



WORKING PAPER SERIES

The Learning System at IBM: A Case Study

Fei Qin

Associate Professor, School of Management, University of Bath

Faculty Affiliate, Good Companies, Good Jobs Initiative at MIT
F.Qin@bath.ac.uk

Thomas Kochan

George Maverick Bunker Professor of Management Professor,
Work and Organization Studies

MIT Sloan
tkochan@mit.edu

MIT Work of the Future Working Paper 10-2020

December 14, 2020



400 Main Street, E19-733, Cambridge, MA 02139

The Learning System at IBM: A Case Study

Fei Qin and Thomas A. Kochan¹

December 3, 2020

¹ Fei Qin is a Faculty Affiliate of the Good Companies, Good Jobs Initiative at MIT and an Associate Professor in the School of Management at the University of Bath. Thomas A. Kochan is the George M. Bunker Professor at the MIT Sloan School of Management. Support for this research is provided by the MIT Good Companies, Good Jobs Initiative and the MIT Task Force on Work of the Future. The views expressed are solely those of the authors. The authors wish to thank colleagues in Human Resources at IBM who helped assemble these data and provided excellent and extensive support and advice throughout this project.

Table of Contents

- I. **Introduction**

- II. **The Your Learning System at IBM**
 - Skills, careers, and HR 3.0 – ‘Skills are the new currency’**
 - The Your Learning Model – A digital learning marketplace**
 - Key features of the system*
 - AI in the back-end process*
 - Individualized learning cycle*
 - Learning consumption*
 - Skills and the ecosystem of digital HR tools**

- III. **The System in Practice: Analysis of Technical Sales Staff**
 - Technical sellers at IBM**
 - Learning patterns of technical sellers**
 - Tech sellers’ time investment in learning*
 - Digital learning badges*
 - Strategic skills*
 - Learning and HR outcomes**
 - Learning and performance*
 - Learning and promotion*

- IV. **Moving forward**
 - Learning amid COVID**

- V. **Summary and Implications for IBM, Industry, and the Workforce**
 - Summary of findings**
 - Implications for IBM**
 - Implications for external audiences**

I. Introduction

There is widespread recognition that changing technologies and ways of working are increasing the importance of workforce skills and the need for skill upgrading. Yet despite a long history of research on training in the fields of organizational psychology, human resources, and labor economics, little is known about the state-of-the-art in training practices offered by employers, use of training opportunities by employees, or the effects of training and upskilling on critical outcomes for workers or employers. This report seeks to start filling this void by describing what we believe to be a state-of-the-art learning system at IBM Corporation and tracing the effects of learning on job performance and career advancement.

In this report we first describe the overall learning system and its multiple components and then trace the use of the system by incumbents in several key technical sales occupations between 2014 and 2019. Our analysis draws from combined personnel, learning, and performance data of the technical sales population along with interviews with multiple stakeholders in the company's learning and training ecosystem.

The results show that time spent on learning and achievement of internal learning credentials the company calls "badges" is positively associated with (1) achievement of sales targets, a key measure of performance for sales staff, and (2) career advancement as measured by movement up levels in the salary bands governing these occupations.

II. The Your Learning System at IBM

Skills, careers, and HR 3.0 – ‘Skills are the new currency’

IBM describes the evolution of its Human Resources (HR) system as moving from the early-day industrial HR (1.0) to internet HR (2.0), to the current digital HR system (HR 3.0). During HR 1.0, HR performed primarily administrative functions and record keeping. During HR 2.0, information technology was widely adopted to optimize organizational administrative processes. With a focus on process automation, the main intended outcomes and benefits of the use of technology in HR functions were on improving efficiencies, so that the same tasks could be performed more cost effectively.

