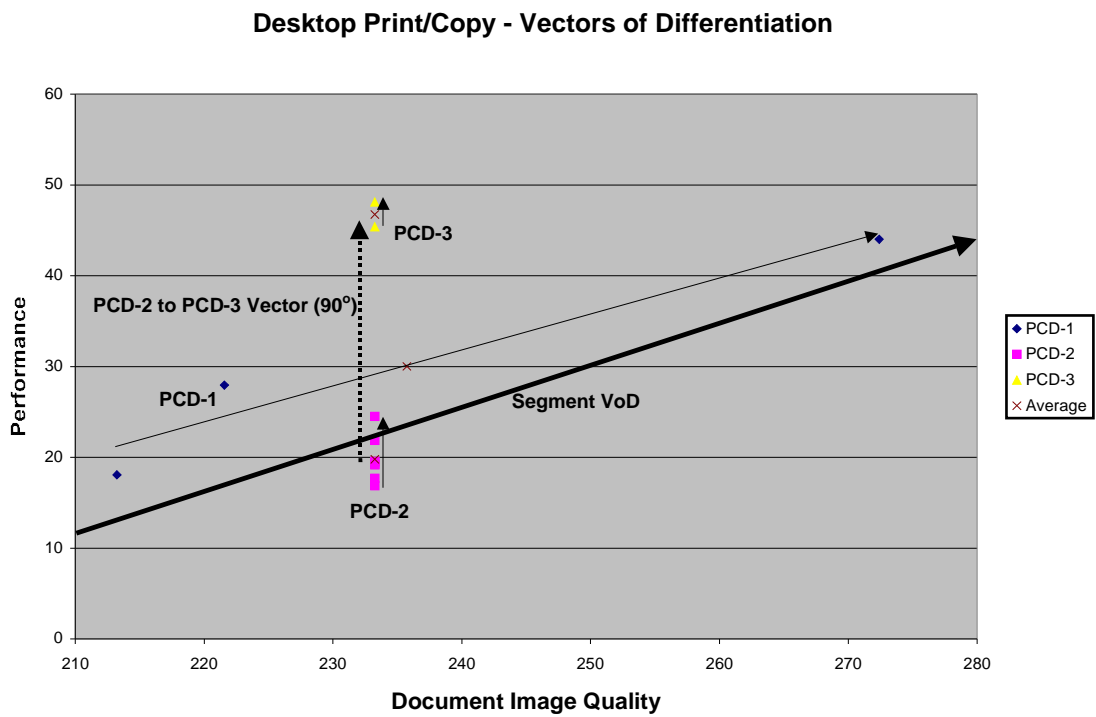


Figure 4.7.21: Xerox Vectors of Differentiation for Desktop Print/Copy

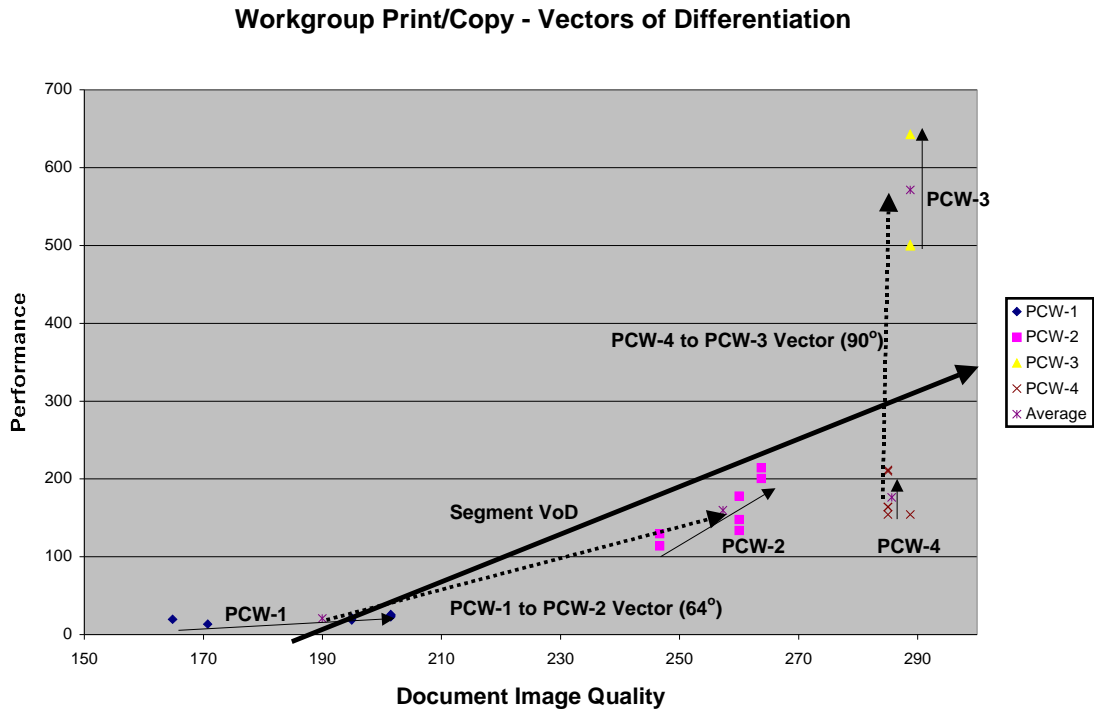


Figure 4.7.22: Xerox Vectors of Differentiation for Workgroup Print/Copy

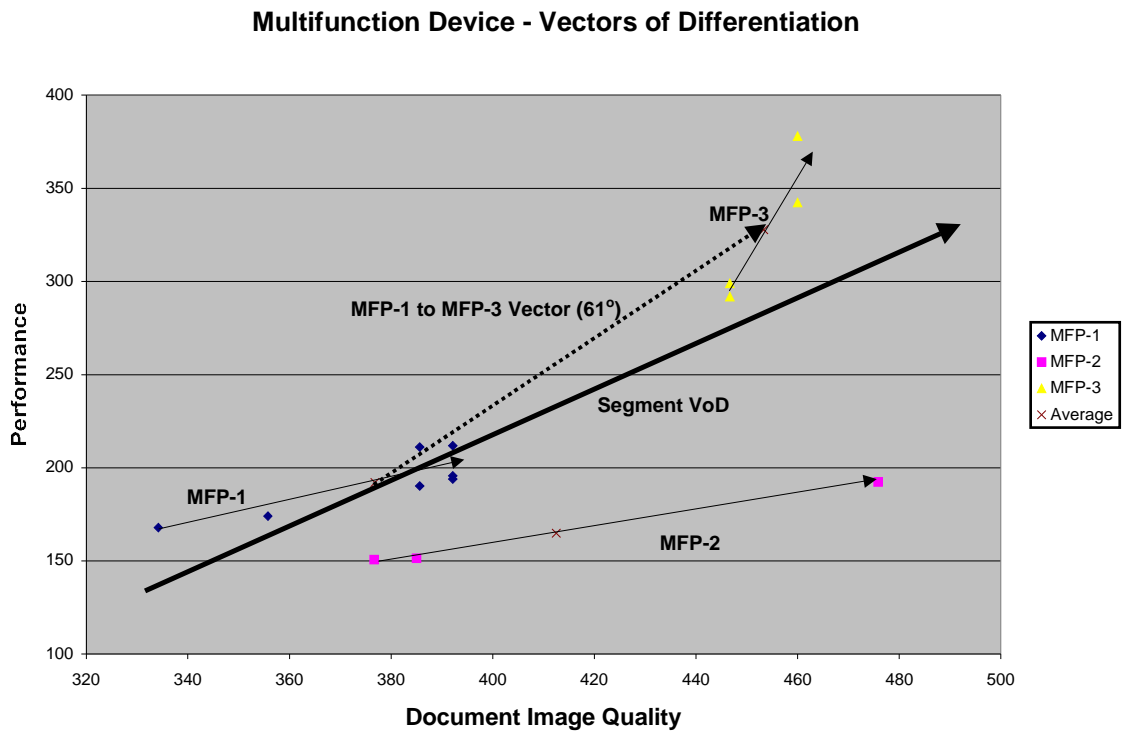


Figure 4.7.23: Xerox Vectors of Differentiation for Multifunction Devices

1. Within families

Table 4.16 lists the family vectors of differentiation for all of Xerox's families. From the data and graphs, it appears that the vector directions are not consistent across all of the families in any market segment. Many product families are differentiated at a 90 degree angle, meaning that products are offered for a range of performance levels for a given level of document image quality. Other families are differentiated at vector directions somewhere between 9.5 degrees and 79 degrees.

A conclusion that can be drawn from this data is that multiple differentiation vector strategies are being pursued/have been pursued with the various families within each segment. However, observing the family vectors by themselves does not provide much insight into the differentiation consistency across the portfolio. They must be viewed together with the appropriate cross-family vectors and segment vectors for the true significance to be uncovered.

Function	Segment	Family	Direction (degrees)	Magnitude	
				Benefit Range	# Products
Printers	Desktop	DP-1	90	173	10
		DP-2	90	176	3
		DP-3	24	3409	4
		DP-4	90	1971	3
	Workgroup	WP-1	22	832	7
		WP-2	88	6024	10
		WP-3	46	3390	4
		WP-4	90	3853	6
		WP-5	54	2798	3
		WP-6	90	9624	4
Copiers	Desktop	DC-1	9.5	3	4
		DC-2	50	752	4
		DC-3	90	762	10
		DC-4	18	272	2
	Workgroup	WC-1	21	587	7
		WC-2	61	5869	21
		WC-3	39	7604	14
		WC-4	90	4272	6
		WC-5	90	4562	4
		Print/Copy	Desktop	PCD-1	5
PCD-2	90			1586	8
PCD-3	45			748	2
Workgroup	PCW-1		22	2855	7
	PCW-2		86	28380	7
	PCW-3		79	16321	4
	PCW-4		90	46213	6
Multi		MFP-1	77	26934	7
		MFP-2	42	1561	3
		MFP-3	79	43538	4

Table 4.7.16: Product Family Vectors of Differentiation

2. Cross-Families

For the products in Xerox's product portfolio, there are many cross-family vectors of differentiation that make sense to investigate. These involve families in a particular segment that have some sort of relationship. In the following discussion, the family relationships as well as the vector directions are discussed.

For the desktop printers segment (Figure 4.15), there are two important family relationships for which vectors should be defined. The first involves DP-1 and DP-2, which both consist primarily of products that do both laser printing and copying. The vector between these families is 90 degrees, meaning that the differentiation is solely along the performance benefit. Family DP-4 is a family of laser printers. By finding the average between the DP-1 and DP-2 families, and connecting this value to the average of DP-4, a vector of approximately 5 degrees is found. This means that the differentiation for the laser printing functions between the families is based almost solely on document image quality, with performance being approximately the same.

For workgroup printers (Figure 4.16), there is only one cross-family vector. This vector spans families WP-4 and WP-6, which are both families of color devices that both print and copy. The direction of this vector is approximately 90 degrees, indicating that the print/copy color devices in this segment are differentiated along the performance benefit.

In the desktop copiers segment (Figure 4.18), there are two cross-family vectors. The first is between families DC-1 and DC-2, which are analog copying machines. The vector direction between these two is approximately 25 degrees, meaning that there is an improvement in both product document image quality and performance from one family to the next. The second vector is between families DC-3 and DC-4, which are digital printers/copiers. This vector has a direction of 90 degrees, with the product differentiation being based on performance.

The cross-family vector for workgroup copiers (Figure 4.19) involves color printers/copiers. This vector is between families WC-4 and WC-5, and is at approximately 88 degrees.

There is one cross-family vector for the desktop printers/copiers (Figure 4.21), which once again involves laser/digital printers/copiers. The vector is between families PCD-2 and PCD-3, and has a direction of 90 degrees.

For workgroup printers/copiers (Figure 4.22), there are two cross-family vectors. The first involves two families (PCW-1 and PCW-2) that are multifunction products. The vector direction between these two families is approximately 64 degrees, giving a substantial jump in performance as document image quality is increased. The second vector is again between color print/copy devices (PCW-4 and PCW-3). As in both the print and copy workgroup segments, this vector direction is again 90 degrees.

Finally, for multifunction devices (Figure 4.23) there is a cross-family vector between MFP-1 and MFP-3, which are workgroup devices. The angle is approximately 61 degrees, which is almost identical to that vector angle between families PCW-1 and PCW-2 for workgroup printers/copiers.

3. Across segments

Table 4.17 lists the segment vectors of differentiation for Xerox's products (graphical version are in Appendix 1, Section 3). As the table shows, within each function, the directions of the vectors of differentiation are not consistent across segments. The directions have a relatively shallow angle for desktop products, meaning that products across the segment are differentiated more strongly along document image quality than performance. The vector directions are much higher for workgroup segment products, where the vectors seem to be more closely oriented toward differentiation along both the document image quality benefit as well as the performance benefit. The highest vector directions can be found for the production segments, where it appears that the strategy is to offer a much wider range of performance for products than for document image quality.

Function	Segment	Direction (degrees)	Magnitude		
			Benefit Range	# Products	# Families
Printing	Desktop	9.5	4842	20	4
	Workgroup	39	41358	34	6
	Production	75	86462	16	1
Copying	Desktop	15	2711	20	4
	Workgroup	34	50375	52	5
	Production	45	11683	12	1
Print/Copy	Desktop	26	8133	13	3
	Workgroup	74	196250	24	3
Multifunction		51	117786	14	3

Table 4.7.17: Market Segment Vectors of Differentiation

By combining the vector data presented so far for within families, across families, and within segments, several trends can be observed. First, laser-based B/W printer/copiers within a segment are generally differentiated along the performance benefit, with the DIQ being roughly the same for all of the products. Second, laser-based color printers/copiers are differentiated along performance as well, with roughly the same document image quality. Third, laser color printers appear to be differentiated along a 54-degree direction. Fourth, color inkjet products are differentiated along a 24-degree direction. Fifth, laser B/W printers are differentiated differently depending upon the family in which they are located. Multifunction devices appear to be differentiated along relatively high vector directions, providing a wide range of performance per unit image quality. Finally, analog copiers have differing vector directions depending upon the segment in which they are located.

Given these observations, it appears that there are some common vectors being pursued for similar products and families. These vectors appear to be located almost solely within each segment for each product function, which is to be expected due to Xerox's company organization. Thus Xerox appears to be incorporating certain differentiation strategies for various families in each segment, and these have been observed with the vector directions discussed here.

7.2.8.2 *Gaps*

In order to be able to observe gaps within the product portfolio, the Core Benefit Propositions of Xerox's products have been mapped against the products of several other companies in the marketplace. By analyzing the relationships between the products in each segment, the product portfolio gaps in both CBP's and the vector of differentiation will be identifiable.

7.2.8.2.1 Core Benefit Propositions

In order to observe gaps in the Core Benefit Propositions for products in Xerox's portfolio, the segments of each relevant function were studied. Areas on the Core Benefit maps were then located where there appeared to be gaps where competitors had products but Xerox had none.

Six possible gaps were identified for Xerox's product portfolio. Three of these gaps are located in desktop printers, one in workgroup printers, one in desktop copiers, and one in multifunction devices. No readily observable gaps exist in the segments for the other functions considered, as Xerox appears to be very strong in these areas.

Figure 4.24 shows the portfolio gaps for the desktop copiers printers. Three gaps have been identified: G-1, G-2, and G-3. G-1 consists of HP products 420C and 340, and the Canon BJC 250 and 255. These are relatively low-end desktop printers that fall outside of the Xerox desktop printer families. Their performance is similar to that of the products in family DP-1, but the document image quality appears to be higher due to color printing capabilities.

Gap G-2 consists of higher performance-level color inkjet HP printers (710C, 1120C, 880C, 895C, 720C). Xerox does not have any products that match the combined levels of document image quality and performance offered with these products. Gap G-3 consists of Cannon color bubble-jet printers (BNJC6000, BJC5100, BJC5000) and Epson color inkjet printers (640, 740, 740i). Xerox has no product match for these as well along the combined performance/document image quality dimension.

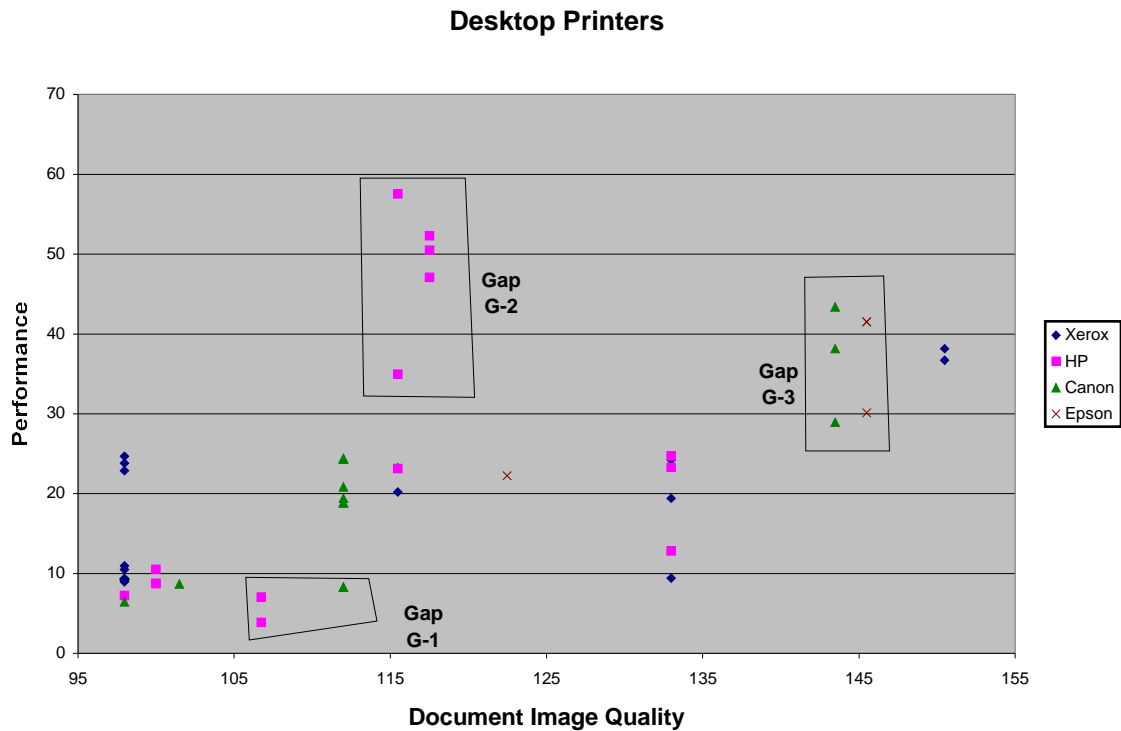


Figure 4.7.24: Gaps for Desktop Printers

Figure 4.25 shows the gap for the workgroup printers segment. Gap G-4 consists of high-performance networkable laser printers from both HP (4000TN, 4000N, 400T, 4000, 5000, 8100, 8000, Mopier 240, Mopier 320) and Epson (3000, 1520, 1200, 800, 850Ne, 850). Xerox has product offerings that have CBP's on par with the G-4 products in terms of performance, but no products that match both the level of performance and image quality that the G-4 products offers.

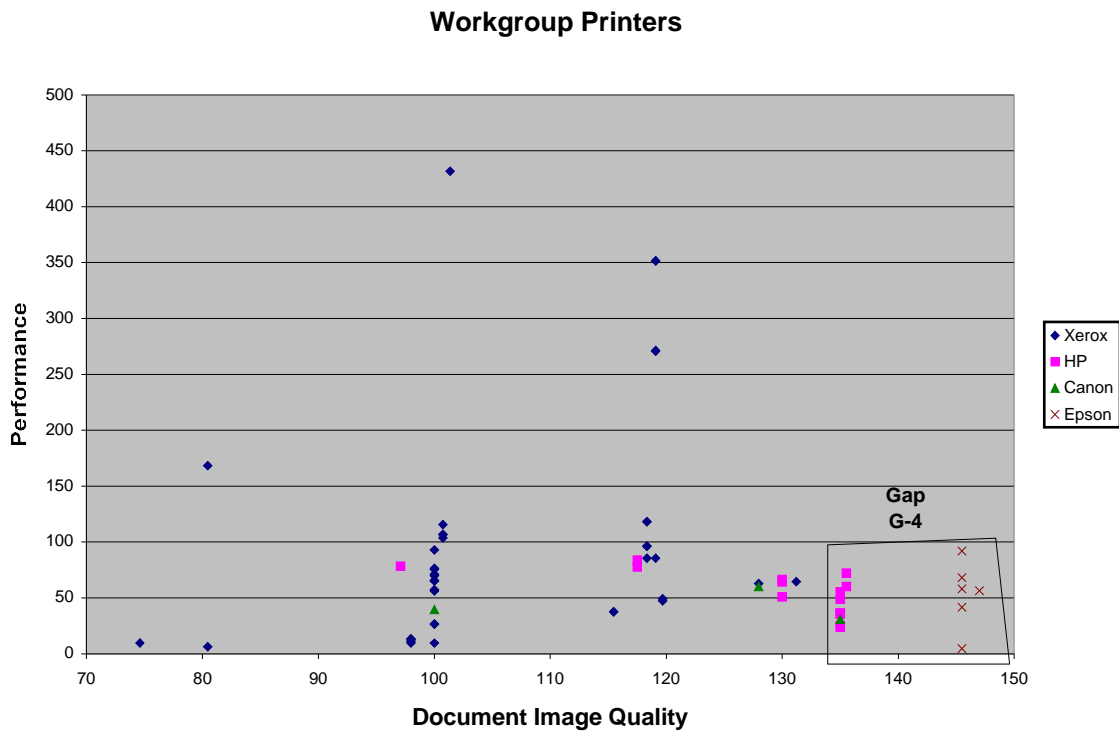


Figure 4.7.25: Gaps for Workgroup Printers

Figure 4.25 shows the gaps for desktop copiers. Gap G-5 consists of three Canon products (PC430, PC 400, PC420) and five Sharp products (UX-460, UX-500, UX-510, UX-600M, UX-3600M, UX-2200CM) that are not only copiers but printers, scanners, and fax machines as well. Xerox has products that offer approximately the same levels of performance for copying, but the competitor products in the gap have significantly higher levels of document image quality.

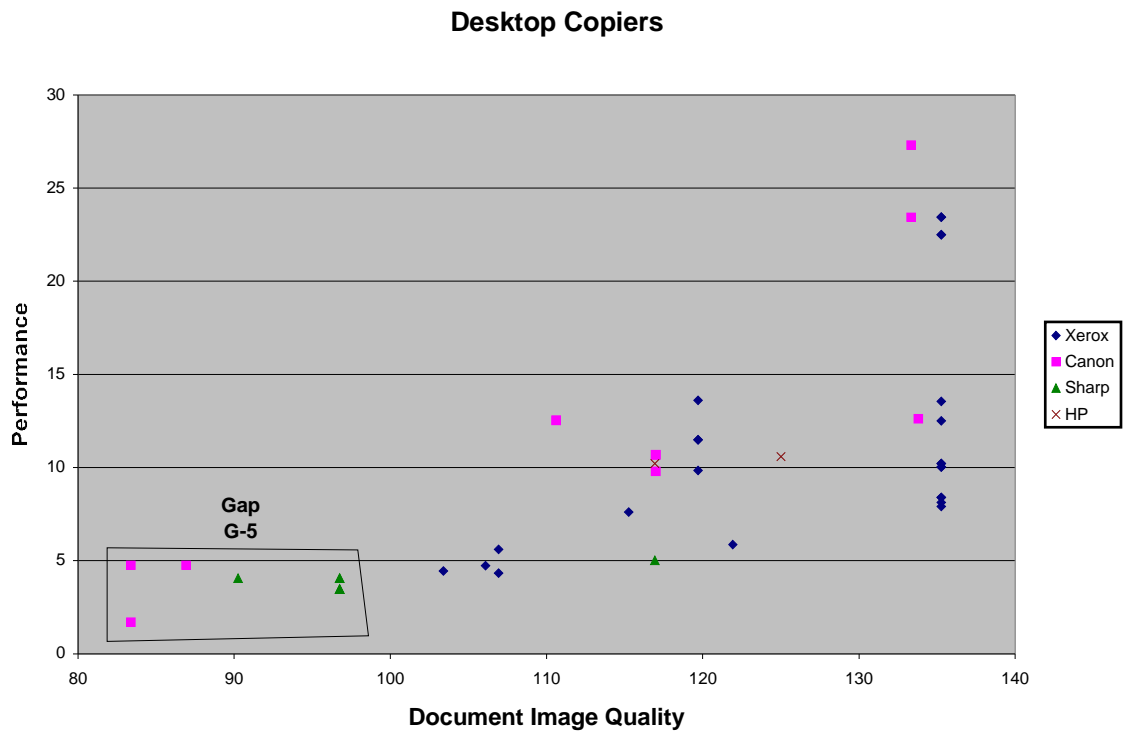


Figure 4.7.26: Gaps for Desktop Copiers

Figure 4.27 shows the gaps for multifunction devices. Gap G-6 consists of the HP 3100, which is a B/W machine, and the Canon C5500 and C635, which are color inkjet multifunction devices. Xerox has products that are similar in nature to these products, but the combined CBP's do not match those in G-6.