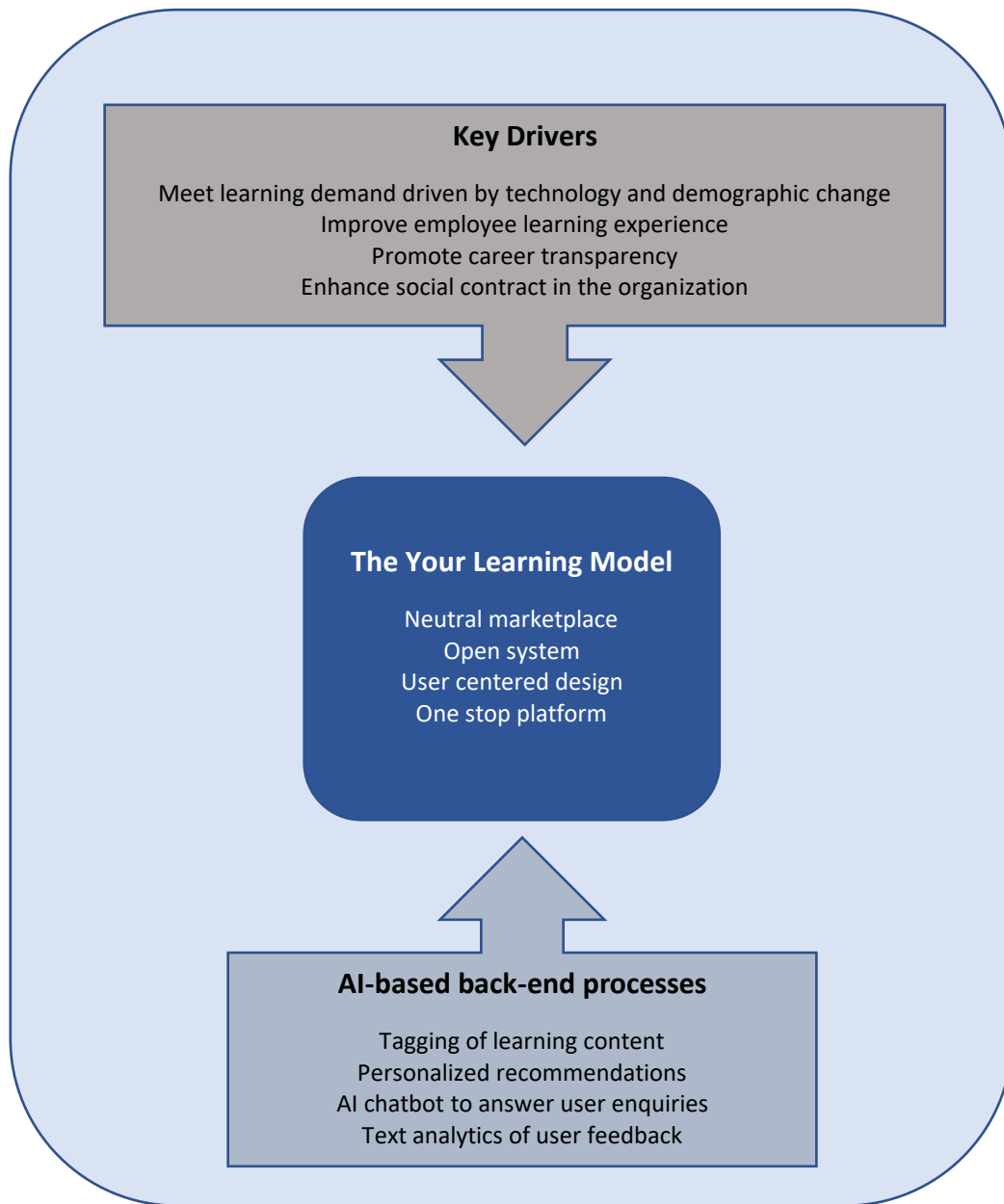
From HR 2.0 to HR 3.0, the HR system was re-positioned to drive the company’s competitive strategies by focusing on skills, and the intended outcome shifted from enhancing efficiency to promoting *engagement*. The emphasis on skills and careers is manifested in the expressions by IBM executives that, ‘careers are placed at the centerpiece of the employment brand’ and ‘skills are the new currency.’

The transformation of the HR system is accompanied by the introduction of a bundle of digital HR tools powered by a new generation of Artificial Intelligence (AI), cognitive, and cloud technologies. These tools support a wide range of HR processes from recruitment and onboarding, training and development, compensation recommendations, to employee retention. Aligned with the strategic focus on enhancing experience and skills, and to upskill and reskill its workforce, IBM has significantly transformed its training and development system to a learning system that is built on state-of-the-art technologies.

The Your Learning Model – A digital learning marketplace

At the heart of IBM’s learning ecosystem is a digital platform named ‘Your Learning.’ Your Learning was developed in house by IBM. The system was designed to address changing workforce demographics, improve employee learning experience, promote career transparency, and enhance the social contract in the organization. Figure 1 summarizes the key features of the Your Learning model, and its key drivers and enabling technologies.

Figure 1 The Your Learning Model



Key features of the system

The platform matches learning demand with the supply of a large pool of internal and external learning resources. Currently more than 300,000 learning resources are available in Your Learning, including both learning content created by IBM such as by IBM Think Academy and learning resources offered by third-party suppliers such as Coursera, Edx, and others. Approximately 60% of the overall learning content is created internally, while 40% comes from external sources.

While traditionally training and development activities require allocation of big blocks of times, and need to be planned ahead to take the time away from regular work, with Your Learning, employees are able to choose when and what to learn. With access to learning content via the platform any time anywhere, learners can make use of small amounts of time that become available to complete a course. Table 1 lists a few examples of e-learning courses.

Table 1 Examples of Learning Courses

Course title	Time spent on completing the course*
Cloud Infrastructure	20 hours
A New Way to Work: Agile Values and Principles (Advanced Sales Coaching)	15 hours
Blockchain	30 hours
Artificial Intelligence Concepts	60 hours

*The learning hours recorded among IBM technical sellers.

Your Learning captures individual, team, and organizational level learning demand. There are courses and learning badges that are required or recommended by the organization. These are also featured in the site. Managers can further add required courses and programs for their team members and review team members’ learning progress.

AI in the back-end process

The development of the Your Learning Platform is built on IBM's own technology competencies. IBM is among the first to adopt AI in its HR functions, and Your Learning was designed to be a heavily AI-driven platform. The system is empowered by an array of AI tools for its back-end process.

AI technologies are behind the key functions of the platform, such as AI tagging of a large variety of learning content empowered by the IBM's inhouse Watson Tag advisor, and personalized recommendations on learning content. AI is also utilized to continuously improve and update the system based on user feedback. The platform features a learning chatbot that answers user questions 24/7. AI and analytics are also used to analyze the very large volume of user feedback and comments generated every day, which enables instant diagnosis of emerging problems and timely solutions. The adoption of AI technologies in these processes not only enables better user experiences, but also significantly reduces administration costs.