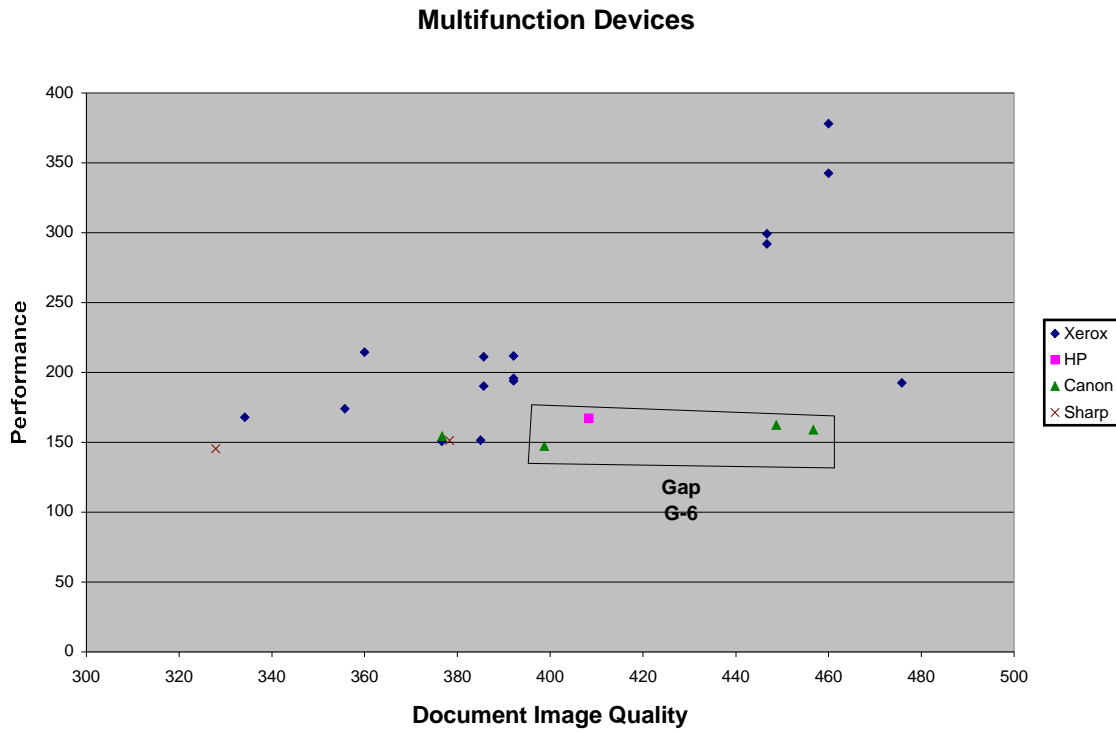


Figure 4.7.27: Gaps for Multifunction Devices

7.2.8.2.2 Vector of Differentiation

Table 4. 18 below shows a comparison of the vectors of differentiation among Xerox and several of its competitors. Figures 4.28 through 4.34 show graphical versions of this data.

Function	Segment	Xerox	HP	Canon	Epson	Sharp
Vector Direction (degrees)						
Printing	Desktop	9.5	30	32	33	-
	Workgroup	39	-50	0	90	-
	Production	75	-	-	-	-
Copying	Desktop	15	3.5	17	-	3
	Workgroup	34	90	70	-	-
	Production	48	-	-37	-	-
Print/Copy		26	46	20	-	10
Multi		51	-	9	-	9

Table 4.7.18: Vector Direction Comparison

The desktop printers segment (Figure 4.28) shows Xerox having a much lower direction angle for its vector of differentiation in contrast to all three of the other competitors considered here. HP, Canon, and Epson all have vector directions between 30 and 30 degrees, while Xerox is around 9.5 degrees. This may be an area for improvement for Xerox, as all three competitors considered here have greater market share in this segment.

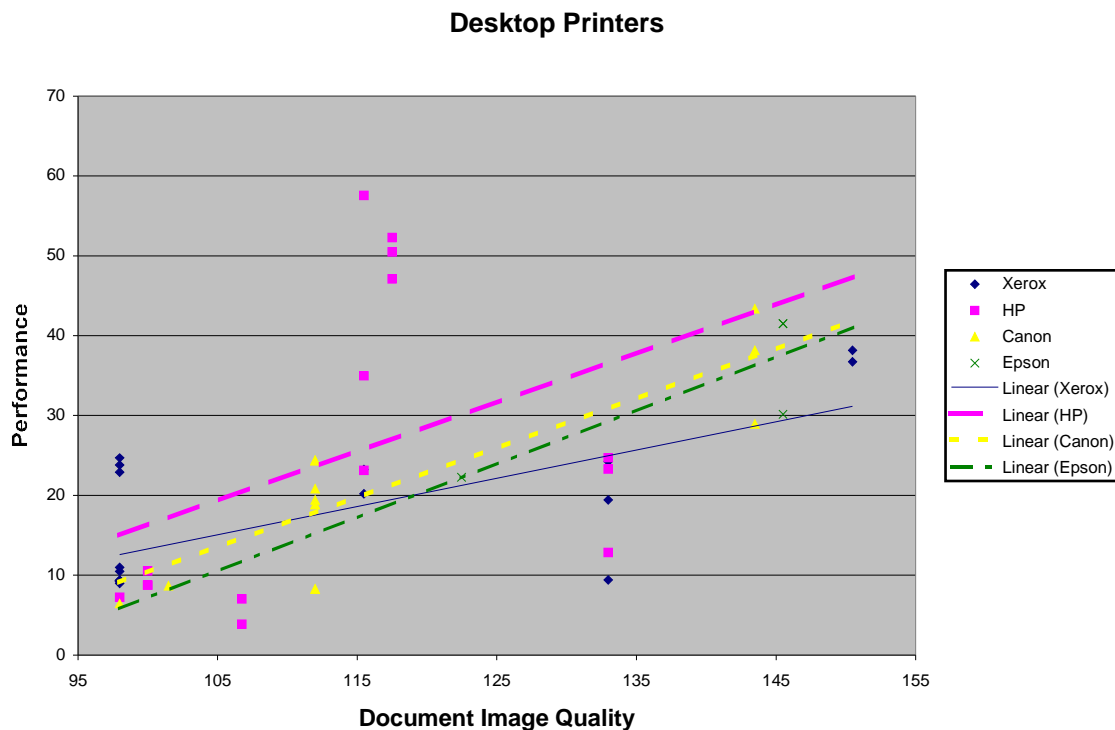


Figure 4.7.28: Competitive Vectors – Desktop Printers

For workgroup printers (Figure 4.29), the vectors of differentiation directions for the products have a wide range. Xerox products have a 39-degree angle, while HP is at -50 degrees, indicating that as these products have a relatively lower level of performance at higher levels of document image quality. Canon's products have a direction of zero degrees, meaning that the products have roughly the same performance level for varying levels of document image quality. Finally, Epson appears to have one family of products differentiated around performance for the same document image quality level.

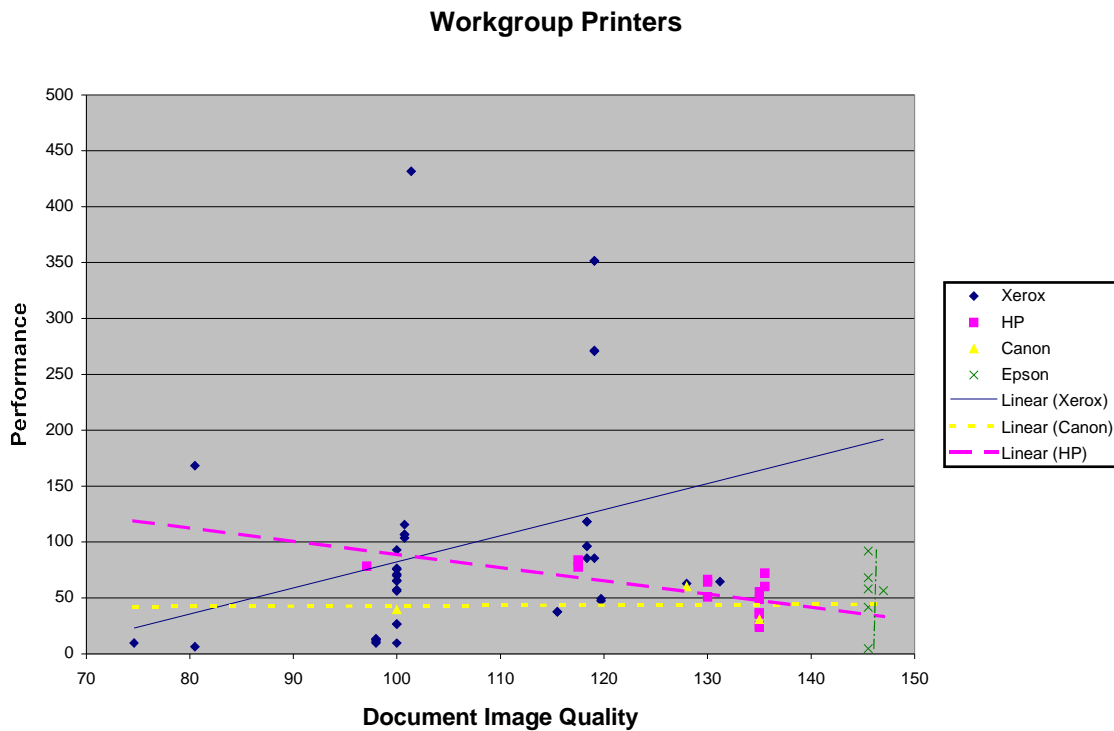


Figure 4.7.29: Competitive Vectors – Workgroup Printers

For desktop copiers (Figure 4.30), there appears to be two different types of differentiation strategies being pursued among the biggest players in the segment. Xerox and Canon (15 and 17 degrees, respectively) appear to have similar differentiation strategies, while Sharp and HP have shallower differentiation directions (3 and 3.5 degrees, respectively). These vector directions could be one of the determining factors in making Xerox and Canon the segment leaders, while Sharp and HP trail, although HP is not a strong competitor in the segment.

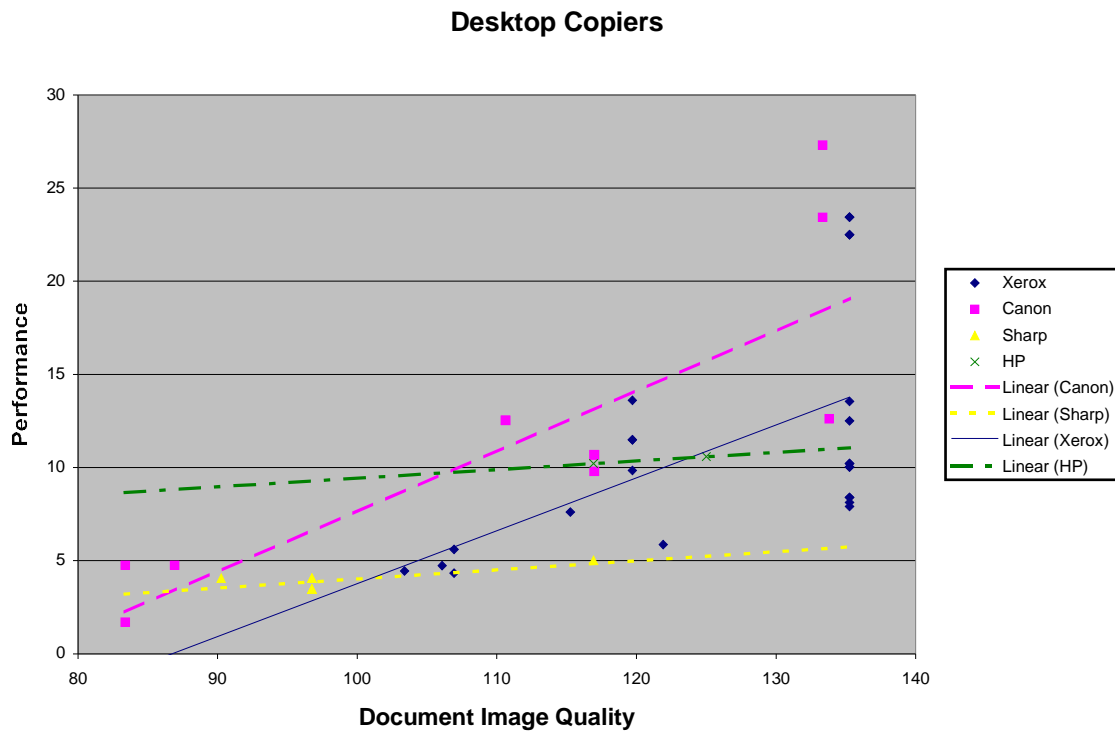


Figure 4.7.30: Competitive Vectors – Desktop Copiers

In the workgroup copiers segment (Figure 4.31), Canon has a higher vector of differentiation direction angle than Xerox (70 degrees to 34 degrees), meaning that Canon offers more performance for an increase in image quality than does Xerox. For an economic impact analysis, further investigation should be conducted for this segment to determine which angle the customers will prefer. The same can be said for the production copiers segment (Figure 4.32), where Xerox has a larger differentiation angle than Canon (48 degrees to -37 degrees).

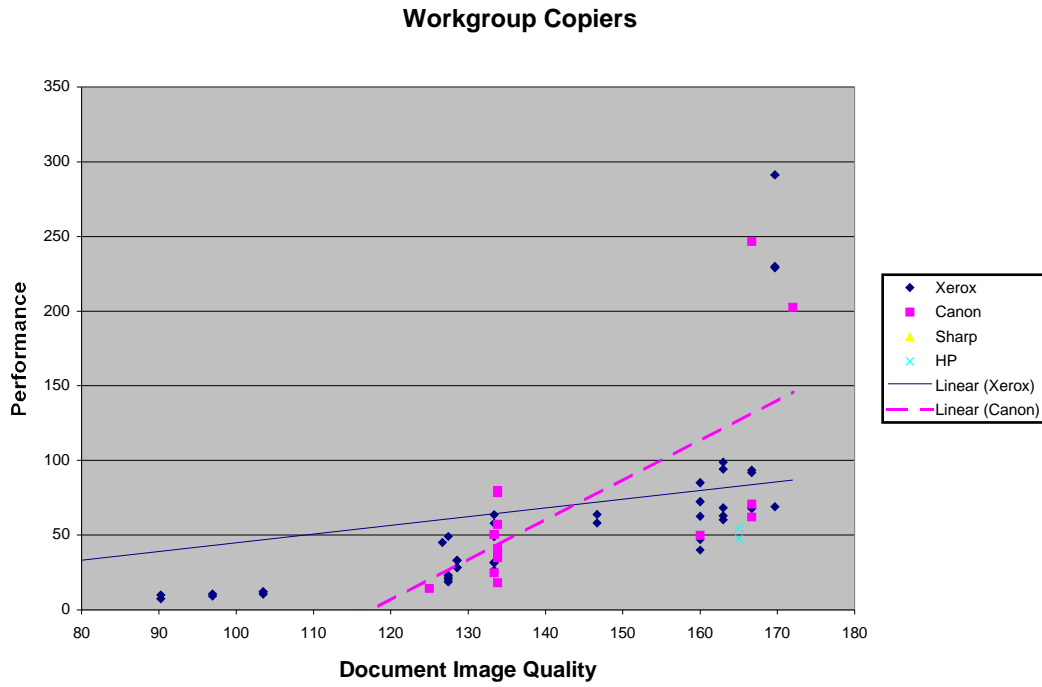


Figure 4.7.31: Competitive Vectors – Workgroup Copiers

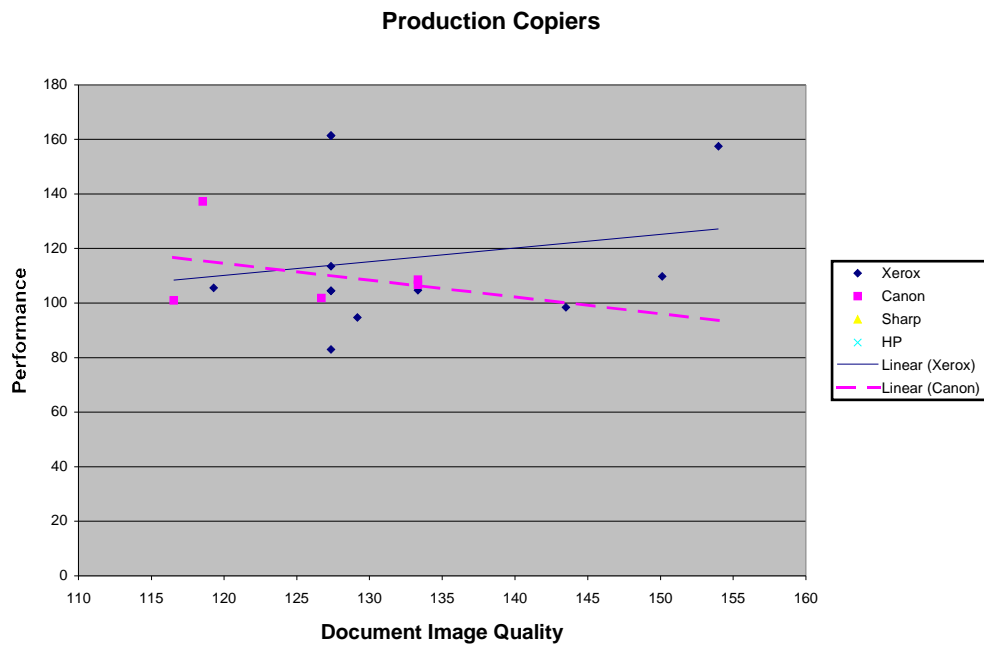


Figure 4.7.32: Competitive Vectors – Production Copiers

The vectors of differentiation for the Xerox products in the print/copy (Figure 4.33) markets are at a much higher angle than competitor products. This appears to be due to Xerox's larger focus on higher-performance workgroup machines in contrast to competitors' foci toward desktop products for these products.

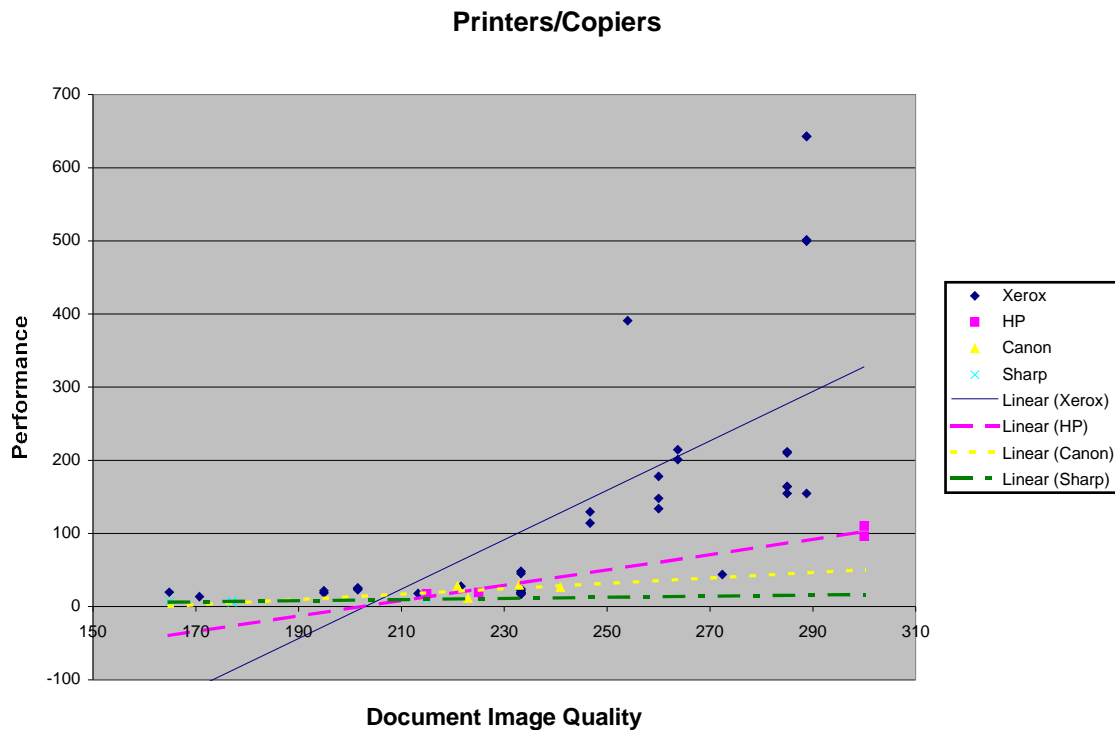


Figure 4.7.33: Competitive Vectors - Printer/Copier

Finally, for multifunction devices, Xerox has a much larger differentiation angle than either Canon or Sharp (51, 9, and 9 degrees, respectively). It appears that Canon and Sharp have chosen similar strategies, while Xerox has pursued one that includes higher performance for these devices.

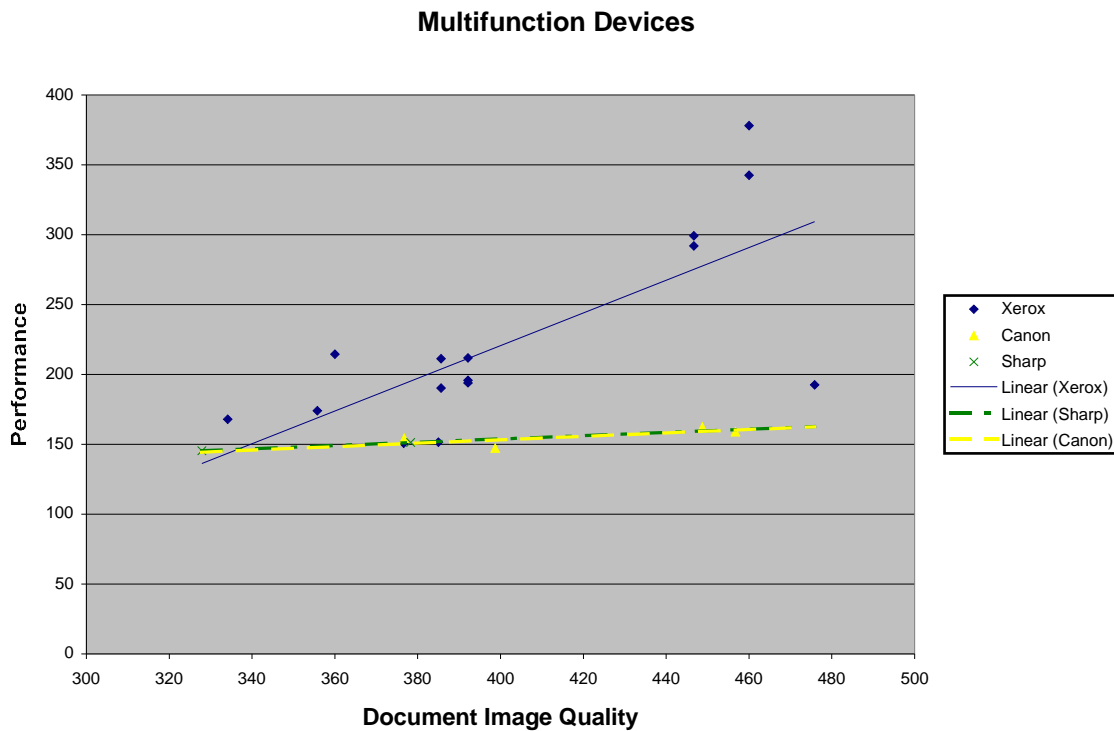


Figure 4.7.34: Competitive Vectors - Multifunction Devices

7.3 Conclusions from Analysis

7.3.1 General Conclusions from Case

From the analysis performed and discussed in this chapter for Xerox's product portfolio, several conclusions can be drawn. First, there were a relatively high number of product overlaps within families due to the commonalities that exist between these products. There were also a low number of overlaps across families and across segments. A conclusion that can be drawn from these statements is that Xerox has planned their product portfolio very well in order to avoid confusing customers and wasting resources by designing products that are too similar.