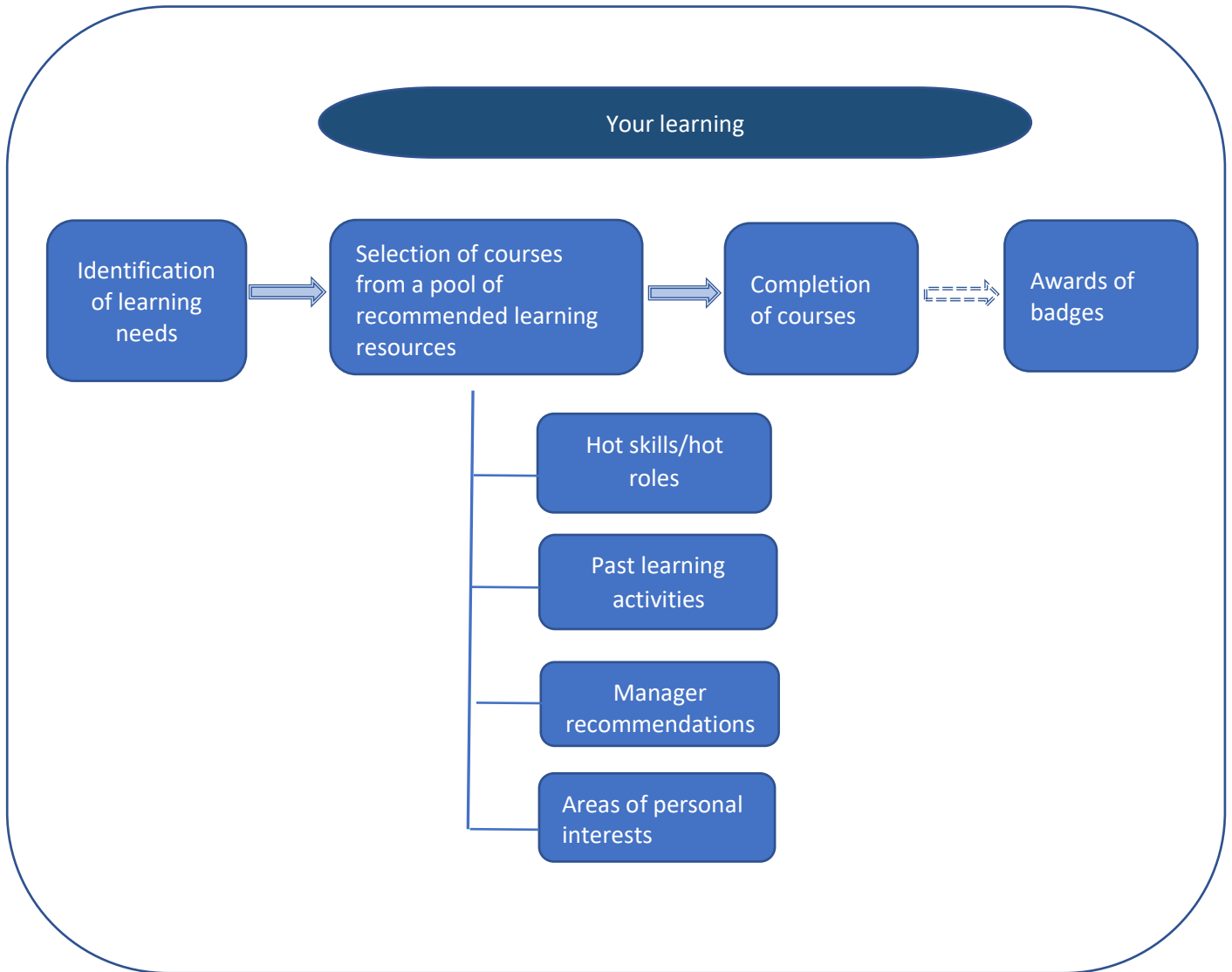
Individualized learning cycle

The '**one stop**' Your Learning platform covers all the key stages in an employee's learning journey, from setting up learning goals and selecting which learning activities to engage in, to monitoring learning progress and recording learning outcomes. In Figure 2 we map out a typical learning journey on the platform.

Personalization is a core feature of the Your Learning platform. The system sets up a user profile for each learner according to the person's demographic attributes from the individual's personnel record, such as job roles and job role specialties, along with the user's own selection of learning preferences. Based on each user's profile, the system displays personalized recommended learning channels, badges and programs, and individual courses.

Users of Your Learning can monitor the progress of their own learning and self-evaluate their progress toward reaching their learning targets. For each user, the system creates individual learning channels, recording in real time each user's learning activities, such as courses completed, badges awarded, and time spent on learning at any point in time. New functions are continuously added to the Your Learning system. The most recent development includes a new application aimed to further boost individual learning activities through offering personalized 'nudging' and social learning.

Figure 2 Typical Learning Cycle on Your Learning



Learning consumption

Your Learning is widely used by IBM employees. According to the organization’s internal report, in 2019, 336,000 IBM employees, accounting for 99% of the entire

workforce, visited Your Learning, with a record of 9.1M visits. In quarter 1 of 2020 alone, 89% of IBM employees visited Your Learning, with 1.9 million visits and 14.1 million page views.

The organization expects every employee to spend a minimum of 40 hours in training and professional development each year, a target known as THINK 40. The actual time investment in learning on average has exceeded that target. In 2019, the average and median annual learning hours per employee were 77 and 52 respectively.