The next conclusion that can be made is that Xerox pursues common differentiation strategies for similar products along the benefit dimensions considered in this analysis. The differentiation strategies vary across products and families that are not related in technologies, functions, or

segments, but appear to be consistent for products that are similar along several characteristics. While a segment differentiation vector can be defined, Xerox may or may not explicitly define this when planning its product portfolio. The segment vectors do, however, provide a basis for which to compare the product portfolio to those of competitors

Finally, competitors appear to pursue different differentiation vectors than those of other companies. In several of the segments one or two companies had a similar vector direction, but in most cases the vector directions varied widely. Companies appear to be willing to pursue the direction that they feel customers will be most likely to accept, even if this appears to be different from those directions that others in the market are following.

7.3.2 Next Steps

The analysis performed within this chapter covers only a small part of the potential that using overlaps and gaps possesses. The purpose of this analysis has been to simply identify overlaps and gaps in the portfolio. These overlaps and gaps must now be further investigated and put into the correct context as to potential impact on the product portfolio. This should consist of investigating the markets where the overlaps and gaps exist, assessing market growth, market share, competitor strengths and weaknesses, etc., to assess the full financial impact of the overlaps/gaps on the product portfolio.

The analysis performed here only took into account the current product portfolio and market. This analysis should next be applied to future market trends and development projects. This will aid the company when making decisions for new products, such as whether to develop a new platform or simply create a derivative off of an existing platform. Performing this analysis with new products also helps to avoid producing redundant products that are too similar to existing ones. If a product is mapped and appears to overlap with an existing product in an undesirable manner, the development project for that product can be altered to avoid the redundancy. A company can also use the gaps as the target of new product introductions in an attempt to take share away from entrenched competitors.

Xerox may want to perform this analysis for different sets of customer groups. The customers considered in this case study were a hypothetical group, but a group that could exist. However, many others customer groups will have different priorities and values than the hypothetical group, and thus each one must be investigated to find overlaps and gaps for those customers.

Finally, an investigation should be conducted concerning the vectors of differentiation for each segment. The purpose of this investigation is to determine the vector directions that customers prefer for their needs. Each company has chosen to pursue some vector direction; it is important to determine the “best” direction in the eyes of the customer that will produce long-term profitability and competitiveness in the marketplace.

8

9 CONCLUSION

9.1 Conclusions from Research

The front-end of the product development process has been shown to be a key part of determining the success or failure of a product portfolio in the marketplace. Much time and effort must be spent planning and analyzing product portfolios so that they may be successful. An important part of this front-end product planning is performing a product portfolio analysis. It allows the company to assess the strengths and weaknesses of the current and planned product portfolios so that adjustments can be made as necessary to ensure long-term competitiveness and profitability. One part of the product portfolio analysis is the overlap/gap analysis that is the focal point of this thesis. The purpose of the overlap/gap analysis is to identify opportunities for improvement to offer a more attractive product portfolio to customers in terms of meeting a range of needs that is optimal for the company.

Product portfolio overlaps were defined as areas in the portfolio where a similar marketing mix for different products is offered to the same/similar customers. They are identified in relation to the company's own product offerings. The benefits for identifying overlaps include reducing customer confusion about similar products, reducing development and marketing spending on redundant products, and limiting product cannibalization in the marketplace.

Product portfolio gaps were defined as areas in the product portfolio where the marketing mix does not meet the needs of some group of customers. This group of customers can consist of two types: customers who are targeted by the marketing mix whose needs the mix does not meet, and a group of customers that are not targeted by a marketing mix. Product portfolio gaps are defined relative to the market needs and competitive offerings. The long-term benefits for identifying gaps include finding additional market niches in which to offer new or improved products, increasing revenues and market share, and preventing competitors from entrenching themselves in market niches.

Two key concepts discussed in this thesis for identifying overlaps and gaps are the Core Benefit Proposition and the Vector of Differentiation. The Core Benefit Proposition was defined as a statement that summarizes the primary benefits offered by a product to the target market. It states the benefits for a product that are required to meet or surpass those offered by competitive products, and differentiating features that are unique to the particular product in meeting customer needs. The Vector of Differentiation was defined as a “thematic characteristic that consistently differentiates, in the mind of the customer, the set of product offerings...across all targeted segments within the market.” This vector defines the “direction” along which a group of Core Benefit Propositions are consistently differentiated.

An approach was defined for identifying product portfolio overlaps and gaps that was based on the measurement and analysis of product Core Benefit Propositions and Vectors of Differentiation. This approach consisted of eight steps: defining the product portfolio, defining key customer benefits, defining product attributes and specifications, choosing a datum reference product, determining measures for product core benefit propositions and mapping the core benefits, determining portfolio vectors of differentiation, and identifying portfolio overlaps and gaps. The keys to this approach were the measurement and comparisons of product Core Benefit Propositions and portfolio Vectors of Differentiation.

The overlap/gap identification approach was demonstrated with a case study of the Xerox Company’s product portfolio and those of its competitors. The approach was followed step-by-step for the portfolio, and resulted in the identification of portfolio overlaps and gaps in both product Core Benefit Propositions and Vectors of Differentiation.

9.2 Recommendations for Future Work

The future work for research in the area of portfolio overlaps and gaps covers several topics. These include a determination of the effect of overlaps and gaps on the portfolio, measuring variety, vectors of differentiation, and other variables of the marketing mix.

Additional work should be pursued with respect to the product-specific overlaps and gaps discussed within this thesis. This research focused on the identification of overlaps and gaps, but did not investigate their impact on the product portfolio. Some of these overlaps and gaps may indeed be necessary or optimal for the product portfolio. Thus additional work should be conducted into determining the “goodness” or “badness” of overlaps and gaps for the long-term profitability of the product portfolio.

The overlaps that occurred within each family can be defined as “variety” in the family. Much research in product development recently has been focused towards planning and measuring variety within families. Additional research should be conducted by combining an overlap and a variety approach for planning product portfolios.

Much work can be done in the area of vectors of differentiation. These topics include determining the “best” relationship between the various family vectors within a segment, methods for determining the vectors that various groups of customers prefer across families and segments, and developing vector of differentiation strategies for the design and development of new products. These should provide additional insight into using the vector of differentiation to gain lasting competitive advantages in the marketplace.

Further investigations should be made into identifying overlaps and gaps for the other marketing mix variables not explicitly considered in this thesis: Promotion, Place, and Price. By integrating the product-specific overlaps and gaps identified within this thesis with customer perceptions of products, overlaps and gaps can be found in the Promotion variable that in turn can be used to develop strategies to improve the position of products in the marketplace. By integrating customer perceptions with buying patterns, overlaps and gaps in product Price and Place variables can be determined that can be used to adjust and improve these variables to improve sales.

10

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12 APPENDIX 1: XEROX PRODUCT PORTFOLIO

12.1 Section 1: Xerox Products

The following is a complete list of the Xerox product portfolio as of June 1, 1999. The products are grouped according to segment and marketing family, as defined by the Xerox company website at www.xerox.com.

Device Type	Model number	Technology Type	Segment
Desktop Copiers			
Xerox Copier	212	Digital	D
Xerox Copier	214	Digital	D
Xerox Copier/Printer	212	Digital	D
Xerox Copier/Printer	214	Digital	D
Xerox Copier	XC820	Analog	D
Xerox Copier	XC1044	Analog	D
Xerox Copier	XC1045	Analog	D
Xerox Copier	XC1255	Analog	D
Xerox Copier	XC355	Analog	D
Xerox Copier	XC356	Analog	D
Xerox Copier	XC580	Analog	D
Printers			
Xerox DocuPrint	P12	Laser	D
Xerox DocuPrint	P1202	Laser	D
Xerox DocuPrint	P8	Laser	D
Xerox DocuPrint	P8e	Laser	D
Xerox DocuPrint	P8ex	Laser	D
Xerox DocuPrint	XJ6C	Inkjet	D
Xerox DocuPrint	XJ8C	Inkjet	D
All-in-One			
Xerox Workcentre	385	Laser	D
Xerox Workcentre	450cp	Inkjet	D
Xerox Workcentre	480cx	Inkjet	D
Print & Copy			
Xerox Workcentre	XD100	Digital	D
Xerox Workcentre	XD102	Digital	D
Xerox Workcentre	XD103f	Digital	D
Xerox Workcentre	XD105f	Digital	D
Xerox Workcentre	XD120f	Digital	D
Xerox Workcentre	XD155df	Digital	D
Xerox Workcentre	XE60	Digital	D
Xerox Workcentre	XE62	Digital	D
Xerox Workcentre	XE80	Digital	D
Xerox Workcentre	XE82	Digital	D

Production Copiers

Xerox	Copier	5365		Analog	P
Xerox	Copier	5385		Analog	P
Xerox	Copier	5665		Analog	P
Xerox	Copier	5680		Analog	P
Xerox	Copier	5390	Duplicating and Finishing	Analog	P
Xerox	Copier	5690		Analog	P
Xerox	Copier	5800		Analog	P
Xerox	Copier	5885		Analog	P
Xerox	Copier	5890		Analog	P
Xerox	Copier	5892		Analog	P
Xerox	Copier	5895		Analog	P

Production Scanners

Xerox	DocuImage	620S		Digital	P
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Production Printers

Xerox	DocuPrint	4090		Digital	P
Xerox	DocuPrint	4250	MRP	Digital	P
Xerox	DocuPrint	4850	HighLight Color	Digital	P
Xerox	DocuPrint	4890	HighLight Color	Digital	P
Xerox	DocuPrint	4135		Digital	P
Xerox	DocuPrint	4635		Digital	P
Xerox	DocuPrint	180		Digital	P
Xerox	DocuPrint	180 MX	Enterprise Printing	Digital	P
Xerox	DocuPrint	135 LMX		Digital	P
Xerox	DocuPrint	96 MX	Production	Digital	P
Xerox	DocuPrint	96		Digital	P
Xerox	DocuPrint	65	Production	Digital	P

Copying/Printing/Scanning

Xerox	DocuTech	6180	Publisher	Digital	P
Xerox	DocuTech	6100	Publisher	Digital	P
Xerox	DocuTech	135	Publisher	Digital	P
Xerox	DocuTech	6135	Publisher	Digital	P
Xerox	DocuTech	65	Publisher	Digital	P