Skills and the ecosystem of digital HR tools

The skill conversations at IBM go beyond Your Learning. With skills and experience placed as the focus of IBM's HR ecosystem, the learning activities and learning outcomes recorded in Your Learning feed into other digital HR tools in the HR ecosystem. This enables improved decision making by employees in career planning and by managers in performance evaluation and compensation rewards.

For instance, information on acquisition of new skills is a key input factor into Compensation Advisor with Watson, an AI-enabled HR tool that provides salary increase guidance to managers. The underlying logic of Compensation Advisor with Watson is that salaries should not only reflect the value generated by an employee through his or her job performance, but also the value of their skills that can create value in the future for the organization. The bundle of these digital HR tools creates an ecosystem through which the investments in learning by employees are expected to be realized, not only by the organization from increased employee performance, but also by employees in their compensation and career progression. In the next section we report the results of our quantitative study of the technical seller population at IBM to further examine the effects of learning.

III. The System in Practice: Analysis of Technical Sales Staff

To take a close look into the connections between learning and skill acquisition on the one hand and employees' job performance and career outcomes on the other hand, we conducted a longitudinal study of the population of technical sales workforce at IBM. Our study sample covers all individuals who were identified by the organization as a technical seller at any point during the time period of January 2014 and September 2019, a population of 14,008 technical sellers in total.

We adopt a research design that employs panel data analysis, taking into account the existence of temporal delays between the learning activities and the hypothesized effects on performance and promotion. Panel data analysis is widely used to make causal inferences from non-experimental data. Our study draws from three main sources of anonymized individual-level data: a) a database with detailed records of each individual's learning activities, such as learning hours and badges awarded, b) the corporation's personnel database that contains job-related information such as primary job role category, business unit/group affiliation, length of service, and salary band, and c) 'Target Incentive' data that record tech sellers' performance in achieving sales targets.

Technical sellers at IBM

There are three major job roles or occupations in the job cluster of technical sellers at IBM: client technical architects (CTA), client technical specialists (CTS), and client technical managers (CTM).

Client technical specialists are technical consultants to clients, IBM sales teams and/or IBM Business Partners. When engaged for a specific opportunity or project, they collaborate with the sales team on the technical issues and are responsible for the technical accuracy of the proposed solutions. Their role also includes broader duties such as developing and delivering technical education, supporting critical situations, and answering technical questions.

Different from specialists, client technical architects create and maintain client relationships at all levels within the client's business. They are usually expected to apply broad technical skills, industry knowledge, and business acumen expertise, and to

leverage IBM technologies, architectures, integrated solutions and offerings in designing solution recommendations for their clients.

Table 2 IBM Technical Seller Role Description

Roles	Role Overview
Client Technical Architect	<ul style="list-style-type: none"> ▪ Create and maintain strong, trusted client relationships at all levels within the client's business. ▪ Design solution recommendations for their clients applying their broad technical skills, industry knowledge and business acumen expertise. ▪ Recommendations leverage IBM technologies, architectures, integrated solutions and offerings to solve the client's business challenges and deliver value.
Client Technical Specialist	<ul style="list-style-type: none"> ▪ Technical consultant to clients, IBM sales teams and/or IBM Business Partners. ▪ Understand the client's business requirements, technical requirements and/or competitive landscape. ▪ Provide technical sales support which may include: collaborate with IBM sales teams to define, design, and detail the technical aspects and feasibility of proposed solutions; deliver Proof of Concept; develop and deliver technical education; support critical situations; design solutions; and answer technical questions. ▪ When engaged for a specific opportunity or project, they are responsible for the technical accuracy of the proposed solution.
Client Technical Manager	<ul style="list-style-type: none"> ▪ Responsible for managing technical professionals who support the sales of IBM products, solutions and/or services to meet/exceed client expectations, key business measurements and IBM reporting requirements.

Client technical manager is a typical managerial role. CTMs are responsible for managing client technical professionals, those in the specialists and architect roles, to meet/exceed client expectations, key business measurements, and IBM reporting requirements. The detailed descriptions of the three technical seller roles are summarized in Table 2.

In fast changing technological environments, reskilling and upskilling are critical for technical sellers to successfully perform their jobs. Technical sellers are directly client facing and close to the market. They need to stay on top of the current industry and technology development trends and constantly update their knowledge base, especially on technical issues, and be aware of new solutions being proposed for emerging problems – not only regarding IBM products, but also what competitors do. A client technical architect who we interviewed explained why continuous learning is important for technical sales staff:

'Other roles are not necessarily client-facing... (as a seller in Global Markets), you are always sitting in front of a customer, and customers ask you questions about IBM products... you will always need to know the answer... (In case of not knowing the answer), we would usually say, I will get back to you tomorrow. Architects who are facing the customers are always under that pressure.'

Learning patterns of technical sellers

We examine both the quantitative aspects of learning in terms of the time spent on acquiring new skills and the qualitative aspects of learning with respect to what skills are acquired. Specifically, we draw from a large learning database that records learning activities at the individual employee level to examine the amount of learning and the type of learning of each tech seller.

Tech sellers' time investment in learning

Figure 3 illustrates the average learning hours in 6-month time episodes from 2014 to 2019, by specialists, architects, and managers respectively. The intensity of learning is high for all the three technical sales job roles. Time spent on learning does not vary significantly across the three job roles. On average, each technical seller spent around 100 hours on learning every year, far exceeding the 40-hour company-wide annual target, and much higher than the company-wide learning consumption.