Workgroup Copiers

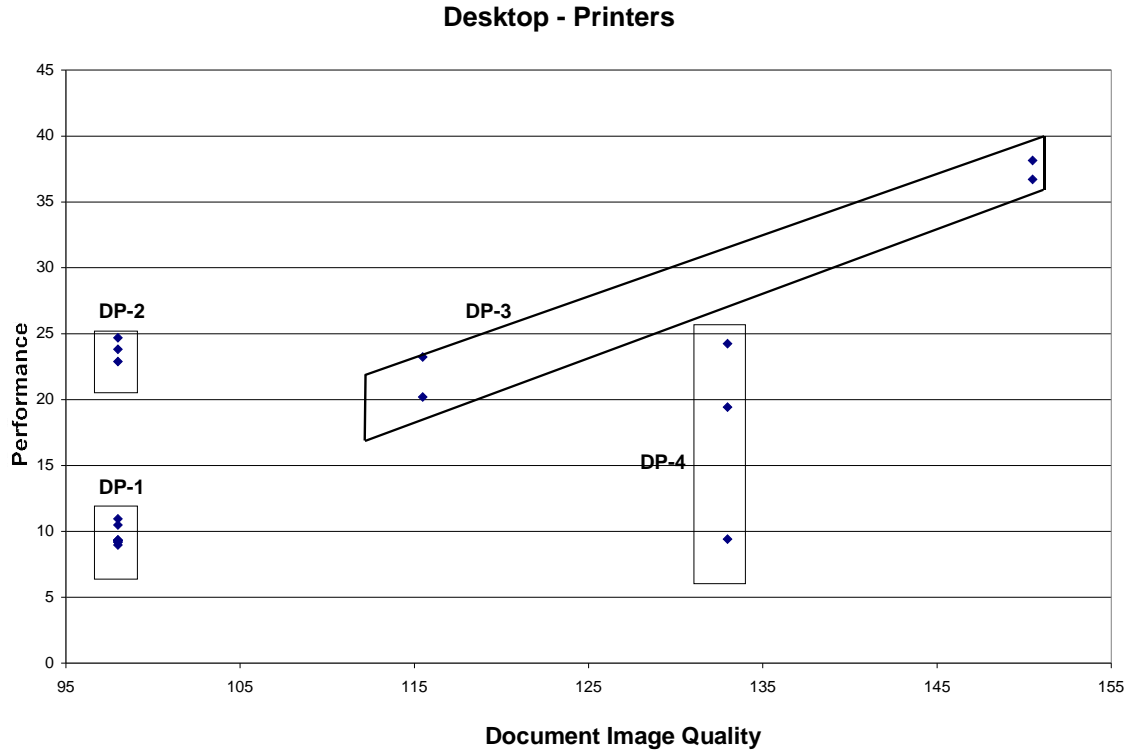
Xerox	BookMark	21	Library Copier	Analog	W
Xerox	BookMark	35	Library Copier	Analog	W
Xerox	Copier	5624		Analog	W
Xerox	Copier	5626		Analog	W
Xerox	Copier	5818		Analog	W
Xerox	Copier	5820		Analog	W
Xerox	Copier	5828		Analog	W
Xerox	Copier	5830		Analog	W
Xerox	Copier	5837		Analog	W
Xerox	Copier	5845C		Analog	W
Xerox	Copier	5855C		Analog	W
Xerox	Copier	XC1875		Analog	W
Xerox	Copier	XC2675		Analog	W
Xerox	Copier	XC23		Analog	W
Xerox	Copier	XC23-A		Analog	W
Xerox	Copier	XC23-AS		Analog	W
Xerox	Copier	XC33-AS		Analog	W
Xerox	Copier	XC33-D		Analog	W
Workgroup Multifunction					
Xerox	Document Center	220	Simplex	Digital	W
Xerox	Document Center	220	Digital	Digital	W
Xerox	Document Center	230		Digital	W
Xerox	Document Center	240		Digital	W
Xerox	Document Center	255		Digital	W
Xerox	Document Center	265		Digital	W
Xerox	Document Center	220ST		Digital	W
Xerox	Document Center	230LP		Digital	W
Xerox	Document Center	230ST		Digital	W
Xerox	Document Center	240ST		Digital	W
Xerox	Document Center	255LP		Digital	W
Xerox	Document Center	255ST		Digital	W
Xerox	Document Center	265ST		Digital	W
Xerox	Document Center	265LP		Digital	W
Xerox	Document Center	332DC		Digital	W
Xerox	Document Center	332ST		Digital	W
Xerox	Document Center	340DC		Digital	W
Xerox	Document Center	340ST		Digital	W

Workgroup Printers

Xerox	DocuPrint	4508	Digital	W
Xerox	DocuPrint	4512	Digital	W
Xerox	DocuPrint	4512N	Digital	W
Xerox	DocuPrint	4635-LFP	Digital	W
Xerox	DocuPrint	4050	Digital	W
Xerox	DocuPrint	C20	Digital	W
Xerox	DocuPrint	NC20	Digital	W
Xerox	DocuPrint	NC60	Digital	W
Xerox	DocuPrint	N17	Digital	W
Xerox	DocuPrint	N17b	Digital	W
Xerox	DocuPrint	N24	Digital	W
Xerox	DocuPrint	N32	Digital	W
Xerox	DocuPrint	N40	Digital	W
Workgroup All-in-One				
Xerox	Workcentre	Pro 545	Digital	W
Xerox	Workcentre	Pro 635	Digital	W
Xerox	Workcentre	Pro 645	Digital	W
Xerox	Workcentre	Pro 657	Digital	W
Xerox	Workcentre	Pro 745	Digital	W
Xerox	Workcentre	Pro 745DL	Digital	W
Xerox	Workcentre	Pro 745SX	Digital	W
Workgroup Color Copier/Printer				
Xerox	DocuColor	30 PRO	Digital	W
Xerox	DocuColor	30 CP	Digital	W
Xerox	DocuColor	40 PRO	Digital	W
Xerox	DocuColor	40 CP	Digital	W
Xerox	DocuColor	4 LP	Digital	W
Xerox	DocuColor	Office 6	Digital	W
Xerox	DocuColor	5750	Digital	W
Xerox	DocuColor	5799	Digital	W
Xerox	MajestiK	5760	Digital	W
Xerox	MajestiK	5765	Digital	W
Xerox	Regal	5790	Digital	W
Xerox	DocuColor	70	Digital Press	W

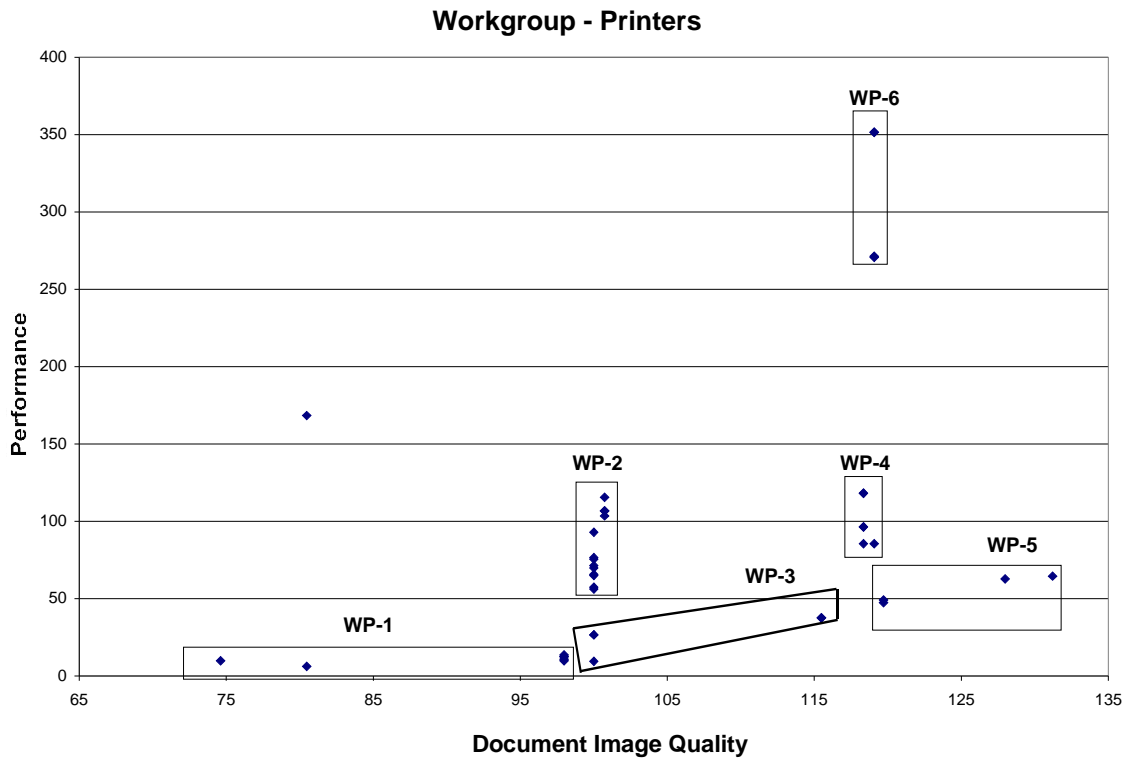
12.2 Section 2: Core Benefit Proposition Maps with Family Identification

This section presents the Core Benefit Proposition mappings discussed in Section 4.2.6.



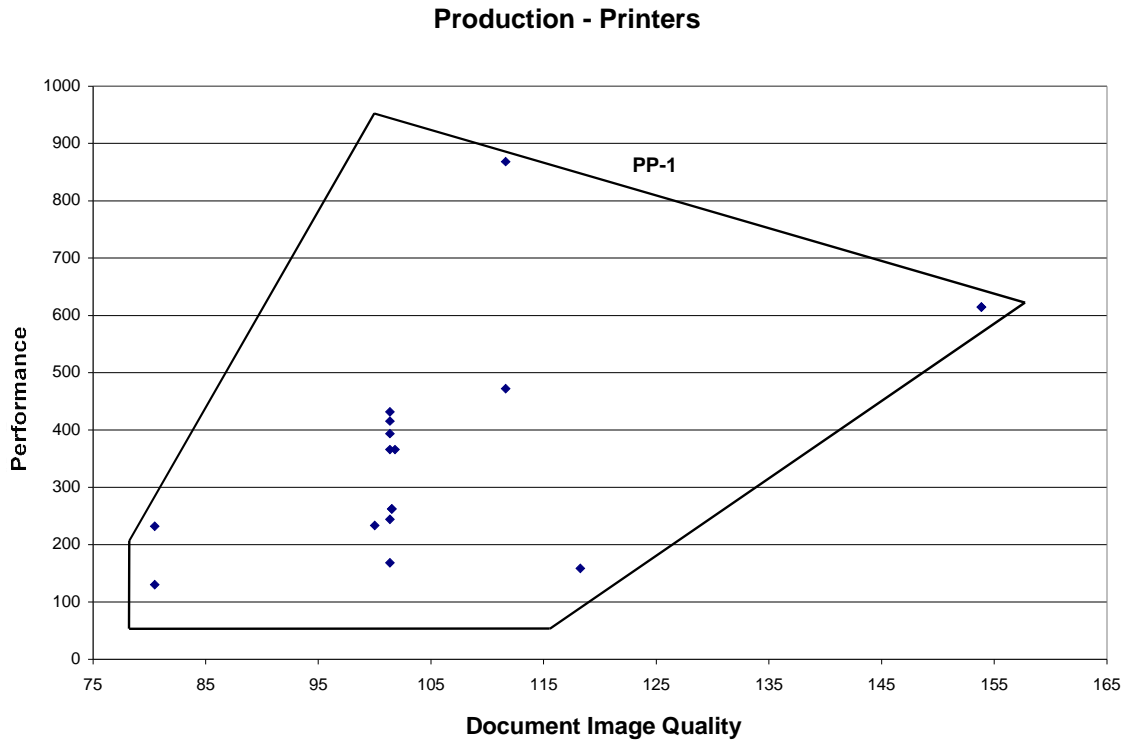
DP-1		DP-2		DP-3		DP-4	
Product	Type	Product	Type	Product	Type	Product	Type
P8e	P	212	P/C	XJ6C*	P, Ink	P8	P
XE80	P/C	P12	P	450cp*	MF,Ink	P8ex	P
XE82	P/C	214	P/C	XJ8C*	P, Ink	P	P
XD100	P/C			480cx*	MF,Ink		
XD102	P/C						
XD103f	P/C						
XD105f	P/C						
XD120f	P/C						
XD155f	P/C						
385	MF						

P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color



WP-1		WP-2		WP-3		WP-4		WP-5		WP-6	
Product	Type	Product	Type	Product	Type	Product	Type	Product	Type	Product	Type
635	MF	N24	P	4508	P	Office 6*	P/C	C20*	P	30CP*	P/C
645	MF	N32	P	4512	P	5750*	P/C	NC20*	P	30PRO*	P/C
645	MF	N40	P	N17	P	5760*	P/C	4LP*	P	40CP*	P/C
657	MF	220ST	MF	N17b	P	5765*	P/C			40PRO*	P/C
745	MF	230LP	P			5790*	P/C				
745SX	MF	240ST	P/C			5799*	P/C				
745DL	MF	255LP	P								
		265ST	P/C								
		255ST	P/C								
		265LP	P								