In general, learning activities are concentrated more in the first two quarters of each calendar year when more time can be freed up from business activities and spent on learning. There is a gradual increase of learning hours over time. Average learning hours

further increased significantly in 2019. This spike is likely to be driven by the company-wide learning campaigns.

Figure 3 Time Spent on Learning by Technical Sellers, 2014-2019

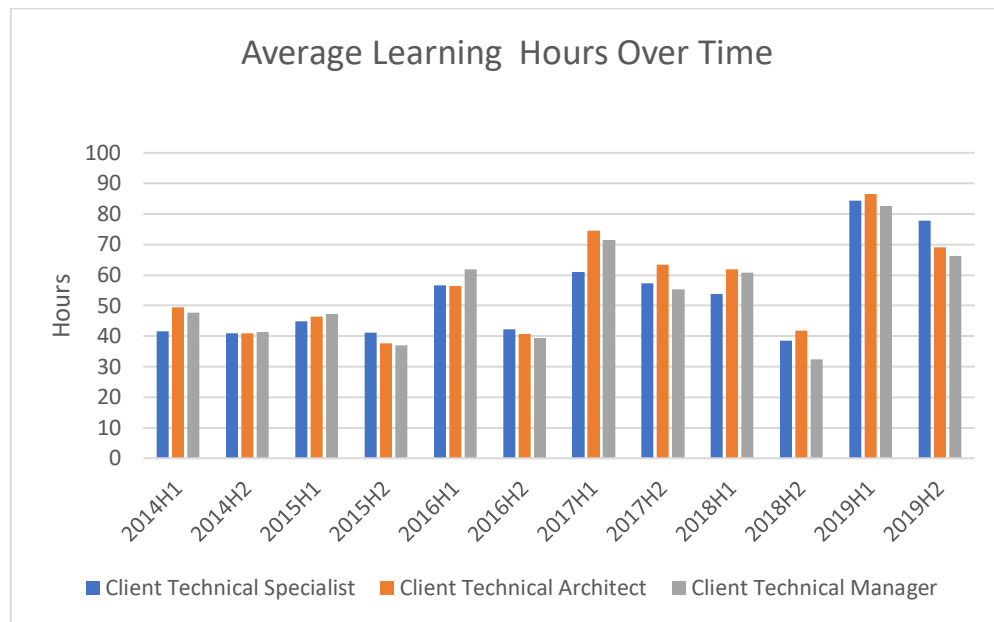
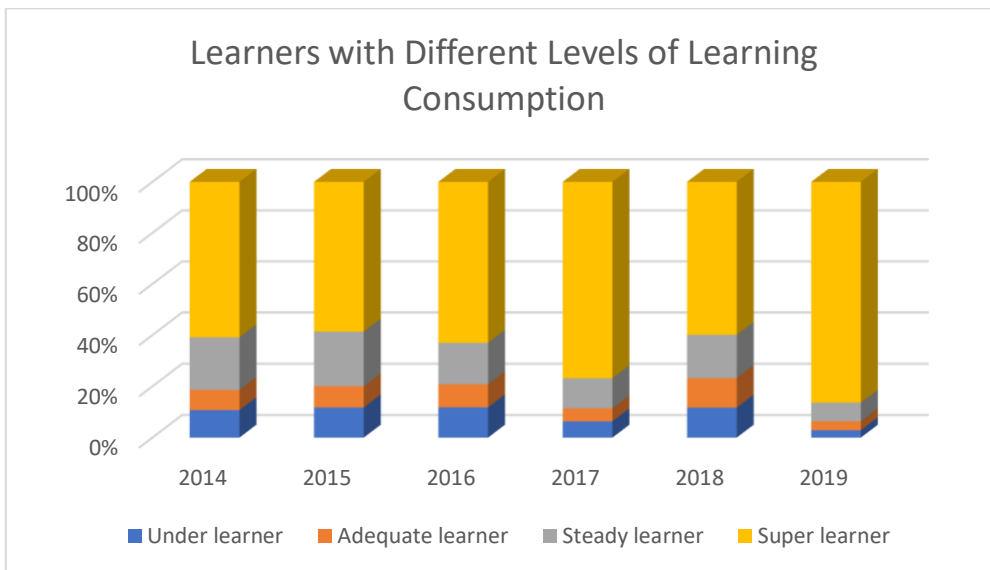


Figure 4 illustrates the distribution of technical sellers with different levels of time spent on learning from 2014 to 2019. Super learners are defined here as individuals with 60 or more learning hours in a given year, steady learners are those who spent 40-59 hours on learning in a year, and adequate learners and under learners are those with 20-39 learning hours and less than 20 learning hours respectively.² Every year around 80% of technical sellers met the Think 40 learning target (the sum of super learners and steady learners), and that percentage went up to over 90% in 2019. A very high proportion of technical sellers qualify as super learners. Across years, the percentage of super learners consistently account for more than 60% of the entire population of technical sellers, and the percentage of super learners reached over 80% in 2019.

² Super learner, steady learner, adequate learner, and under learner are the terms used internally in the organization. The definition here is adapted from the internal definition with slight differences. We define 'under learners' as those with 0-20 hours while the internal definition of under learners excludes the cases of 0 learning consumption.

Figure 4 Technical Sellers with Different Levels of Time Expenditure on Learning, 2014-2019



Digital learning badges

IBM’s Digital Badge Learning Program plays an important role in the company’s learning and training ecosystem. Learning badges are digital credentials issued for recognition of learning accomplishments, particularly for recognition of technical skills. A learning badge is awarded after completion of designated, usually assessed, learning activities.

IBM issues a large number of digital badges, organized in different categories. The vast majority of the badges that technical sellers obtained are either associated with acquiring new knowledge (i.e. knowledge badges) or the application of new knowledge (i.e. skill badges). Skill badges are associated with hands-on application of concepts and theory. The focus of learning assessments for skill badges is on effective application of the subject matter. In contrast, knowledge badges are associated with learning at concept and

theory levels, including either discipline-specific learning content or knowledge from a broad range of topics. There are also other types of badges relating to contribution, performance, and membership that may involve complex assessment processes.

As illustrated in Figure 5, over half of all the badges that technical sellers acquired are knowledge badges, and about 30% are skill badges.

Figure 5 Type of Badges Acquired by Technical Sellers



Strategic skills

The learning system also designates certain skills as “*strategic.*” These are skills that are especially closely aligned with organization-level evolving business strategies. Most of the strategic skills relate to new technological fields, such as cloud and artificial intelligence. There are also strategic skills pertaining to management and development methodologies, such as design thinking and agile. These are the areas that the organization deems important to its sustainable growth. The top three categories of strategic learning badges awarded to technical sellers are Cloud, Analytics, and Design Thinking, with Cloud being

the area with most learning investment by tech sellers, accounting for over one third of the total number of badges acquired.

Learning and HR outcomes

To investigate the relationship between learning and HR outcomes, we focus on two key areas – performance and promotion. To estimate performance, we adopt the measure of target percent achieved by individual sellers; to predict promotion, we look at the odds of moving up the salary band. The results are detailed below.

Learning and performance

IBM has established a clearly structured, transparent performance-reward system for technical sellers that features incentive pay. A central component of the incentive pay system for the sales workforce is target incentive payment. Employees under a Target Incentive plan are assigned a specific performance target. At the end of the specified period of an incentive plan, performance against achieving the target is recorded as a percentage, which is called target incentive percent earned. Therefore, target incentive percent earned captures to what extent the expected target is met.

Our interviews with tech sellers confirmed that many sellers closely track how far along they are in meeting these performance targets.

To examine the extent to which technical sellers' job performance is associated with their learning outcomes, we estimate individual sellers' target incentive percent earned in every 6-month time period. We include in the regression models learning-related explanatory variables along with a list of job-related control variables.

Learning badges

Our estimation reveals a strong effect of learning badges on target percent achieved. Specifically, tech sellers with the average number of 5 learning badges achieve 5% higher TI compared with those with no badges.

Different types of badges

A closer examination of different types of badges reveals a more nuanced picture. While both skill badges and knowledge badges show positive effects on performance, the effect of a skill badge – awarded for *application* of new knowledge, is much larger than a knowledge badge – awarded on *acquiring* new knowledge. The magnitude of the skill badge estimate is almost double that of a knowledge badge. This result implies that technical sellers' learning on applied subjects may better translate into their job performance.

The analysis further delves into the impact on job performance of building competencies in organization strategic skills. We estimate the effect of strategic badges – learning badges that are associated with the strategic skills noted above that the organization views as important for strategic transformation. The results reveal a much stronger effect of strategic badges than that of non-strategic badges.

Learning and promotion

While there is good evidence that learning has a positive impact on the competency of performing the current job role, does it pay off for employees' career progression? To answer that question, we further estimate the extent to which upward career mobility, or promotion, is related to learning activities.

Promotion is measured as moving up a salary band, a standard measure for career advancement at IBM. We test the effects of learning on the odds of promotion up a salary band in the year ahead, controlling for a list of experience and job-related factors such as length of service, current salary band level, and performance, among others.

Learning badges

The regression results support the hypothesis that acquisition of learning badges is positively associated with the probability of promotion. Particularly, the odds of being promoted increase relatively by approximately 9% with each badge acquired. For example, the odds of promotion for a technical seller in one year is approximately 7.7%, with one more badge, it increases to 8.4%.

A closer examination of the two major types of badges that tech sellers acquired shows that skill badges have significant, large effects on promotion. Specifically, one more skill badge increases the odds of promotion relatively by approximately 16%.

Time investment in learning

Time investment in learning also shows a significant effect on promotion. The likelihood for promotion varies across learners with different levels of learning activities. With all other factors controlled, super learners (those with 60 or more hours spent on learning in a given year) enjoy 1.62 times higher odds of promotion in the next year, comparing with technical sellers who did not meet the 40 hours learning target. Steady learners (with 40-59 learning hours in a given year) also have 1.26 times higher odds of promotion than learners who under invest in learning (<40 learning hours).

IV. Moving forward

Learning amid COVID

Today's organizations not only need to cope with rapid changes in technologies, markets, and industries, but also need to stand resilient to other kinds of unexpected external shocks. Like in organizations worldwide, the COVID-19 pandemic has imposed unprecedented impacts on many aspects of organization life and work routines. How has COVID-19 affected learning behavior of IBM technical sellers? We further investigate the latest learning patterns amid the pandemic.

While adapting to new ways of working, technical sellers have been continuing the time they spent on learning.