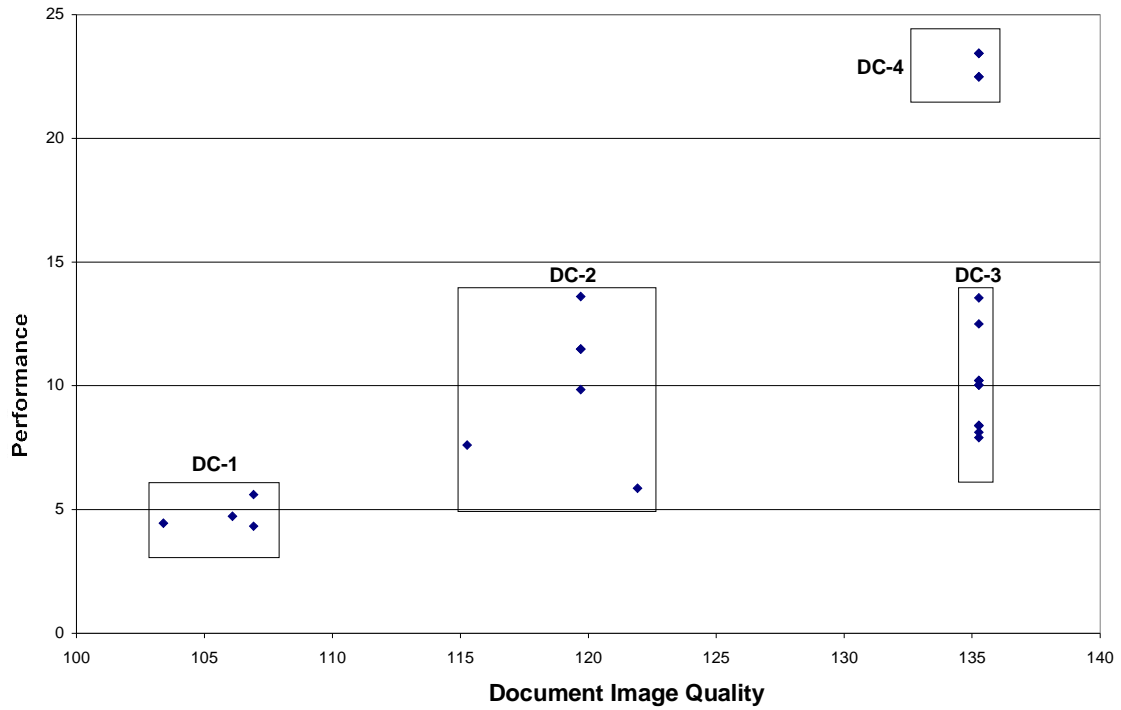
P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color



Production Printers			
Product	Type	Product	Type
4090	P	6135	P
4250	P	4635	P
6100	P	4850	P
6180	P	4890	P
135MX	P	65	P
135	P	180	P
4135	P	180MX	P
4635	P	96MX	P

P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color

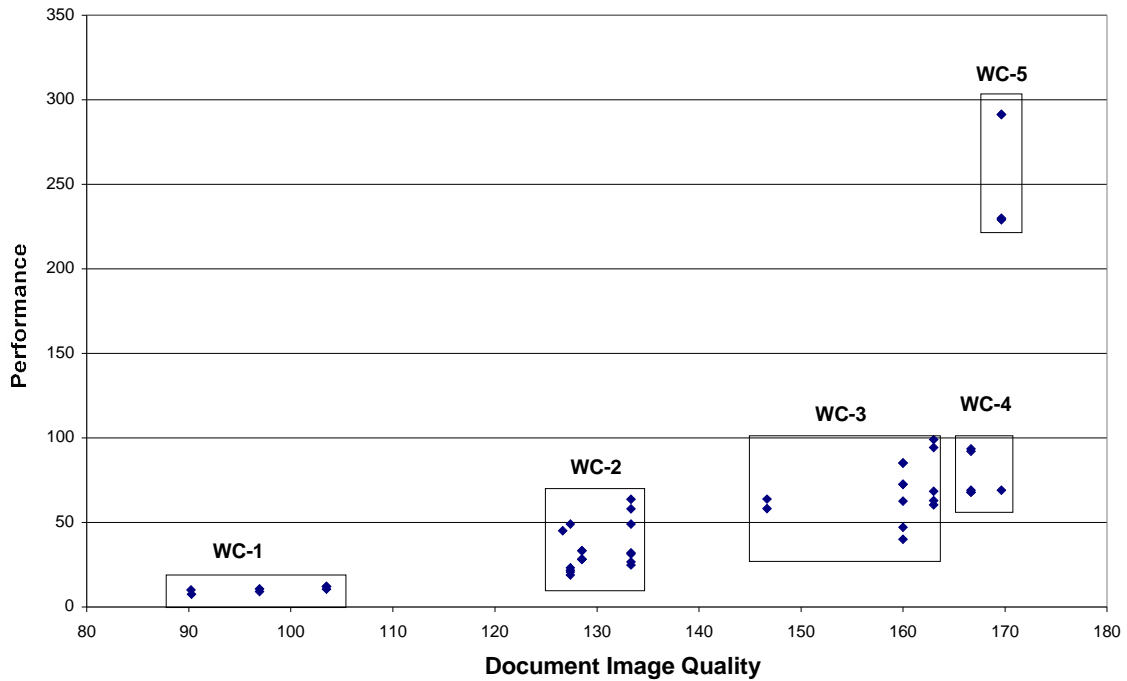
Desktop - Copiers



DC-1		DC-2		DC-3		DC-4	
Product	Type	Product	Type	Product	Type	Product	Type
XC355	C	XC820	C	XE60	C	212	C
450cp*	MF, Ink	XC1044	C	XE62	C	214	C
XC356	C	XC1045	C	XE80	P/C	212	P/C
XC580	C	XC1255	C	XE82	P/C	214	P/C
385	MF			XD100	P/C		
480cx*	MF, Ink			XD102	P/C		
				XD103f	P/C		
				XD105f	P/C		
				XD120f	P/C		
				XD155f	P/C		

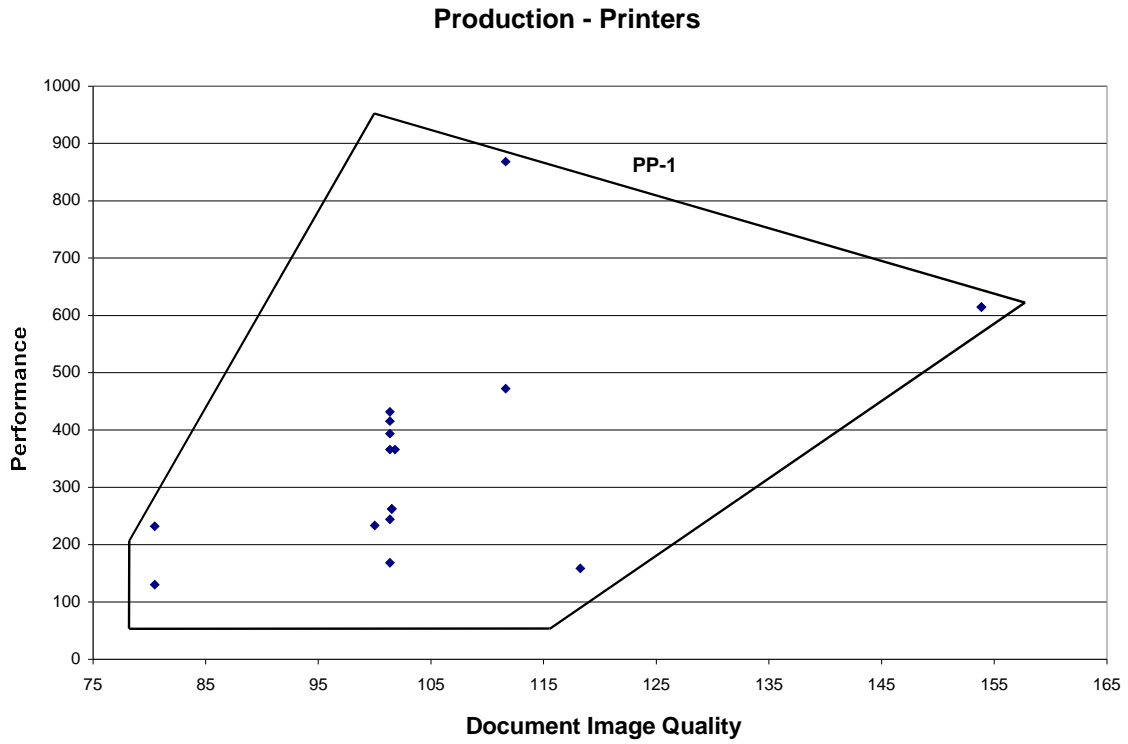
P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color

Workgroup - Copiers



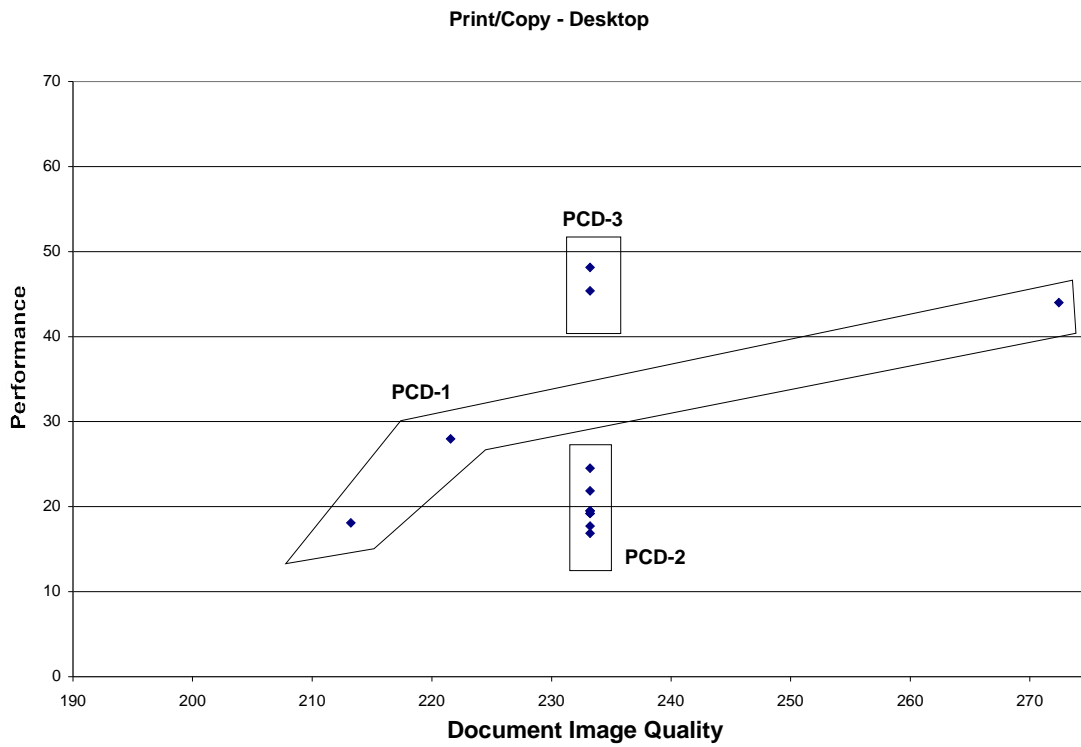
WC-1		WC-2		WC-3		WC-4		WC-5	
Product	Type	Product	Type	Product	Type	Product	Type	Product	Type
545	MF	35	C, Analog	220	C	Office 6*	P/C	30CP*	P/C
645	MF	21	C, Analog	230	C	5750*	P/C	30PRO*	P/C
657	MF	5828	C, Analog	240	C	5760*	P/C	40CP*	P/C
635	MF	5830	C, Analog	255	C	5765*	P/C	40PRO*	P/C
745	MF	5837	C, Analog	265	C	5790*	P/C		
745SX	MF	5845C	C, Analog	220ST	MF	5799*	P/C		
745DL	MF	5855C	C, Analog	230ST	MF				
		5624	C, Analog	240ST	P/C				
		5626	C, Analog	255ST	P/C				
		5818	C, Analog	265ST	P/C				
		5820	C, Analog	332DC	C				
		XC33-D	C, Analog	332ST	P/C				
		XC33-A	C, Analog	340DC	C				
		XC33-AS	C, Analog	340ST	P/C				
		XC23	C, Analog						
		XC23-A	C, Analog						
		XC23-AS	C, Analog						
		5820	C, Analog						
		5818	C, Analog						
		XC1875	C, Analog						
		XC2675	C, Analog						

P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color



Production Copiers			
Product	Type	Product	Type
5895	C, Analog	5800	C, Analog
5892	C, Analog	5885	C, Analog
5890	C, Analog	5665	C, Analog
5680	C, Analog	5365	C, Analog
5390	C, Analog	5385	C, Analog
5690	C, Analog	135	C, Analog