Figure 6 Technical Sellers' Learning amid COVID

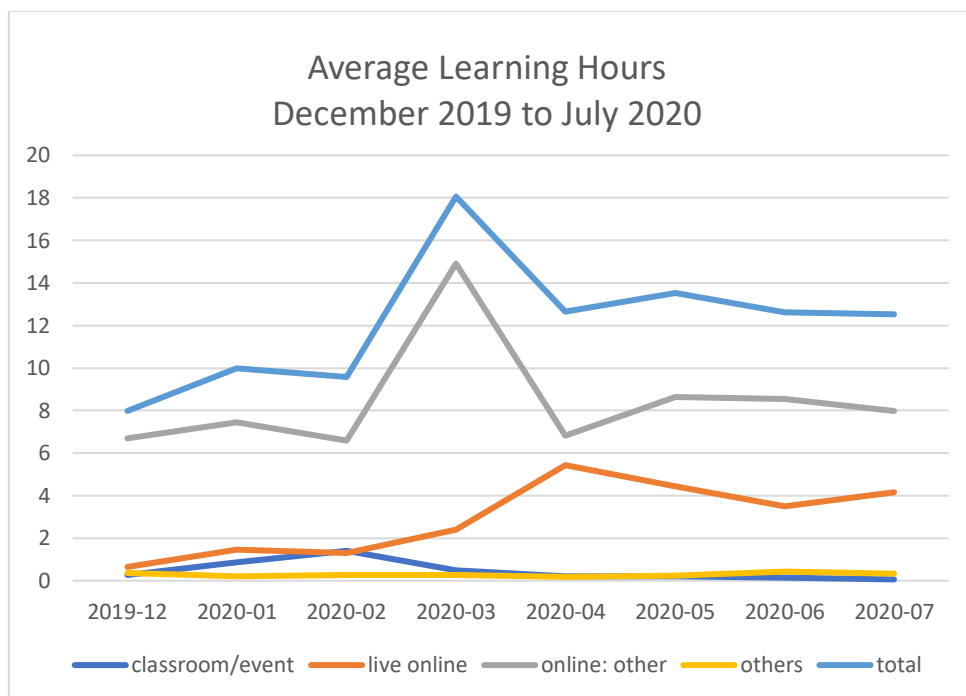


Figure 6 illustrates the time that technical sellers spent on learning across different types of learning activities by month from December 2019 to July 2020. Despite the disruption of the pandemic, overall learning consumption remains high. In March 2020 when many countries and cities introduced lockdown measures leading to a large proportion of workforce switching to working-from-home, the average learning hours across all learning activities of tech sellers reached 18 hours, a 35% increase compared with the number of learning hours in the same month in 2019.

Figure 7 Distribution of Learning Activities amid COVID

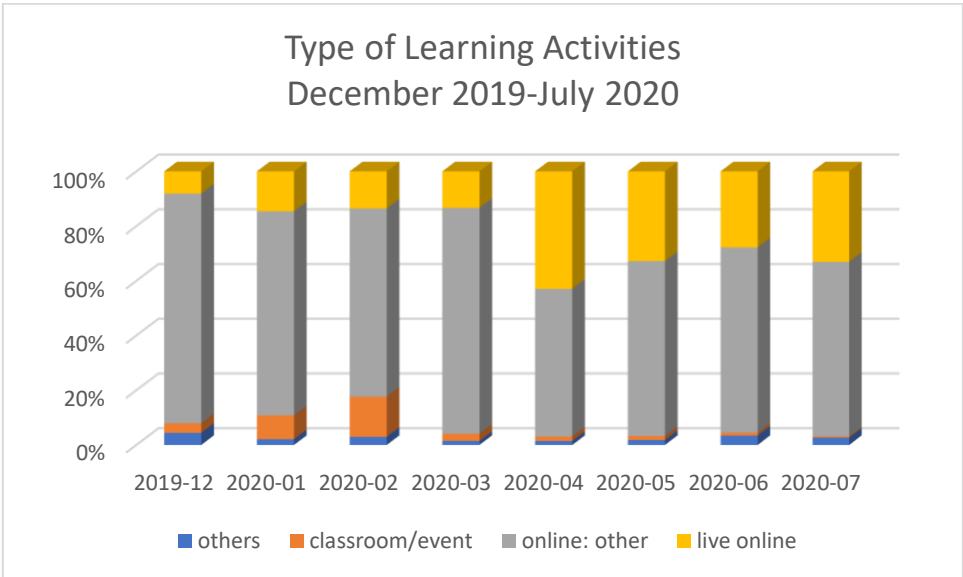


Figure 7 illustrates the distribution of time spent on various learning activities every month from December 2019 to July 2020. March 2020 witnessed a sharp decline of the percentage of classroom or event learning from 15% in the previous month to less than 3%, and at the same time an increase of asynchronous online learning from 68% to more than 83%. After an immediate increase of asynchronous online learning in March, live learning picked up in April, with a significant increase to more than 43% of all learning

hours, and remained at the level of around 30% in the subsequent months. Since March 2020, online learning overall accounts for 95% of all time spent on learning.

The findings are in line with organization wide patterns. In Q1 of 2020, IBM employees spent 5.36 million hours on learning overall, equivalent to an average of 16 learning hours per person. Eleven percent of IBM employees accumulated more than 40 learning hours in this single quarter. In Q2 2020, the average learning per employee reached 41 hours, an increase of 25 hours from Q1 and 7 more hours YoY. Particularly, virtual learning increased significantly by 66% from Q2 2019 to Q2 2020, while classroom learning dropped 82%.