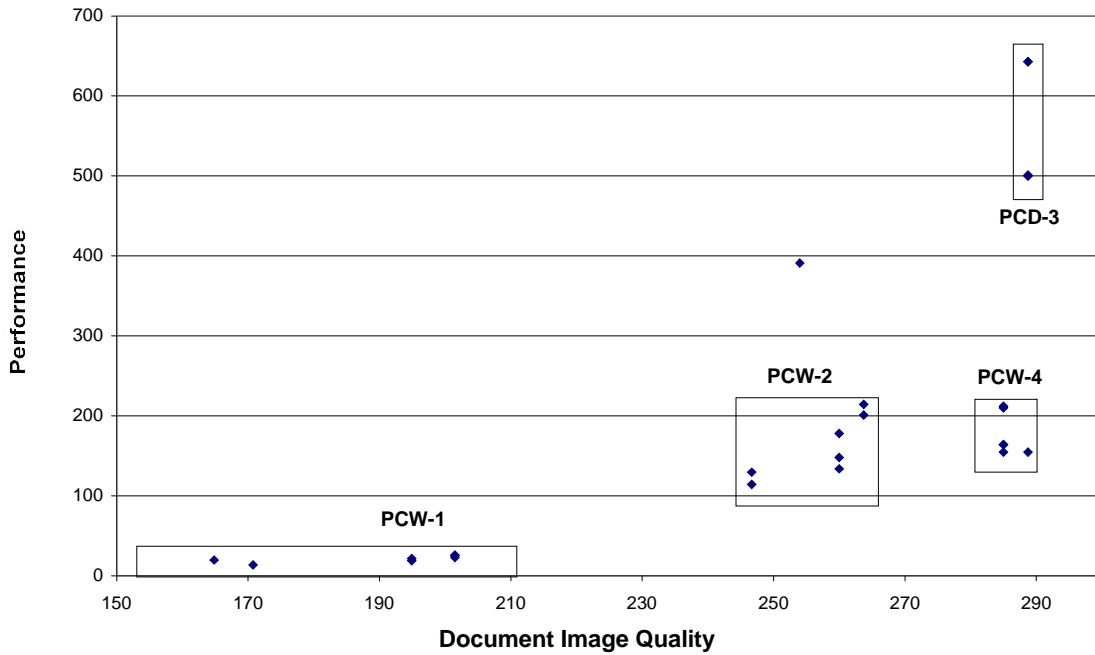
P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color



PCD-1		PCD-2		PCD-3	
Product	Type	Product	Type	Product	Type
385	MF	XE80	P/C	212	P/C
450cp*	MF,Ink	XE82	P/C	214	P/C
480cx*	MF,Ink	XD100	P/C		
		XD102	P/C		
		XD103f	P/C		
		XD105f	P/C		
		XD120f	P/C		
		XD155f	P/C		

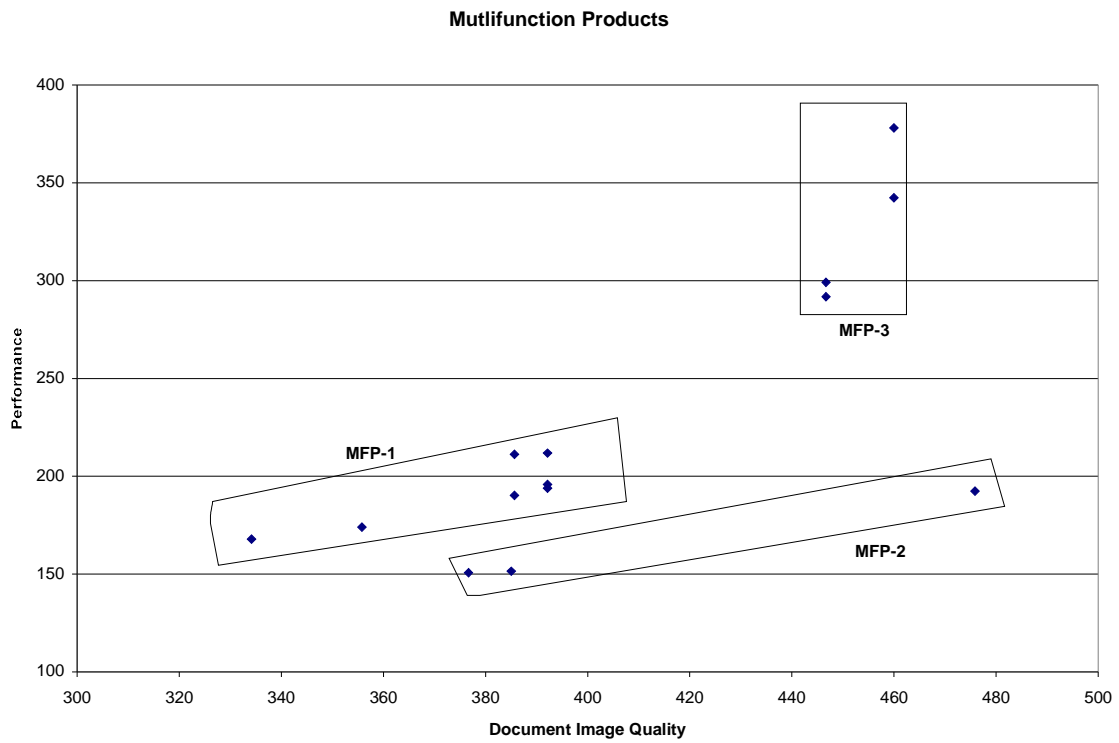
P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color

Print/Copy - Workgroup



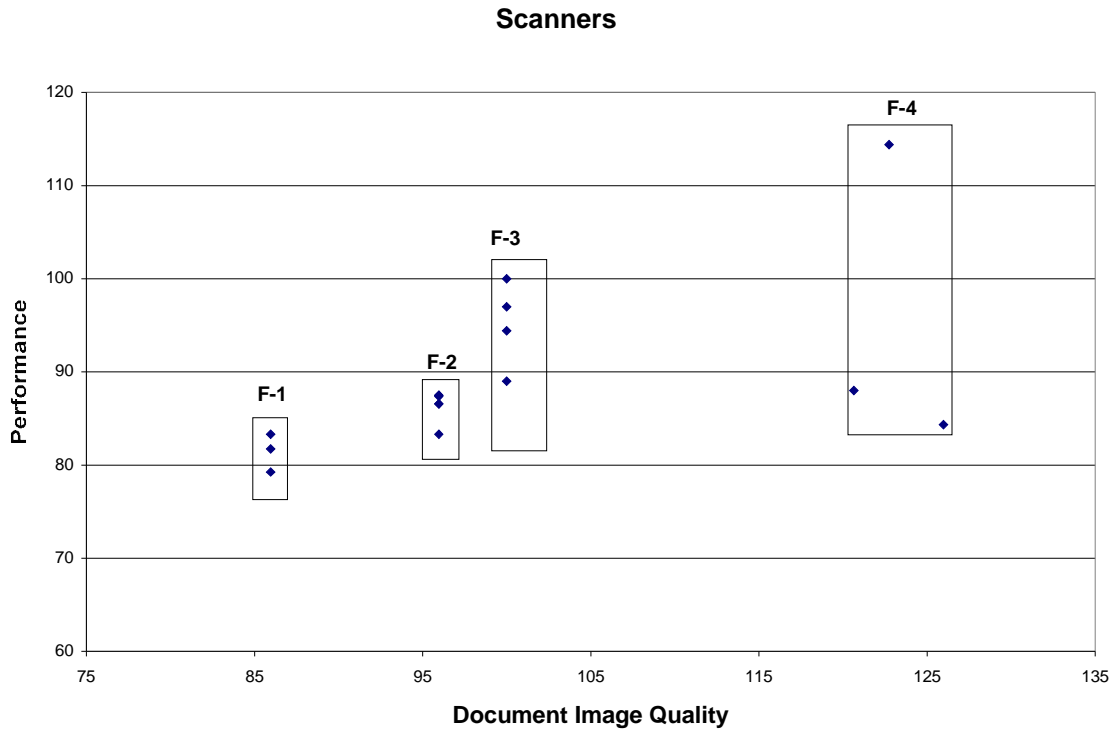
PCW-1		PCW-2		PCW-3		PCW-4	
Product	Type	Product	Type	Product	Type	Product	Type
545	MF	220ST	MF	30CP*	P/C	Office 6*	P/C
645	MF	230ST	MF	30PRO*	P/C	5750*	P/C
657	MF	240ST	P/C	40CP*	P/C	5760*	P/C
635	MF	255ST	P/C	40PRO*	P/C	5765*	P/C
745	MF	265ST	P/C			5790*	P/C
745SX	MF	332ST	MF			5799*	P/C
745DL	MF	340ST	MF				

P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color



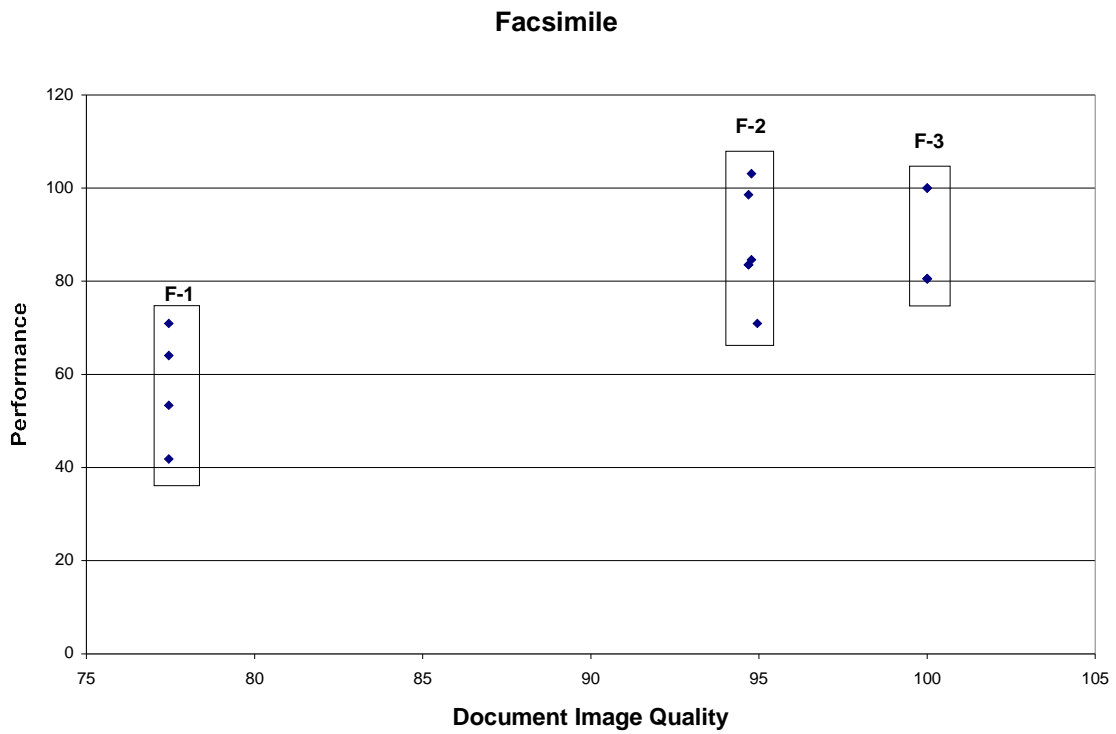
MFP-1		MFP-2		MFP-3	
Product	Type	Product	Type	Product	Type
545	MF	385	MF	220ST	MF
645	MF	450cp*	MF,lnk	230ST	MF
657	MF	480cx*	MF,lnk	332ST	MF
635	MF			340ST	MF
745	MF				
745SX	MF				
745DL	MF				

P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color



S-1		S-2		S-3		S-4	
Product	Type	Product	Type	Product	Type	Product	Type
545	MF	635	MF	340ST	MF	620	Scan
450cp*	MF,Ink	645	MF	332ST	MF	480cx*	MF,Ink
385	MF	657	MF	220ST	MF	135	P, Scan
		745	MF	230ST	MF		
		745SX	MF				
		745DL	MF				

P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color



F-1		F-2		F-3	
Product	Type	Product	Type	Product	Type
545	MF	635	MF	340ST	MF
480cx	MF,lnk	645	MF	332ST	MF
450cp	MF,lnk	657	MF	220ST	MF
385	MF	745	MF	230ST	MF
		745DL	MF		
		745SX	MF		

P = Printer; C = Copier; P/C = Printer and Copiers; MF = Multifunctional; * = Color

13 APPENDIX 2: COMPETITOR PRODUCTS