The uninterrupted training and development activities can give the organization a unique advantage in continuously building skill competencies for the workforce that can pay off in the future.

V. Summary and Implications for IBM, Industry, and the Workforce

This case study brings together data available from different parts of IBM's HR data base to describe and analyze the effects of its state-of-the art organization-wide learning system. To our knowledge it represents the first time IBM has brought these data together to enable this type of qualitative and quantitative analysis of its complete learning system. It is also, to our knowledge, the first in-depth description and analysis of a state-of-the-art learning system of this kind to be made available for discussion among interested audiences outside of IBM. We therefore use this final section of this report to summarize our key findings and to start a discussion of the implications of these results both for IBM and for the future of learning and development in industry and the workforce.

Summary of Findings

This case study documents the development and use of a multi-faceted learning system that is embedded in a larger HR ecosystem focused on the importance of skills. Skills are critical to both IBM's business performance and to the career progression and security of its workforce. The key facets of this learning system include:

- A clear expectation that all employees will engage in 40 hours (or more) learning per year.
- The availability of a large and diverse array of learning "resources" developed by IBM and by outside education providers for employees to choose from to advance their skills and career opportunities.
- Use of an array of AI tools to assess employees' current skill proficiencies and guide them through pathways for further skill development to match their skills with available job opportunities.
- AI generated skills assessments that provide feedback to employees and serve as inputs to supervisors when making performance appraisals and salary recommendations.

The learning system is used extensively. In 2019 99 percent of IBM employees visited the learning system at least once. On average employees spent 77 hours in learning activities in 2019. Learning consumption has further increased in 2020 during the COVID-19 crisis.

By assembling data from multiple HR units, we were able to assess the effects of learning on job performance and career progression. The results show that time spent on learning and achievement of internal credentials the company calls “badges” is positively associated with (1) achievement of sales incentive targets, a key measure of performance for sales staff, and (2) career advancement as measured by movement up levels in the salary bands governing these occupations. Significant positive effects with both job performance and odds of promotion are associated with achievement of “skill” badges (badges that test for application of new knowledge) and “strategic” badges (those covering specific knowledge and skills related to new technologies such as AI and cloud computing and critical behavioral skills such as design thinking).

Implications for IBM

IBM has set clear and high expectations that all IBM employees will engage in learning as a normal part of their work activities and has built a system that allows individual employees to manage their personal learning plans. This represents a shift from most prior corporate training programs in the sense that it allows individuals to choose from a broad array of course offerings developed within and outside IBM rather than being limited to requesting permission to participate in training programs developed by inhouse training professionals and offered at a specified time or location. While this shift from a corporate initiated and managed training system to an individual learning system is not unique to IBM, the number and range of different “resources” (course offerings) is extensive and allows for greater access and choice among employees with different skill and/or career development needs or aspirations. Yet given the variety of courses, continuous monitoring of the quality and modifying the range of offerings to ensure courses are of high quality and relevant to the skills of the future are substantial tasks that will require continued investments.³

Training budgets in many companies have often been among the first to be cut when the economy declines. Our evidence indicates that rather than experiencing a

³ IBM does not warrant or guarantee in any way the effect of a learning system on its employees, including but not limited to job performance or career advancement, or future activities relating to learning activities. IBM makes no representations or warranties that any employee will, or is likely to, achieve an outcome similar to those discussed in this study. IBM conducts business activities such as promotion and compensation of employees without regard to race, color, religion gender, gender identity or expression, sexual orientation, national origin, genetics, disability, age, or any other protected category/characteristic.

decline in learning, learning hours increased considerably in the months since the COVID-19 crisis began. This demonstrates a resiliency of training unlike the prior pattern, in part because employees are in control of the time spent in learning. Thus, one perhaps unforeseen benefit of the Your Learning system is to make learning more resilient to economic downturns or disruptions than training programs of the past. One implication for IBM (and other firms) is to continue to invest in further development of its learning system in periods like the present, given the demonstrated willingness of IBM employees to continue and indeed to deepen their investments in learning in these difficult times.

Our evidence indicates that skills and strategic badges have large positive impacts on job performance and odds of being promoted. This suggests that further investments in course offerings focused around these two categories of learning would be especially beneficial to the company and to the workforce.

This analysis draws on data housed in a variety of different parts of IBM's massive HR data base. Building the data needed for the analysis required coordinated efforts of professionals who collect and manage a number of different HR units. Combining these data in this way produced results that document some of the benefits of IBM's learning system to the company and its employees. Yet much more could be done to further explore the patterns of learning and their consequences.

Implications for External Audiences

We undertook this project in part to provide a rich case study of a state-of-the-art workforce training, development, and learning system for the MIT Task Force on Work of the Future. <https://workofthefuture.mit.edu/research-post/the-work-of-the-future-building-better-jobs-in-an-age-of-intelligent-machines/>. A key objective of the Task Force is to assess the current state of private and public sector training and development programs, practices, and institutions. This case study provides a window into what an individual firm can do to promote learning, skill upgrading, and career mobility for workers and managers employed in occupations facing significant technological and product market changes. The mix of technical and behavioral resources available to IBM's tech sales staff mirrors the mix of skills needed for these professionals to adapt to advancing technologies, changes in product mix, and evolving customer needs. The high

take up rates observed among these professionals and the positive effects of their learning on job performance and career progression demonstrate the potential of this type of system. A question worthy of discussion is how to encourage and support more employers to implement similar learning systems adapted to the needs of their business and workforce.